MANAGEMENT OF VASCULAR DISEASES

2nd International Educational Course of Central European Vascular Forum (CEVF)

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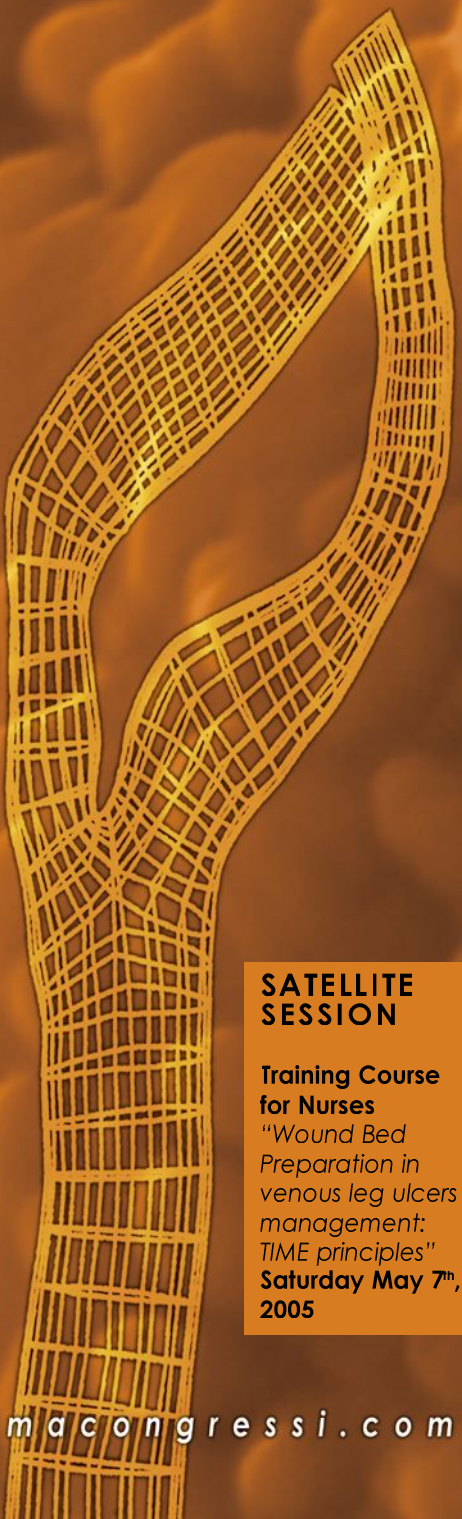

Under the Auspices of

Italian Society for Angiology and Vascular Medicine

Italian Society for Vascular Investigation

Organized by

Angiology Care Unit
University Hospital - Padua - Italy

May 4-7, 2005
Abano Terme (Padua) - Italy

SATELLITE SESSION

Training Course for Nurses
"Wound Bed Preparation in venous leg ulcers management: TIME principles"
Saturday May 7th, 2005

www.cevf2005.sistemacongressi.com

Dear Colleagues,

I have the pleasure of giving my warmest welcome on mine and my assistants' behalf, to all the Participants and Speakers of the ***2nd International Course on "The Management of Vascular Disease"****, organised by the Central European Vascular Forum.*

Our main objective in the organization of the program was to provide the most complete update on the Vascular Disease management, intended as the 360° approach from the diagnostic suspect, to the diagnosis, to the various treatment possibilities and the peculiar characteristics of the follow-up.

In order to harmonize all the topics of discussion, it has been necessary to ask some of the Speakers to sacrifice their specific competence to treat more general topics, such as the clinical or epidemiologic point of view, equally important under the educational profile. For this, I want to thank all the dear friends who have accepted this imposition.

One of the sessions from the Course is dedicated to the presentation and discussion of those clinical cases with a particular pedagogic exemplarity, which in our intent should represent an exercise in clinical reasoning.

I hope that the days spent in the amenities of Abano Terme will be useful to the improvement of the specific competences of each one of us, in line with the great cultural traditions of the Patavine Medical School. One of the oldest Universities in Italy and Europe, which in the past few years has celebrated the anniversary of the birth, death and teaching at the Padua Medical School of scientists as Vesalius, Copernicus, Harvey, Galileo, Morgagni, Acquapendente and others, each one of them a different expression of the deep-seated Central European Culture.

Prof. **Giuseppe Maria Andreozzi**
Past-President of Italian Society for Angiology and Vascular Medicine
Head of Angiology Care Unit of UniversityHospital of Padua
Italian National Delegate of Central European Vascular Forum

We thanks

ALFA WASSERMANN

BIOHEALTH

CIZETA MEDICALI

CRINOS

FOOTCARE BIOMEDICA

LA FARMACEUTICA DR. LEVI

SANAGENS

SIGMA TAU

STRODER

And also

CHIESI

GENTILI

GLAXO SMITH KLINE

NOVARTIS PHARMA

PFIZER

PIERRE FABRE

SERVIER

VARIMED

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PROGRAMME "AT GLANCE"

May 2005	Wednesday 4th	Thursday 5th	Friday 6th	Saturday 7th
8:30 AM		**SESSION 2**	**SESSION 5**	**SESSION 7**
9:00 AM			PRACTICE	
9:30 AM		AORTA AND	SESSIONS	PERIPHERAL
10:00 AM		ABDOMINAL		ARTERIAL
10:30 AM		VESSELS	KEYNOTE LECTURE	DISEASES
11:00 AM		*BREAK*	*BREAK*	*BREAK*
11:30 AM		**SESSION 3**	PRACTICE	**SESSION 8**
12:00 PM			SESSION	DIABETES AND
12:30 PM		VENOUS		PERIPHERAL
1:00 PM		THROMBO EMBOLISM		ARTERIAL DISEASE
1:30 PM	*REGISTRATIONS*			
2:00 PM	***OPENING***	*LUNCH*	*LUNCH*	*LUNCH*
2:30 PM	***CEREMONY***			
3:00 PM	**SESSION 1**	**SESSION 4**	**SESSION 6**	CONSENSUS
3:30 PM			CHRONIC	MEETING
4:00 PM	PHYSIC BASIS AND	CEREBROVASCULAR	VENOUS	ON
4:30 PM	APPLICATION	DISEASES	INSUFFICIENCY	INTERMITTENT
5:00 PM			& LYMPHOEDEMA	CLAUDICATION
5:30 PM				(for Invited Speakers only)
6:00 PM	KEYNOTE LECTURE	KEYNOTE LECTURE	KEYNOTE LECTURE	

SCIENTIFIC PROGRAMME

Wednesday May 4th

1:30 PM *Registrations*
2:00 PM *Opening Ceremony*

1st session Physic Basis and Application

Chairpersons: F. Benedetti Valentini (Rome) – K. Roztocil (Prague)

3:00 PM Physics of Conventional and Innovative Ultrasound Measurement
A. Evangelisti (Florence)

3:15 PM Vascular Haemodynamics and Doppler Interpretation of Supra Aortic Trunks
S. Castellani (Florence)

3:30 PM Vascular Haemodynamics and Doppler Interpretation in the Arteries of Upper and Lower Limbs
A. Visonà (Castelfranco Veneto)

3:45 PM Intima-Media Tickness, % of Stenosis Measurement and Clinical Findings
P.L. Antignani (Rome)

4:00 PM Transcranial Doppler and Eco-color-Doppler
G. Meneghetti (Padua)

4:15 PM Vertebrobasilar Ultrasonography
B. Gossetti (Rome)

4:30 PM Eco-color-Doppler before, during and after Carotid Surgery
L. Pedrini (Bologna)

4:45 PM Errors and Limits of Ultrasounds in Vascular Medicine
L. Lusiani (Castelfranco Veneto)

5:00 PM The Treadmill Test in the Assessment of Intermittent Claudication
M. Prior (Verona)

5:15 PM Speed rather than Distance: a new parameter for a home-based training programme on claudication
P. Zamboni (Ferrara)

5:30 PM The techniques for the evaluation of the microcirculation can be applied in a clinical environment?
S. Forconi - T. Gori (Siena)

5:45 PM ***Continuous Medical Education Multiple Choice Tests***

6:15 PM **Keynote Lecture**
Chairman *V. Puchmayer (Prague)*
Which Abdominal Aorta Aneurysm is not suitable for open repair?
T. Sosa (Zagreb)

Thursday May 5th

2nd session — Aorta and Abdominal Vessels

Chairpersons: D. D'Amico (Padua) - L. Castellani (Tours)

8:30 AM	Aortic Dissection G.R. Pistolese (Rome)
8:45 AM	Diagnosis and Clinical Approach to Abdominal Aorta and Mesenteric Arteries C. Pratesi (Florence)
9:00 AM	Small Abdominal Aortic Aneurysms Surveillance F. Verlato (Padua)
9:15 AM	Conventional and Endovascular treatment of Descending Thoracic Aorta Aneurysm G.P. Deriu (Padua)
9:30 AM	Limitations of endovascular aneurysm repair - the other face of the coin E. Hussein (El Cairo)
9:45 AM	Vena Cava Diseases M. Frego (Padua)
10:00 AM	New Issues in EVAR follow-up D. Palombo (Genoa)
10:15 AM	Complications of Abdominal Vascular Surgery G.C. Bracale (Naples)
10:30 AM	***Continuous Medical Education Multiple Choice Tests***
10:45 AM	*Break*

Thursday May 5th

3rd session — Venous Thromboembolism

SCHWARZ PHARMA

Chairpersons: *S. Coccheri (Bologna) – E. Ponte (Trieste)*

11:00 AM	Epidemiology and Natural History of VTE and related implications for treatment S. Coccheri (Bologna)
11:15 AM	Eco-color-Doppler and DVT: Compression Ultrasound or Extensive Venous Examination? G. Palareti (Bologna)
11:30 AM	The coagulative test in the diagnosis, prevention and therapeutic monitoring of VTE P. Simioni (Padua)
11:45 AM	Venous thromboembolism and cancer A. Pinto (Palermo)
12:00 PM	Superficial Venous Thrombosis N. Barbera (Messina)
12:15 PM	Therapeutic Options in out-patients and in-patients with DVT R. Parisi (Venice)
12:30 PM	Pulmonary Embolism: Diagnosis and Treatment P. Prandoni (Padua)
12:45 PM	Upper Limbs Deep Vein Thrombosis G. Camporese (Padua)
1:00 PM	***Continuous Medical Education Multiple Choice Tests***
1:30 PM	*Lunch*

Thursday May 5th

4th session — Cerebrovascular Diseases

Chairpersons: G. Baggio (Padua) – M. Cospite (Palermo)

3:00 PM — Risk factors in stroke and VAD
P. Prati (Udine)

3:15 PM — Does Ultrasound Characteristics of Carotid Lesions influence the choice of treatment
J. Fernandes e Fernandes (Lisboa)

3:30 PM — Traditional and Endovascular Carotid Revascularization
F. Grego (Padua)

3:45 PM — Which Medical Treatment for Asymptomatic or Symptomatic Carotid Patient?
R. Pesavento (Padova)

4:00 PM — Patency of Forame Ovale and Paradoxical Cardioembolism
R. Razzolini (Padua)

4:15 PM — Percutaneous closure of Patent Foramen Ovale and atrial septal defect: when and how
M. Carminati (San Donato Milanese - Milan)

4:30 PM — Intracranial Aneurysm
R. Scienza (Padua)

4:45 PM — ***Continuous Medical Education Multiple Choice Tests***

5:15 PM — **Keynote Lecture**
Chairman — *A. Strano (Rome)*
Update sull'ictus cerebrale: SPREAD 2005
G.F. Gensini (Florence)

Friday May 6th

5th session Practice Session

Chairpersons: E. Marchitelli (Rome) – G. Pollari (Rome)

PRESENTATION OF CASE REPORT IN PLENARY SESSION, WITH INTERACTIVE INVOLVEMENT OF PARTICIPANTS.
THE PRESENTATION WILL BE STOPPED FOLLOWING THE LOGICAL DECISION MAKING, AND PARTICIPANTS WILL BE ASKED ABOUT THEIR OWN CHOICE.
THE REPLIES WILL BE REGISTERED ON THE REPORT FORM FOR THE EDUCATIONAL TRAINING

8:30 AM	***Participants' Meeting and Distribution of the Forms for the Educational Training***
8:45 AM	Case n. 1– G. Camporese (Padua)
9:00 AM	Case n. 2 – A. Amato (Bologna)
9:15 AM	Case n. 3 – L. Di Pino (Catania)
9:30 AM	Case n. 4 – G. Salmistraro (Padua)
9:45 AM	Case n. 5 – M. A. Scomparin (Padua)
10:00 AM	Case n. 6 – R. Pepe (Rome)
10:15 AM	Case n. 7 – D. Righi (Firenze)
10:30 AM	*Break*
10:45 AM *Chairman*	**Keynote Lecture** *A. Stella (Bologna)* The Acute Ischemia of Lower Limbs: how to improve surgical outcome? Indications from the ILAILL Study G. De Donato (Naples)
11:15 AM	Case n. 8 – F. Verlato (Padua)
11:30 AM	Case n. 9 – A. Carlizza (Rome)
11:45 PM	Case n. 10 – G. Arpaia (Vimercate - Milan)
12:00 PM	Case n. 11 – R. Martini (Padua)
12:15 PM	Case n. 12 – F. Pilon (Padua)
12:30 PM	***Continuous Medical Education Multiple Choice Tests***
1:00 PM	*Lunch*

Friday May 6th

6th session — Chronic Venous Insufficiency and Lymphoedema

Chairpersons: *G.B. Agus (Milan) – F. Annoni (Milan)*

3:00 PM — The Reflux Patterns in Varicose Veins
S. Camilli (Rome)

3:15 PM — Chronic Venous Insufficiency (CVI) - Pathophysiology Diagnosis and Management
G.M. Andreozzi (Padua)

3:30 PM — Compression Therapy in CVI
H. Partsch (Wien)

3:45 PM — Elastic Stocking and Quality of Life, in Patients with Chronic Venous Insufficiency
R. Cordova (Trapani – Padua)

4:00 PM — Indications and Techniques of Traditional Venous Surgery
U. Baccaglini (Padua)

4:15 PM — Indications and Techiniques of Haemodynamic Venous Surgery
S. De Franciscis (Catanzaro)

4:30 PM — Integrated Treatment of Venous Diseases
L. Scaramuzzino (Naples)

4:45 PM — Epidemiology, Diagnosis and Management of Lymphoedema
V. Gasbarro (Ferrara)

5:00 PM — Surgical Treatment of Lymphoedema
C. Campisi (Genoa)

5:15 PM — Conservative Treatment of Lymphoedema
G. Scondotto – D. Aloisi (Bologna)

5:30 PM — ***Continuous Medical Education Multiple Choice Tests***

6:00 PM — **Keynote Lecture**
Chairman *G. Brotzu (Cagliari)*
The Management of Venous Ulcers: what news?
C. Allegra (Rome)

9:00 PM — *Social Dinner*

Saturday May 7th

7th session — Peripheral Arterial Diseases

Chairpersons: A. Pagnan (Padua) – F. Setacci (Siena)

8:30 AM — Role and Clinic Relevance of Traditional and New Risk Factor of ATS
S. Novo (Palermo)

8:45 AM — Endothelial Dysfunction: prognostic and clinical application
P. Poredos (Ljubljana)

9:00 AM — Management of Stable Claudication
G. Brevetti (Naples)

9:15 AM — Definition and Management of the Severe Claudication
H. Rieger (Engelskirken)

9:30 AM — Iliac, Femoral and Popliteal Endovascular Procedure in Claudicant Patients
A. Balbarini (Pisa)

9:45 AM — The Physical Training in Patient with Peripheral Arterial Disease
E. Arosio (Verona)

10:00 AM — Update on therapeutic angiogenesis in the clinical setting
P. Pauletto (Padua)

10:15 AM — Management Strategies for CLI
R. Martini (Padua)

10:30 AM — The Foot's Revascularisation "under knee"
P. Frigatti (Padua)

10:45 AM — New Devices for Distal Revascularization - Different Strategy (PTA or Bypass) for different patients?
R. Ragazzi (Padua)

11:00 AM — ***Continuous Medical Education Multiple Choice Tests***

11:15 AM — *Break*

Saturday May 7th

8th session **Peculiarities of Diabetic Vascular Disease**

Chairpersons: *R. Del Guercio (Naples) – A.R. Todini (Rome)*

11:30 AM Distal arterial revascularization in diabetic patients
C. Dzsinich (Budapest)

11:45 AM Pathogenesis, Clinical Features and management of Charcot's Foot
G. Piaggesi (Pisa)

12:00 PM Pedal bypass and limb salvage in Diabetic patient
M. Gargiulo (Bologna)

12:15 PM The Acute Diabetic Foot
L. Dalla Paola (Abano Terme)

12:30 PM ***Continuous Medical Education Multiple Choice Tests***

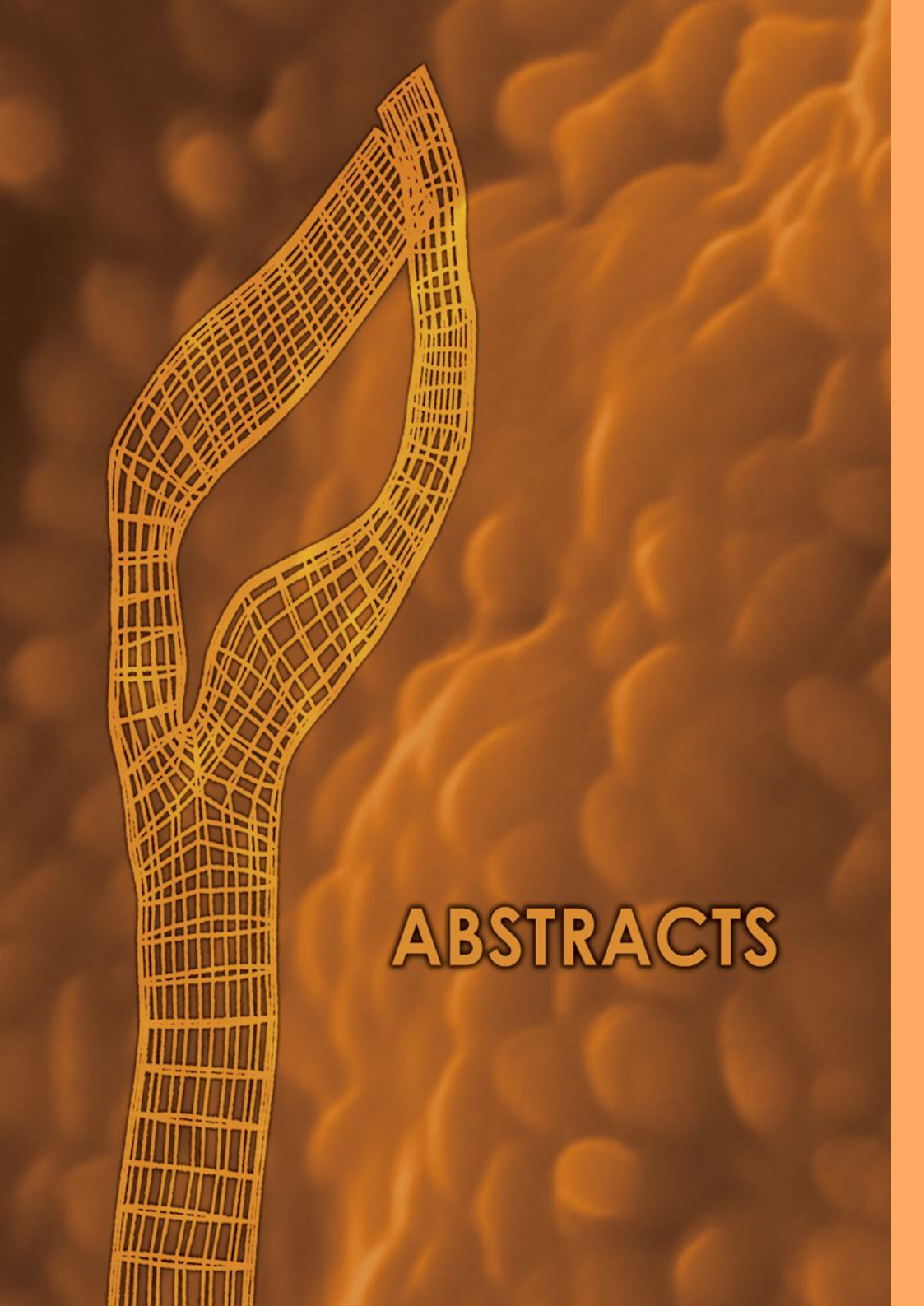
1:00 PM *Lunch*

3:00 PM **Consensus Meeting on "Intermittent Claudication"**

Invited Speakers Only

biofutura

7:00 PM *End of the Course*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Director of Diabetic Foot Section, Dpt of Endocrinology and Metabolism, University of Pisa – Italy

1

VASCULAR HAEMODYNAMICS AND DOPPLER INTERPRETATION OF SUPRA-AORTIC TRUNKS

Sergio Castellani
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Duplex scanning provides simultaneous hemodynamic and morphological informations of supra-aortic vessels by combining 2D echography, color-doppler, power-angio and conventional doppler techniques. 2D echography can detect and define the site of an atherosclerotic lesion, describes its thickness and extension, provides a morphologic characterization and distinguishes eccentric from concentric and ulcerated plaques. In addition 2D echo allows a plaque tissue characterization based on its echogenicity (Tab.1).

Tab. 1 Modified GRAY – WEALE CLASSIFICATION (1988) (1,2)

Class 1 Echolucent (anechoic) with thin echogenic cap
Class 2 Mostly echolucent with small echogencic areas
Class 3 Echogenic plaques qwith small echolucent areas (anechoic)
Class 4 Homogeneously echogenic
Class 5 Non classifiable calcified plaques

This classification has allowed plaque definition in a consistent and repeatable fashion independent from the site of examination. Since some international "consensus conferences" have achieved an agreement on this standard definition, the classification was included in the guidelines of the most important international scientific societies thus allowing to speak a "universal" language despite the use of different machines, provided that gray scale regulation is maintained rigourously constant (the color of the void vessel lumen must be homogeneously black and the wall echo intensity must be homogeneously white) .

The hemodynamic characterization is mandatory to classify the severity of a carotid stenosis. Ultrasound techniques use colordoppler to draw a roadmap of acceleration jets and focal bruits, while conventional Doppler is used for the velocitometric quantification of the acceleration. When an atherosclerotic lesion extends less than 3 from the carotid origin, a greater than 50% ICA stenosis is constantly associated with a Doppler frequency shift and the focal acceleration is directly proportional to the diameter reduction (3). This relation has been worldwide used to screen hemodynamic carotid stenoses with Doppler techniques. Each vascular laboratory should use its own reference values according to a table that has been validated by parallel angiographic evaluation.
Table 2 reports, for example, the reference values adopted by the laboratory of our institution. Velocities were measured after 60° angle correction, and were compared with the angiographic findings showing a greater than 90% sensitivity and specificity.

Tab. 2 DOPPLER VELOCITY CRITERIA TO GRADE CAROTID STENOSES

Stenosis (%diameter reduction)	ICA peak systolic velocity (PSV) cm/sec	ICA end-diastolic velocity (EDV) cm/sec	ICA/CCA Vel. ratio
30-49	> 100	< 100	1.5-1.8
50-69	125-180	< 100	> 1.8
70-79	180-250	< 100	> 3
80-95	> 250	> 100	> 3.5
Occlusion	Absence of flow or inverted flow in the proximal ICA		

ICA = internal carotid artery
CCA = common carotid artery

References:
1. Gray-Weale AC, Graham JC, Burnett et al., Carotid artery atheroma: comparison of preoperative B mode ultrasound appearance with carotid endarterectomy specimen pathology. J Cardiovasc Surg. 29,676, 1988.
2. Geroulakos G, Ramaswami G, Nicolaides A, et al Characterization of symptomatic and asymptomatic carotid plaques using high resolution real time ultrasound Br J Surg 80, 1274, 1993.
3. Spencer MP, Reid JM, Quantitation of carotid stenosis with continuous wave Doppler (CW) Doppler ultrasound. Stroke 10, 2326-330,1979.

2 VASCULAR HAEMODYNAMICS AND DOPPLER INTERPRETATION IN THE ARTERIES OF UPPER AND LOWER LIMBS

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Responsabile UOD Angiologia- Azienda ULSS 8 Castelfranco Veneto (TV), Italy

The arterial system of upper and lower limbs cause clinical problems when acute or gradual arterial narrowing occur or if arteries become aneurismatic.
One of the remarkable aspects of the arterial system is its ability to adapt. The adaptation is too slow in acute occlusion, while collateral circulation opens and functions well when chronic arterial obstructions develop.
A great deal of attention deserves the concept of critical stenosis, which defines the degree of reduction in arterial cross-sectional area sufficient to produce a fall in pressure and flow beyond the site of involvement under resting flow conditions. A critical stenosis has been defined as a 50% reduction in diameter, which corresponds to a 75% reduction in cross-sectional area.
It is well known, however, that much less severe degrees of stenosis can become haemodynamically significant when there is a conspicuous increase in flow, such as might occur during exercise.
With a critical arterial stenosis, we can measure pressure drop across the area of obstructive involvement. These haemodynamic considerations explain why the measurement of ankle systolic blood pressure (ASBP) and ankle/brachial index (ABI) are such important methods of documenting the presence of occlusive disease in the lower limb.
ASBP is the most sensitive parameter for the assessment of haemodynamic significance because it is the first to fall (mean and diastolic blood pressure do not decrease until obstruction becomes more advanced); moreover it is easy to detect with any indirect methods, such as continuous wave (CW) Doppler.
It is important to realise that the magnitude of the pressure fall depends on the resistance offered by the collateral circulation. In general terms, with a single segment arterial occlusion of an iliac or superficial femoral artery, the ASBP is more than half that recorded from arm and ABI is greater than 0,50. When another segment is occluded the resistances offered by the second series of collateral is one additive. Thus, a multisegmental disease gives an ABI less than 0,50
Other relevant haemodynamic considerations involve the changes that occur in the velocity patterns. When a total occlusion develops, flow is diverted through collateral arteries and a progressive fall in the peak systolic velocity with loss of the reverse flow component is observed.
The contour of such waveforms has been described as monophasic and represents a "damped" version of the normal patterns. The end diastolic velocity remains above zero, which is a reflection of the compensatory decrease in resistance offered by the peripheral arterioles.
The normal flow pattern in the leg is triphasic (forward, reverse, forward) within each heart cycle. A biphasic flow signal without reverse flow is not a normal finding in the leg and indicates a proximal obstruction. However, a biphasic flow pattern in an upper extremity artery may be within normal limits.
An absence of reverse flow component in a normal arterial system reflects the lower resistance to flow. An arterial flow pattern in the arms or legs that is monophasic is always abnormal, reflecting the presence of a high grade stenosis or occlusion proximal to the recording site.
As screening for peripheral arterial disease, the clinical history and ABI is generally all that is needed.
The ABI is described following these criteria: normal, more than 0,95; abnormal, less than 0,95; multilevel disease less than 0,50; critical ischemia less than 0,30. Toe/brachial index (TBI) is measured when the arteries cannot be compressed (due to medial calcification). The diagnostic criteria for TBI are: normal, more than 0,70; abnormal, less than 0,69.
The peripheral arterial duplex scanning is indicated for: candidates for PTA and to reexamine the same segment to define haemodynamic significance as complement of arteriographic finding; to document sources of emboli; to evaluate unusual causes of claudication; to detect and treat false aneurysms; to evaluate results of fibrinolysis; to perform intraoperative monitoring and to monitor grafts.
The categorical criteria for arterial disease in the lower extremities are: normal (peak systolic velocity within normal limits, clear window underpeak systole, reverse flow present); <50% (peak systolic velocity within normal limits, spectral broadening present, reverse flow present, peak systolic velocity increase – but not more than 100% from previous segment); 50-79% (peak systolic velocity increase –more than 100% from previous segment, reverse flow absent, poststenotic flow, spectral broadening PSV 120- 250 cm/sec); 80-99% (peak systolic velocity increase –more than 100% from previous arterial segment, absence of reverse flow, poststenotic flow present, PSV 250 cm/sec); occluded (absence of Doppler signals, retrogade flow in collateral artery at site of vessel entry).
The upper extremities evaluation may be for either acute (suspected embolic events) or chronic problems: cold sensitivity-primary or secondary Raynaud's disease; thoracic outlet syndrome-vascular versus neurogenic; documentation of subclavian steal syndrome; suspected vasculitis. The innominate, subclavian, axillary, brachial radial and ulnar arteries are easily assessed by duplex scanning.
The diagnostic criteria are: normal (uniform waveforms; biphasic or triphasic waveforms; clear window beneath systolic peak); less than 50% diameter reduction (focal velocity increase; spectral broadening; possibly triphasic or biphasic flow); more than 50% diameter reduction (focal velocity increase; loss of triphasic or biphasic velocity waveform; poststenotic flow); occlusion (no flow detected).

INTIMA-MEDIA THICKNESS, % OF STENOSIS MEASUREMENT AND CLINICAL FINDINGS

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It is well known that carotid axis is studied with echo-color-Doppler (ECD) that is actually considered the gold standard diagnostic exam.
In the last national guidelines, it is reported that ECD is the preferred test for diagnosis and screening of cerebrovascular diseases. It is also indicated in patients with transient ischemic attacks o recent stroke for a correct etiopathogenetic frame.
It is also indicated in patients with latero-cervical murmur, with peripheral and/or coronary arterial disease, with aortic aneurysm, in subjects over 65 years with multiple risk factors and in patients who should undergo on a major vascular surgical treatment.
ECD supplies morphologic and hemodynamic information for a correct definition of carotid atherosclerotic disease, in which every characteristic sets out for medical or surgical treatment.
Hemodynamic grade of stenosis: it is well known the evidence of haemodynamic grade of stenosis and of its evaluation: the significant reduction of cerebral stroke risk is due to surgical treatment in patients with symptomatic stenosis between 70% and 99% (NASCET) or between 80% e 99% as the ECST study reports. It is also well defined that asymptomatic patients with heamodynamic stenosis over 60% (ACAS stduy) should undergo to surgical treatment.
Evaluation of intima-media thickness(IMT): IMT is defined as a regular or not increase of the arterial wall. It has been demonstrated a strong correlation between echographic data and the histologic findings of the arterial wall with a difference of 30%, for a reduction of fluid component in microscopic preparation.
IMT increases physiologically with age and it is accepted as pathological if the its measurement is more than 1,5 mm.
Moreover, IMT is actually considered as an indicator of cardiovascular risk and as a measure of the extent of atherosclerosis.
An epidemiological study on 15,000 subjects, demonstrated that there is a positive correlation with the increase of IMT and HDL-cholesterol and triglycerides values besides arterial hypertension and diabetes mellitus. The control and treatment of cardiovascular risk factors is associated with a reduction or a lower progression of IMT in the same ways as the reduction of cardiovascular events and the symptomatic improvement of peripheral arterial disease.
Morphology of carotid plaque: morphologic plaque parameters that should be evaluated during ECD examination are well defined: plaque structure, morphology of the surface (fibrous cap), echogenicity, ulceration or rupture. All these parameters should be evaluated for a correct definition of a "plaque with risk" that needs an immediate surgical treatment. Several studies evidenced that a fine fibrous cap or an ulceration or a superficial necrotic core are parameters that correlates with a symptomatic carotid plaque. Plaques can be divided, on the basis of echographic features, into homogeneous and heterogeneous plaques, soft, hard and mixed plaques.
In literature, several authors defined the type of plaque as a marker for cerebrovascular ischemic event risk. In fact, it has been shown that plaques associated with cerebral symptoms are frequently less echogeneous and more obstructive that the asymptomatic one. The incidence of symptomatic lesions is more elevated with heterogeneous plaques (80%) respect to the percentage of stenosis (stenosis over 70% = 75% of symptomatic lesion, stenosis over 60% = 68%). Moreover, greater is the grade of stenosis , greater is the incidence heterogeneous plaques. In particular, echolucent plaques are more correlated with cerebrovascular ischemic event risk, independently by grade of stenosis, gender, age and other cardiovascular risk factors.
A recent study correlated neurovascular symptoms with the characteristics of carotid plaques and demonstrated that asymptomatic patients presented hyperechogenetic plaque with mild carotid stenosis (<70%), patients with "amaurosis fugax" presented a hypoechogenetic plaque with severe stenosis (90%) and patients with transient ischemic attack and stroke had a echogenetic plaque with intermediate grade of stenosis (80%).
An Italian study showed that not homogeneous plaques and with irregular surface were more symptomatic (respectively 5% and 5.8%) respect to those homogeneous and with a regular surface (respectively 1.3% and 0.9%).
Normally a visual analysis evaluates the plaque structure, and it is actually highly reliable and well comparable (intra-operator reproducibility K= 0.95); but this evaluation is subjective, operator-dependent and instrument-dependent. To improve and standardize the method, it has been proposed a computed analysis of the plaque morphology on the basis of grey scale changes of the plaque structure (GSM: Gray Scale Median). This method has recently been modified fixing 0 as the echographic value of blood and 190 as the adventitia value in order to improve its sensibility; in fact it has been possible to observe that patients with amaurosis had a GSM of 7.4 , symptomatic patients a GSM of 13.3 and asymptomatic patients a GSM of 30.5.
The real vantage of GSM are its accuracy and reproducibility but its disadvantage are represented by elevated software cost, long time of the test and difficult application in clinical practice.
This method can anyway give therapeutic indications, as described in ICAROS study, in which the indications of endovascular angioplasty are supplied on the basis of GSM evaluation: GSM < 25: uncertain indication of angioplasty, GSM between 25 and 50: PTA with a protective system, GSM >50: without protective system.

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TRANSCRANIAL DOPPLER ED ECO-COLOR-DOPPLER

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The role of ultrasounds in primary and secondary prevention of stroke is well defined. In many Italian and European centres the selection of patients requiring carotid surgery is based on the informations provided by Doppler ultrasounds. Moreover transcranial Doppler has been demonstrated to be a useful diagnostic tool able to evaluate the presence of microembolic signals expression of high risk carotid plaques that demand an aggressive therapeutic approach [1]. However the role of neurosonology in acute stroke is not yet well defined as validated guidelines are lacking. Transcranial Doppler has been demonstrated to be a reliable technique in the evaluation of intracranial circulation due to the fact that it is accurate, non invasive and able to influence patient's management and outcome. Italian guidelines (SPREAD 2003) establish that assessment of extracranial and intracranial vessels with ultrasounds should be available in the acute setting as the reliability and the temporal resolution of the ultrasounds make this technique able to assess rapidly and non invasively the site of arterial occlusion and the time of arterial recanalization. In fact transcranial Doppler allows an early identification of occlusion or stenosis of cerebral arteries and contributes to the etiologic diagnosis and to a better understanding of the pathophysiology of stroke. Moreover this technique has an important prognostic value as it gives early informations on markers of stroke progression allowing a prompt and a selective therapeutic decision. In this paper we report the multidisciplinary program developed by the Cerebro Vascular Illness Study Group on behalf of the Italian Neurological Society and of the Italian Society of Neurologists, Neurosurgeons and Neuroradiologists. This program has been developed with the aim to train experts in the management and treatment of stroke and the module described here is dedicated to the neurovascular ultrasounds. This module is made of 10 hours of theoretical lessons and of 65 hours of practical training. The didactic aim of the program is to provide the knowledge and the skills required to prescribe extracranial and intracranial Doppler ultrasounds examinations and to interpret the reports of these procedures in order to assess their diagnostic and prognostic value as well as their risk and cost/benefit ratio.

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VERTEBROBASILAR ULTRASONOGRAPHY

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Lesions of the vertebrobasilar system are considerably less studied than stenosis of carotid arteries. The most likely reasons for this are that stroke is far more commonly caused by lesions of carotid arteries, that the diagnosis of vertebrobasilar ischemia can be difficult due to the wide variety of symptoms and the fact that the vertebrobasilar system is more difficult to assess. Ultrasounds (US) of Vertebral (VA) and Basilar (BA) arteries are an effective technique, providing direct or indirect evidence of abnormal VA circulation, proximal or distal to the VA itself.

The VA is divided into four segments: segments V_1, V_2 and V_3 represent the extracranial VA, V4 is the intracranial one. V_1 begins along the posterior superior border of the subclavian artery (SCA) and extends to its entrance into the transverse foramen of the sixth cervical vertebral (C6): rarely the VA can arise from the aortic arch or common carotid artery. V_2 extends from the C6 to C1, travelling through transverse foramina at each vertebral level. V_3 is rostral to C1, ending at the point at which the artery pierces the dura madre. V4 is intradural segment and extends from the entrance into the cranial compartment to the junction with the contralateral VA to form the BA. Muscular branches originate from V_1 and V_2 and often have communications with branches of the external carotid artery; the posterior inferior cerebellar artery (PICA) originates from the intradural segment of the VA; rami of anterior spinal artery also originate from the intradural segment of the VA.

Duplex colour-coded ultrasonography (DCCU) allows to insonate V1 in approximately 90% of cases, with the right being more easily visualized than the left; V_2 segment is visible in 95% of patients. Once the probe has been positioned over the long axis of the common carotid artery, it is slid posteriorly: acoustic shadows from the transverse processes of the vertebrae will appear and one or more segment of V_2 segment should be seen between the shadows. The vessel should be imaged with colour Doppler, with a suitable low pulse repetition frequency/high colour gain, to establish the direction of flow. The V_3 section is not routinely imaged by many centres, while V_4 and BA may be investigated by Transcranial Doppler ultrasonography. With a transtemporal approach the P1 segment of the posterior cerebral artery (PCA) and the BA head can be depicted in all but 9% of cases; the transforaminal acoustic window allows direct insonation of V_4 segment and the proximal two-thirds of BA in 75% of cases. The application of pulmonary stable echo-enhancing agents can increase the diagnostic yield in situations with limited acoustic penetration, using transcranial colour-coded duplex ultrasonography.

In all patients, the extracranial course of the VA is assessed by 7.5 MHz linear and 5 MHz sector transducers: the transcranial and transforaminal examinations were carried out with a 2.0 MHz pulsed probe. For the cervical and transtemporal insonation the patient is lying in a supine position with head straight and the neck extended; it may be necessary to rotate the head to assess postural changes in VA flow. Transforaminal examination is performed with the patient lying on the right side and the head bent forward as much as possible.

Normal Doppler parameters

Peak systolic velocity (PSV) is approximately 20-60 cm/sec in V_2 segment: PSV is higher at the origin, in V_1, ranging from 30 to 100 cm/sec (mean 64). End diastolic velocity (EDV) is 15.10 ± 5.39 cm/sec. Mean flow velocity (MV) is 25.26 ± 7.54 cm/sec and MV-ratio (MV of contralateral VA divided by that of target VA) is 0.94 ± 0.37. A normal VA diameter is regarded as 3.5 mm (3.76 ± 0.66), with a tendency for the left VA to be larger than the right; diameter ratio (diameter of contralateral VA divided by that of target VA) is 0.97 ± 0.27 mm. MV in BA is 42±10 cm/sec. The direction of the flow goes far away the probe (it is always negative in relation to zero crossing).

Hypoplasia

Hypoplasia is evinced by a normal spectral waveform or bidirectional in some cases and the marked dilatation of the contralateral VA: a diameter of < 3mm is suggestive of hypoplasia.

Stenosis/occlusion

The origin of VA is the most common site of stenosis, although strictures may occur throughout its length; ostial stenoses may be detected by a focal velocities in excess of 100 cm/sec and a tardus-parvus waveform in the more distal VA. The degree of turbulence and poststenotic pulsatility changes, in comparison with the contralateral VA, were applied to further classify high-grade stenosis: in 70% stenosis, a small decrease in poststenotic pulsatility, in 80% a markedly decrease and in 90% a scarcely modulated poststenotic flow spectrum with almost nullified pulsatility. Detection of a well-defined VA walls on the grey-scale image with no flow is suggestive of occlusion in the VA origin, particularly if calcified plaque can by identified. Preserved PSV but EDV of zero indicates an occlusion before branching PICA; MV <18 cm/sec, MV-ratio ≥1.4 and a diameter ratio <1.4 indicate the occlusion after branching PICA.

Dissection

The V_3 segment is the most frequency involved in dissection and US pattern is characterized by abnormally low PSV, a high resistance waveform and absence of flow or reversal of flow.

Extrinsic compression

During cervical rotation an extrinsic compression of VA can occur at all levels; the US technique is neither sensitive nor specific in this application. A reduction or cessation of VA flow on cervical rotation is sometimes demonstrable, but the potential technical difficulties of insonation of the VA during head movement and achieving a significant degree of cervical rotation in elderly patients, and the frequent false positive test greatly reduce its sensitivity.

Vertebral-subclavian steal syndrome

Hemodynamically lesions of the SCA proximal to the VA origin may cause characteristic changes in the ipsilateral VA. A SCA stenosis ≤ 45% in diameter may manifest itself as a "pre-bunny" waveform, which is associated with the preservation of anterograde flow and the presence of a sharp mid-systolic deceleration, with a sharp first systolic peak and a more rounded, lower second systolic peak. An SCA stenosis in range of 55% may produce a deeper cleft between the two systolic peaks (bunny waveform), whereby the nadir of the clefts is at the same level and end diastole. Significant stenosis of SCA (~80% or greater) produces a VA waveform with initial anterograde flow and subsequent retrograde flow each cardiac cycle. Occlusion or high grade SCA stenosis may produce complete VA and BA flow reversal. It should be noted that mild to moderate SCA stenoses may only produce a pressure gradient after exercise and that exercise may increase the stage of an already abnormal VA waveform (exercise test).

Coronary-subclavian steal syndrome(CSSS)

CSSS occurs when the left internal mammary artery (LIMA) has been used as a bypass conduit for coronary revascularization and the presence of a significant stenosis in the proximal SCA causes flow reversal in the VA and ipsilateral LIMA, creating a steal away from the heart and/or the brain. A bunny waveform may be evident in the left VA.

Aortic valve disease

Patients with severe aortic stenosis and/or aortic incompetence may have alterations in the VA waveform and it may become "bisferious", with the second systolic peak greater than or equal to the first, both peaks being distinct from the dicrotic notch. This appearance may also be seen in the carotid arteries.

6 ECO-COLOR-DOPPLER BEFORE, DURING AND AFTER CAROTID SURGERY

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Eco-color-Doppler is the first tool to evaluate or to screen patients with carotid stenosis and, in many cases; it can be the only vascular preoperative examination, if we exclude the evaluation of the brain.

Before surgery it's important to study carotid, subclavian and vertebral arteries, to show combined stenosis or occlusions and to evaluate the possible collateral pathway during carotid clamping. The parameters that must be evaluated to propose an invasive treatment and to choose the type of treatment are at carotid level: the degree of the stenosis, the surface of the plaque, the echogenicity of the plaque, with the determination of the GSM (grey Scale Median), the position of carotid bifurcation, the proximal and distal end of the stenosis.

Reporting the degree of the stenosis must be declared the method used to measure it; moreover the flow parameters peak systolic velocity (PSV) and end diastolic velocity (EDV) at the level of the stenosis, with a correct angle of insonation, must be reported. A wide photographic documentation of both longitudinal and transverse scan of the common carotid artery and of the carotid bifurcation must be reported.

During surgery, a completion ultrasound (US) evaluation is useful to show technical errors and to decrease post-operative complications. The more common defects are: intimal flaps or residual stenosis in the endarterectomized area, a residual stenosis in the common carotid artery that can be flapping in the distal end, incomplete endarterectomy in the external carotid artery with flaps or partial thrombosis, stenosis caused by irregular suture, mural thrombus, clamp related dissections. This last rare complication is often present only in the follow-up examination.

The intraoperative ultrasound or angiographic evaluation generally improves the ability of the surgical equip, so the number of patients who need intraoperative correction for technical faults decreases in a short time. However, an US evaluation can be recommended because it is short time consuming and does not increase the costs of the operation but, on the contrary, it can save some rare patients by very severe complications.

After surgery, many surgeons agree with a follow-up evaluation, particularly in the first year, to show restenosis due to intimal hyperplasia. Long-term follow-up may be useful to show late restenosis (generally more than 5-10 years after surgery) and to draw survival or free of recurrence curves of a group. The contralateral carotid bifurcation must be evaluated to show an increase of an eventual associated lesion. The surgeons, on the basis of their own experience, will prescribe the timing of the follow up US evaluation.

7 ERRORS AND LIMITS OF ULTRASOUNDS IN VASCULAR MEDICINE

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An appropriate use of ultrasonic imaging in vascular medicine must be based on the understanding of some limitations inherent to the physics of ultrasounds (US) and to the physiology of the arterial circulation. In order to avoid major errors, it must be appreciated that ultrasonic images are highly artifactual and require interpretation.

1. It is a common assumption that US travel at a constant speed of 1540 m/s in soft tissues; all instrumentations are calibrated accordingly. However, the speed varies from fat (1450 m/s) to muscle (1580 m/s) or cartilage (1670 m/s). As a consequence, a certain amount of spatial distortion is always present in B-mode images; for example, if US travel only through fat, a reflector would appear to be 6% deeper than it is. When using a biopsy probe, part of the uncertainty of the location is due to this type of problem.

2. It is generally believed that extremely thin ultrasonic beams produce images highly defined along the thickness axis (i.e., only the superficial and deep portion of the vessel wall are visualized, when insonated in a longitudinal plane). However, ultrasonic beams are rather thick, compared with the diametper of medium sized arteries. As a consequence, the final imagine is a compound of different planes, and reflections coming also from lateral portions of the vessel wall, or even extraluminal structures (especially if very echogenic, such as those containing calcium), make the interpretation of a single image hazardous (i.e., normal arteries can be viewed as occupied by protruding calcific plaques).

3. In longitudinal studies, aimed at evaluating the progression of atherosclerotic plaques, reproducibility is a major issue. US have shown to be highly reproducible in terms of linear measurements (i.e., arterial wall thickness), thanks to the optimal axial resolution. However, the same is not as true for tissue characterization, mainly due to the angular dependence of the reflections (the gray scale of a specular reflector depends on the incidence of the ultrasonic beam angle). As a consequence, the appearance of an atherosclerotic plaque may change from one examination to another, depending on the viewpoint. Pointing systems, with the capability to orient probes and to make imaging consistent on subsequent examinations, have never been introduced in the clinical practice.

4. Colour-coding of the Doppler shift does not permit a quantitative approach to blood velocity analysis. A low pulse repetition frequency (PFR) is allowed within each picture element (pixel) of a colour image, as compared with the far higher PFR of a single-gated conventional pulsed wave (PW) Doppler. This fact, along with the averaging process (necessary to reduce background noise), explains why the velocity values of a colour instrument are lower than the corresponding values of a PW Doppler device. As a consequence, colour-coded images cannot be used to quantitate arterial stenosis, instead of the spectral analysis of the PW Doppler.

5. According to the Doppler equation, the angle correction of the Doppler frequency allows for peak blood velocity to be measured. Such correction is obtained assuming that blood flows along streamlines parallel to the vessel wall, with a steady parabolic profile. However, this is almost never the case. In fact, blood flow is helical in straight vessels, squewed in curved vessels, convergent into stenoses, pulsatile throughout conductance vessels and turbulent in many physiologic conditions. This makes angle correction very uncertain; colour-Doppler imaging does not help any further in this respect. As a consequence, the measurement of blood velocity being very inaccurate, the degree of an arterial stenosis can only be estimated through wide steps of severity.

6. Apart from the physics of US, many other hemodynamic variables affect the velocity of blood and its temporal profile throughout a single cardiac cycle. Although their importance cannot be overlooked when Doppler velocity is used for quantification purposes, they tend to be disregarded in the clinical practice. For example, aortic insufficiency brings about an enhanced stroke volume (the amount of blood ejected by the left ventricle per systole), and a backward flow in diastole; which means, a higher peak systolic velocity and a slow or inverted flow in diastole. Valvular aortic stenosis impedes pulse pressure to be transferred downstream; which means, a dampened and delayed peak velocity along the arteries. In atrial fibrillation the stroke volume changes from beat to beat, according to the variance of ventricular filling; which means, an arterial blood flow with peak systolic velocities constantly changing.
Such alterations are circumvented by measuring velocity ratios instead of absolute velocities, in order to estimate the degree of an arterial stenosis. However, reference values, specific for the aforementioned conditions, have never been validated.

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8 THE TREADMILL TEST IN THE ASSESSMENT OF INTERMITTENT CLAUDICATION

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Intermittent claudication is an atherosclerotic disease that causes a considerable impairment of the functional status of the patient, both as regard as the routine daily activities and the walking ability.
Since the treatment of this condition focus on increasing walking distance, it is particularly useful to objectively quantify this parameter at the time when the patient is firstly assessed, and then whenever a control of therapy efficacy is needed.
There are many tools for the functional evaluation of the patient with intermittent claudication: recording of the self-assessed walking distance, motion sensors, the 6 minutes walking test, disease specific validated questionnaires, and measurement of claudication and maximal walking distance achieved on a treadmill using standardized protocols.
Each of these methods has pro and cons that suggest their use in defined contests, but the most appropriate to objectively measure the walking distance with a reasonable reproducibility is the treadmill testing (1).
The test needs the availability of a treadmill with speed and grade controls. The traditional constant load test is conducted at a defined speed (1.5 to 2.5 mph according to most used protocols) at a fixed grade (ranging from 0% to 12%). Once the adopted parameters are set, the patient start walking till first notices the onset of claudication pain, then time is recorded and the distance is calculated (initial claudication distance, or ICD). The patient keeps walking until reaches the maximal tolerable level of claudication pain, then the test is stopped, the time is recorded and the distance is calculated (absolute claudication distance, or ACD).
The constant load treadmill test demonstrates coefficients of variation of 20% to 30% for ICD and of 15% to 20% for ACD (2). To achieve a better reproducibility graded treadmill protocols, similar to those developed for testing patients with cardiac disease, have been proposed.
According to these protocols the patient starts walking at a speed of 2 mph at 0% grade, with progressive timed increases of grade of either 2% every 2 minutes or 3.5% every 3 minutes. Times to onset and to maximal tolerable pain are then recorded and ICD and ACD are calculated. Using progressive treadmill testing, within-subjects coefficients of variation of 15% to 25% for ICD and of 12% to 13% for ACD are reported (3). Is, in fact, noticeable that the more the workload during testing is set, the more the measurements variability is reduced, thus obtaining a better data reproducibility. The problem is that data achieved at higher workloads, albeit more affordable, are less representative of the true functional impairment experienced by the patient in the daily living.
Another open question is that regarding which parameter, between ICD and ACD, is more appropriate to use as an end point in clinical trials.
Although most studies showed that ACD is more reproducible than ICD that is probably more influenced by the individual discomfort perception, the latter may more truly represent real life, where the patient has its walking limited by the onset of claudication.
Thus, if ACD may be a more appropriated measurement to use as a primary end point in clinical trials (4), is better that, in the everyday clinical management of patient with intermittent claudication, ICD and ACD are both taken into account.
In conclusion, when an objective measure of the walking distance is needed, as when the outcome of claudication therapy is assessed in clinical trials, treadmill testing has a fundamental role, but less certain is its usefulness in routine practice.
In fact, other methods are available to assess the functional impairment of the patient with claudication in the everyday clinical practice, like the 6 minutes walking test or the use of disease specific questionnaires (e.g. the Walking Impairment Questionnaire). These tests are easier to perform, need less expensive equipments, and consent an evaluation of the level of patient inability at least as clinically valuable as the treadmill test (5).

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9 SPEED RATHER THAN DISTANCE: A NEW PARAMETER FOR A HOME-BASED TRAINING PROGRAMME ON CLAUDICATION

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Claudication is typical of second-stage peripheral arterial occlusive disease (PAOD),which affects 6% of the U.S. population aged 55 and older. The proven effectivenessof physical exercise in reducing this functional handicap has opened the way fordeveloping efficacious tests and methods that can be used in designing optimalrehabilitation programs.
Currently, assessment of arteriopathic patients is performed using tests based on apredetermined time or on determination of the critical distance to pain, known as"pain- free walking distance". This parameter is obtained either through single-stage orprogressive protocols on the treadmill. The progressive method appears to be moreappropriate for evaluating arteriopathic patients, since it implies a gradual increase inmetabolic demand.
Our group proposed a patient evaluation test based on small speed increments that would eventually cause the onset of the typical cramping pain. Our aim was to define the functional handicap by a precise individual critical speed, called the Pain Threshold Speed (PTS), rather than by a less specific distance to the onset of pain, attained by walking at a fixed speed (1). Painful cramping occurs at a walking speed that differs from patient to patient and seems to be related primarily to the degree of occlusive pathology and the functionality of the collateral circulation.
Unlike other available methods, PTS could represent more than a useful tool for measuring the outcome of rehabilitation. It could allow for the development of a new rehabilitation strategy, similar to the way that the anaerobic threshold is used in sports training. This parameter, detectable through laboratory and field tests, correlates with the running pace in endurance competitions and is used to establish training limits for high-quality training sessions. Likewise, detection of the muscular anaerobic threshold or another readily detectable parameter could have similar applications in tailoring rehabilitative programs in PAOD (2).
This parameter would enable physicians to discriminate between anaerobic and submaximal aerobic training sessions. PTS is determined in our clinical settino with a treadmill protocol based on level walking, low starting speed, and progressive increments at a predetermined distance up to the onset of pain. In this way, PTS is always measurable in all patients, even in those with severe clinical handicap in which the other tests are unable to assess individual variations. In addition, repeatability and equivalence between established tests were demonstrated. PTS showed a significant correlation with Pain-Free Walking Distance (r=0.833; P<0.0001), with 6-Minute Walking Distance (r=0.724; P=0.005), and with ABI in the more ischemic limb (r=0.641; P<0.0001) (1).
PTS is a reliable parameter that correlates well with other established measures. It is useful for determining the degree of functional handicap and for designing and guiding rehabilitation protocols.
In our Center, using PTS parameter we were able to monitor a successful as well as economic home-based rehabilitation program (2).

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10 THE TECHNIQUES FOR THE EVALUATION OF THE MICROCIRCULATION CAN BE APPLIED IN A CLINICAL ENVIRONMENT?

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The term "microcirculation" refers to a much publicized, poorly understood, anatomical and functional entity. In modern clinical practice, vascular medicine has focused on conductance vessels, which can be imaged using ultrasound and invasive angiography. The assessment of the structure and the function of resistance vessels is often overlooked and, to date, is a multidisciplinary field, which attracts the interest of angiologists, cardiologists, nuclear medicine specialists and dermatologists. Complicating this scenario, the term "microcirculation" is often used as a synonym of resistance vasculature, which is very incorrect from a physiological and pharmacological standpoint. The traditional concept that most of the coronary vascular resistance resides in arterial microvessels and not in coronary arterioles and small conductance arteries did not resist more recent research and the latter have been described to have a critical importance in the regulation of coronary blood flow.

Because resting coronary arteriovenous oxygen difference is near maximal (60–70%), and it does not appreciably increase when the heart requires more oxygen, coronary resistance vessels (including, but not limited to, microvessels) are of critical importance for their role in the regulation of oxygen and nutrients supply to the myocardium by modulating coronary flow conductance and substance transport. In the last years, studies have demonstrated that the coronary microcirculation has a determinant role in the pathophysiology of both chronic and acute myocardial ischemia. As well, microvascular dysfunction is the determinant of the no-reflow phenomenon. Diagnostic and therapeutic strategies are being studied in order to investigate and treat also this segment of the circulation. Recent technological advances have lead to a point where physicians can study both safely and effectively, in patients undergoing vascular angiography, the state of (micro)vascular resistances. For instance, the influence of an epicardial stenosis on the distal arterial pressure-flow relationship can be studied using sensor-tipped angioplasty guidewires that measure parameters such as post-stenotic absolute coronary flow velocity reserve (CVR), relative CVR (rCVR), and pressure-derived fractional flow reserve of the myocardium (FFR). These indexes can give an idea of the functional significance of the stenosis as well as of the adjustments in the vascular territories downstream. Parameters such as the TIMI flow and myocardial blush grade can provide semi-quantitative information on the state of myocardial perfusion. Similarly, noninvasive methods, such as contrast echocardiography, allow easy and safe assessment of tissue perfusion at rest, during stress, and in response to various pharmacological stimuli. Other techniques, such as laser Doppler flowmetry and laser Doppler imaging, although less reliable as of now, provide surrogate information regarding cardiac microvascular function as derived from the study of this function at the level of a more accessible territory such as the skin. Capillaries can also be directly studied by capillaroscopy, which enables the investigator to assess morphology, density and blood flow velocity at the level of the nail folds; as well, one can estimate capillary pressure by direct cannulation using glass micropipettes. Strain gauge plethysmography allows assessing changes in peripheral blood flow in response to specific pharmacological stimuli or to muscular exertion. Of particular importance, plethysmography has been used in the last 20 years to as the gold standard for the assessment of endothelium-dependent vasodilation, which is used as a surrogate endpoint for "endothelial function". Of note, information regarding the dynamic control of microcirculatory resistances can also be derived from methods that investigate blood rheology and haemostasis. Platelet aggregability and red blood cell deformability are indeed important determinants of blood flow at the level of the microvasculature. These methods have been largely used in clinical research, but recent evidence demonstrates that they can also be used in clinical practice for their potent prognostic implications.

Of importance, although their role as prognostic markers has been clarified, the interpretation of the results of these methods is complex. For instance, modifications in blood flow in response to drugs and/or ischemia, although measured at the level of skin microvessels, must be considered as the resultant of modifications at the level of both the micro and macrovascular circulation. In sum, it is our opinion that research efforts have to addressed in the future towards a better understanding of the specific physiology of the microcirculation and the development of techniques that can be used as diagnostic tools in clinical settings.

In this presentation, we plan to discuss background concepts, current methods, and clinical relevance of these techniques and provide practical insights for patient management.

AORTIC DISSECTION

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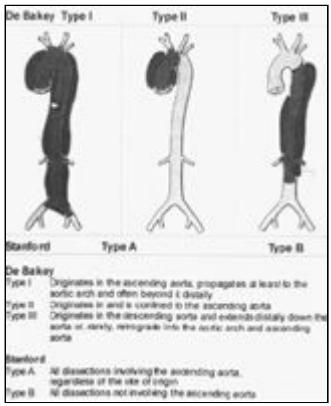
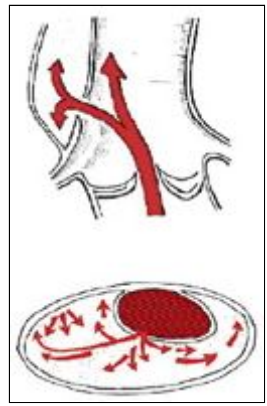
The aortic dissection is the most frequent acute pathology of the aorta, in relationship 2,5/1 with the aneurysm of the abdominal aorta. The male sex is more frequently involved: 3:1. The more frequently interested decade is sixth, with approximately 60% of the patients. They have been recognized numerous conditions that are associated or that they predispose to the dissection like the arterial hypertension, the hereditary connective tissue diseases, the medial aortic degeneration. The aortic dissection is characterized by the formation of intimal tear in the intima, creating a "flap" which it follows by division of the aortic wall, with consequent spillage of blood and the creation of a true and a false lumen. Between the hereditary diseases that are associated to the dissection, the most known they are the Marfan Syndrome, the Turner Syndrome, the Ehlers-Danlos syndrome. The common denominator of these diseases is the presence of a degeneration in one of the three layers of the wall. The lesion can also be iatrogenic and recognizes causes as previous cardiac surgery (15%) or cardiac catheterization (5%). The intimal lesion is in the greater part of the cases cross-sectional and is localized in 65% of the cases in the ascending aorta (Type B sec. Stanford) at two centimetres from the ostium of the coronary arteries. Mortality is of 2% for every successive hour to the beginning of the symptoms. The thoracic pain is nearly always present: retrosternal (85%) or posterior (46%). Abdominal pain (22%), syncope (13%) are also characteristic and stroke (6%). In case of proximal extension, a cardiac tamponate can be manifested that, being involved the coronary artery, it can results in to myocardial ischemia or infarction. The presence of a lesion of the aortic valve involves cardiac insufficiency. In case of extension towards in the aortic arch, the cerebral perfusion can be compromised with symptoms correlates to the limits of the lesion. The clinical diagnosis comes confirmed from the transesophageal echocardiography, the CT scan of the thorax, or the Magnetic Resonance of the aorta, that they demonstrate mainly the presence of the double lumen. The treatment of the acute aortic dissection is surgical. The most commonly executed intervention is the prosthetic substitution of the ascending aorta with repair of the valve apparatus, when necessary. Mortality of 10% if the intervention comes executed within 24 hours, of 13% within 7 days, of 20% to a month. The more frequent causes of post-operative death are the aortic rupture, the stroke, the visceral ischemia, the cardiac tamponate. The dissection can have origin also below to the subclavian artery (Type B sec. Stanford) with successive extension to be distant them or retrograde. Also in this case a thoracic pain posterior (64%) or retrosternal (63%) is nearly always present, but the beginning can also be characterized from one painful symptomatology in abdominal area (43%). Less frequently a neurological deficit or an ischemia of a limb can be present. Mortality is inferior to the dissection of type A: the dissections of Type B complicated are characterized from mortality to 30 days of the 10%. When are present symptoms or signs of ischemia of a limb, acute renal insufficiency, visceral ischemia or contained rupture, mortality is of 20% after 2 days, and of 25% after 30 days. In these cases the predictive factors of mortality are represent to the advanced age, the event aortic rupture and the shock. Also in this case the clinical diagnosis comes confirmed from the transesophageal echocardiography, the TC of the thorax or the Magnetic Resonance of the aorta, than beyond to the double lumen they evidence the extension of the dissection and the involvement of the visceral organs. The treatment of the acute dissections of type B can be conservative, in consideration of the possible evolution of chronic type of the aortic pathology with suitable antihypertensive medical therapy, or surgical, in case of not controllable hypertension, persistent thoracic pain, referable appearance of hemothorax, symptoms or signs to organ ischemia. The objective of the surgical therapy is to close the tear of the dissection and to maintain or to re-establish the hematic flow in the aorta and in the arteries originating from the aorta. In the greater part of the cases is possible to replace the proximal tract of the thoracic aorta, but it is possible to adopt alternative surgical technical that they preview also the exclusion of the aorta or the single fenestration. In the acute dissections mortality rate with the aortic substitution is 20%. Recently, encouraging data suggest the employment of the thoracic endoprosthesis that, above all in the patients to high risk, seem to have better results compared to the conventional surgical treatment.



Classifications of Aortic Dissection



Drawing of dissection type A

12 DIAGNOSIS AND CLINICAL APPROACH TO ABDOMINAL AORTA AND MESENTERIC ARTERIES

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The indication to surgical treatment of disease of abdominal aorta derives from both accurate local and general clinical evaluation and instrumental assessment of anatomo-morphologic features of the disease.
Abdominal aortic aneurysm (AAA) is the most common disease involving abdominal aorta; nowadays, at least two international randomized trials have stated the correct indications for surgical management of AAA. Surgical treatment should be electively performed when the maximum diameter exceeds 5,5 cm and clinical and instrumental surveillance should be preferred when the diameter is below 4 cm. For AAAs between 4 and 5.5 cm of diameter, the choice of treatment should be based on clinical and anatomical features, in the attempt to identify the subgroup of patients with small aneurysm at high risk of rupture (female sex, symptomatic lesions, saccular AAAs, AAAs with blister or thin parietal thrombi).
Until '90s, conventional open surgical repair was the only possible approach to AAA, and it still remains the treatment of choice, with excellent early and long term results and low rates of perioperative fatal or nonfatal complications.
In last years, with the introduction and wide diffusion of catheter-based techniques, endovascular repair of AAA (EVAR) has became an adjunctive tool in the management of this potentially fatal disease, allowing to treat also older patients, with several comorbidities and at high surgical risk. However, EVAR is not feasible in all the patients with AAA and it requires a careful preoperative instrumental evaluation, aiming at assessing the feasibility of the procedure and choosing the most appropriate device. In patients candidate to EVAR, a multistep diagnostic approach is mandatory, including three-dimensional angio-CT scan and, in some cases, digital subtraction angiography.
When the indication is correct and preoperative assessment adequate, results of EVAR are fairly good with low rates of perioperative complications. Few data do exist about long-term results of EVAR; the results of ongoing multicentric randomized trials comparing EVAR and open surgical repair are expected to assess the long-run benefit of EVAR.
Considering chronic obstructive disease of aorto-iliac axis, recent international guidelines (TASC) have stated the different therapeutic approaches on the basis of clinical status and of lesions' morphology; due to the knowledges about bening natural history of peripheral arterial disease and to the large diffusion of endovascular procedures, nowadays surgery is limited to patients with severe ischemia and long, calcified, multilevel lesions.
Both in aneurismal and obstructive disease, the role of ultrasounds in screening, diagnosis, therapeutic indications and in follow-up is increasing and it represents a tool which must be known and widely used by the vascular specialist.

13 SMALL ABDOMINAL AORTIC ANEURYSMS SURVEILLANCE

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The Clinical Problem

Decision - making in regard to elective repair of abdominal aortic aneurysms (AAA) requires careful assessment of factors that influence rupture risk, operative mortality and life expectancy. Only 10 to 15 percent of patients survive the rupture of an abdominal aortic aneurysm; a minority reach the hospital alive, and of these, only about half survive the emergency surgical repair (1). Ultrasonographic screening studies show that about 5 percent of men older than 65 years of age have an occult small aneurysm (3 to 6 cm in diameter) (2,3). The risk of rupture of small aneurysms is low, but the natural history of an untreated aneurysm is one of continued expansion (4). Based upon the best available current evidence, 5,5 cm is the best threshold for repair in an "average" patient (5,6): of the abdominal aneurysms that are at least 4.0 cm in diameter when detected at screening, only one fifth are 5.5 cm or larger. What recommendation of surveillance should be made for those with smaller aneurysms?

Screening

Abdominal palpation has neither the sensitivity nor the specificity of ultrasonography in screening for aneurysm (7). Recently, a trial involving 67,800 men in the United Kingdom demonstrated that screening halves the rate of aneurysm-related death within four years but does not reduce overall mortality and does reduce quality of life (principally patients' perceptions of their own health) (3). Without a medical therapy that limits the growth of aneurysms, population-screening programs may not be cost effective (8)

Surveillance

Surveillance programs must be rigorous and have stringent quality control. Ultrasonographic monitoring of previously diagnosed aneurysms is reliable, safe, noninvasive, and relatively inexpensive (8). Abdominal aortic aneurysms are not always asymptomatic, and tenderness on aortic palpation, back pain, abdominal pain, and intermittent claudication can all be aneurysm-related symptoms. Patients are also inelegible to a normal surveillance program if there is evidence of an expansion of the aneurysm of 1.0 cm or more in the past year or 0.7 cm or more in the past 6 months.

Evidence concerning the appropriate interval between screenings comes from the analysis of the previous diameter of the aneurysm, the rate of growth, and rates of rupture (9). If men were considered for surgery when their aneurysms reached a diameter of 5.5 cm, screening intervals of 12 months could be recommended for aneurysms with diameters of 3.0 to 4.4 cm, and intervals of 6 months for aneurysms with diameters of 4.5 to 5.5 cm. On this basis, approximately 5 percent of patients would be considered for surgery at each surveillance visit.

In women, even if there are no formal guidelines, intervention at diameter 5 cm or less appears indicated. In fact the risk of rupture is four times as high among woman as among men. The fact that aneurysms rupture at smaller diameters in women may simply reflect the tendency for the normal aorta to be smaller in women than in men, with a fixed diameter representing a greater dilatation as a proportion fo the original diameter. Also subsets of younger low risk patients, with long life expectancy, may prefer early repair (10).

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14 LIMITATIONS OF EVAR - THE OTHER FACE OF THE COIN

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Endoluminal treatment of abdominal aortic aneurysms has emerged as potential therapy in the last decade or so, since its introduction by Juan Parodi in 1991.
Although immediate and mid-term results of endoluminal aortic aneurysm exclusion are quite encouraging, late adverse events still represent a great limitation for the widespread use of the technique.
The following is an overview of the current status of the practice of EVAR (Endovascular Aortic Aneurysm Repair) with a critical evaluation of the results using the available devices, and limtations of this treatment modality so far.

15 VENA CAVA DISEASES

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Introduction. Vena cava diseases are relatively uncommon, but in the last decades modern imaging techniques have greatly faciltated the diagnosis of caval involvement in a variety of conditions. In the meantime, progress in medical therapy and surgical techniques (general, vascular, endovascular) have allowed to treat most underlying diseases or at least to effectively palliate symptoms.
Aetiology. Vena cava may exceptionally be affected by primary lesions, either congenital (fibrous ring, hypoplasia) or acquired (Takayasu's disease, leiomyosarcoma, aneurysm). A primary thrombosis is the most frequent caval disease, usually ascending from a distal deep vein thrombosis. Cava may also be secondarily involved in advanced neoplasm, i.e the wall can be invaded by pancreatic and gastric carcinoma. Peculiarly renal, cortico-adrenal and exceptionally hepatic carcinoma can grow endoluminally with a neoplastic thrombus via the renal, suprarenal and hepatic veins towards the right atrium. Other neoplasms (large ovarian tumors, retroperitoneal sarcomas, lymphatic metastases and lymphomas) may preferably compress the cava. Similarly, benign diseases can severily narrow the cava untill occlusion, i.e hypertrophic hepatic segments (usually the first, which anatomically can completely surround the cava, and the fourth) in cirrhosis or Budd-Chiari's, inflammatory diseases as Takayasu's or idiopathic retroperitoneal fibrosis, and large aortic aneurysm. Finally, post-traumatic artero-venous fistulae, sometimes iatrogenic in nature, or rupture of an aortic aneurysm into the cava or the iliac veins may result in a hyper-afflux condition.
Symptoms. A part from caval aneurysms or fistulae, symptoms are substantially due to distal stasis (oedema, venous claudication, ulcers), obviously accompained by the manifestations of the underlying diseases. Swelling of the legs can be caused even by simple caval narrowing and usually responds to elastic compression and diuretics. But oedema can be severe, extended to scrotum or vulva and and poorly responsive to conservative therapy, when the occlusion is complete or sudden, especially if associated with lymphatic invasion or hypoalbuminemia. Sometimes oedema is accompained by lumbar heaviness and microhematuria if the obstruction is suprarenal, by liver insufficiency and ascites if suprahepatic, or dyspnea due to pulmonary hembolism.
Diagnosis. Knowledge of the underlying disease (i.e neoplasm, thrombophylia, etc.) helps in suspecting the caval involvement. Echo-doppler is of first choice and usually part of the examination for a suspected deep vein thrombosis of the inferior limbs. Second line evaluation with angio-Ct scan and MRI usually provides complete informations about the extension of the thrombosis and the cause of obstruction. Tridimensional reconstruction, although not essential, provides an impressive view of the morfo-functional pattern. Phlebography is not necessary for diagnosis, but is insuperable in depicting collateral supply.
Therapy. Treatment depends on the underlying disease and severity of symptoms. Percutaneous dilatation and stenting can definitively resolve congenital stenosis. Anticoagulation and/or thrombolysis are the standard therapy for primary thrombosis. Indications to caval filters still remain controversial, although a quite general agreement exists after a first embolic episode. Caval filters themselves can favour a complete thrombosis. Surgical ilio-caval thrombectomy has given controversial results and is currently indicated only

for lower limb salvage or life-threatening phlegmasia and for salvage of a transplanted kidney. Nevertheless, very recently excellent results have been reported with early surgical thrombectomy associated with endoluminal reconstruction [1]. Transluminal thrombectomy can also resolve complete occlusion secondary to filter deployment [2]. Venous bypass for chronic, benign ilio-caval occlusion is rarely performed, with 50-60% patency rate at two-three years [3].

Effective palliation can be achieved with stenting for malignant stenosis, with a 60% mid-term patency rate[4]. When a resection is feasable, surgery may face particular problems to prevent intra-operative embolism. A temporary infra or supra-renal filter may be inserted via a jugular vein, but atrial control is needed. when the thrombus reaches the supra-hepatic cava or enter the atrium. Segmental resection of infra-renal, supra-renal and retro-hepatic cava can be usually performed without reconstruction if renal veins are preserved (particularly the left vein, which is a crossing for collateral circulation via gonadic, cortical and lumbar veins). Resection of the supra-hepatic cava invariably requires reconstruction with reimplantation of residual hepatic veins. Caval reconstruction can be obtained with a safenous derived conduit or a ringed PTFE tube..

Clinical experience. At the 1st Surgical Unit of Padua University, post-operative ascending ilio-caval thromboses continue to be observed, in spite of regular subcutaneous heparin profilaxis. These are usually treated with anticoagulation. Filters are used with restrictive criteria, generally after a first embolism episode or for a floating thrombus in a high cardio-pulmonary risk patient. Additionally, while in the past paraneoplastic caval thrombosis from a remote tumor was often considered a contraindication to surgical removal of an otherwise resectable carcinoma, more recently temporary filters have been used to perform the resection.

A high number of secondary caval involvement have been seen, due to the attitude of this Center to treat advanced tumors and hepatic diseases amenable to liver transplantation (oltx). Nine supra-hepatic caval thromboses or stenoses were associated with Budd-Chiari's sindrome: two congenital fibrous rings were successfully dilated; a stenosing hepatic myeloproliferative mass was treated with oncocarbyde; out of three complete cava and hepatic veins thromboses due to myeloproliferative diseases, one was dissolved with actylase and two required oltx with caval transposition; a thrombosis secondary to protein S deficiency required repeated oltx for recurrence. A thrombosis associated with immunocomplexes in Crohn's disease and two important caval compressions from acute Budd-Chiari's disease were transplanted. Out of 50 pediatric oltx, two were performed for hepatoblastoma with neoplastic thrombosis of the cava [5].

At least eight additional endoluminal neoplastic thromboses were removed together with the primary tumor (two out of 300 hepatocarcinomas, three of 50 adrenocortical carcinomas, two renal carcinomas, one of 60 retroperitoneal sarcomas). Open atrial control with cardiopulmonary bypass was required in four; digital control of the ostium was sufficient in the remaining cases. Retroperitoneal sarcomas characteristically dislodge the cava and invasion is late, thus only four out of 60 patients in our series required parietal resection[6]. A retroperitoneal sarcoma invading the cava and right hepatic vein was resected together with right kidney, right hepatic lobe and suprarenal and retrohepatic cava, leaving the left lobe hanging on the right atrium [7] (death one month later from dropsy). A young man with a primary caval leiomyosarcoma was resected of the infrarenal cava and one year later for an isolated lung metastasis. Among 900 primary or metastatic hepatic tumors, 3-5% developped a symptomatic cava compression, which was usually resolved or ameliorated by liver resection, chemoembolization and a somewhat hazardous percutaneous thermoablation or alcohol injection. A limited number obtained a good palliation with endoluminal stent.

Among the benign diseases, a 13 cm large aortic aneurysm obstructing the cava was successfully repaired in emergency and a permanent filter was implanted a few days later [8]. An idiopathic retroperitoneal fibrosis, non responding to medical therapy was resected with a complete viscerolysis of the ilio-caval, aortic and uretereral axes. Finally, a high flow iatrogenic ilio-caval fistula was excluded with a covered stent with immediate restoration of normal cardiac rate [9].

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NEW ISSUES IN EVAR FOLLOW-UP

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The most common complications reported following EVAR has been endoleak with persistent perfusion of the aneurysm sac[1,11], related to increased intrasac pressure and endotension[4,11], stentgraft kinking and migration, stenosis and thrombosis.
Anterograde perfusion of the aneurysm at proximal or distal attachment site (type I endoleak) or at the junction of modular device extension (type III endoleak) usually leads to urgent treatment; retrograde perfusion from patent lumbar or inferior mesenteric arteries frequently leads to conservative observation[1,3].
Therefore, long-term follow-up is mandatory to document device's structural integrity and perfect aneurysm exclusion(1,11).
The role of plain abdomen radiography has still a relevance in case of device failure, rupture of fabric or modular components separation[3].
Computed tomographic angiography (uni- and biphasic CTA) has been recommended as the modality of choice and is the required method for the EUROSTAR registry.
In this data registry center (1996-2000) CTA was obtained at 1,3,6,12,18 months and yearly after EVAR and documented the incidence of all complications happened in all the 88 centers involved.
In particular, EUROSTAR analysis was determinant in early outcome evaluation of procedure within and after 30 days from treatment.
Death perioperative rate overall was 3.2%, and cumulative survival rate at 48 months overall was 75%, the latter not directly related to EVAR[11].
It has been demonstrated that delayed CT-scanning significantly increases the sensitivity for detection of reperfusion endoleaks (i.e., type II) but doubles the radiation rate per examination[1].
Magnetic resonance angiography (MRA) has been proven to be safe for the examination of non-ferromagnetic stents and stentgrafts, and has also been reported to be efficient in detection of endoleaks[1]. In further studies, MRA appeared to be advantageous in demonstrating occult endoleaks, because of its improved depiction of delayed, faint enhancement in the aneurysm sac. In addition, MRA can be considered the modality of choice in individuals with impaired renal function and known hypersensitivity to iodinated contrast media[2].
Recently, an original report revealed even more accuracy in detecting endoleaks using a blood pool contrast agent for MRA, due to less delayed image degradation [7].
The role of contrast-enhanced ultrasound (EUS) imaging in EVAR follow-up is not yet standardized. Some reports that compares EUS with the reference standards (CTA and MRA) confirm high sensitivity (100%) but also relatively low specificity (65%), due to high rate of false positive results[1]. In addition, the statistical correlation between US and CT was modest[8].
Even if in many Centers it's tipically required to definitely establish the location and type of endoleaks, conventional digital subtraction angiography (DSA) has by now an important role in treatment of endoleaks and endotension by application of coils, cuffs or glue[1].
Lately, an impressive study reports, as a first experience in humans, an implantation of an ultrasound-activated remote pressure transducer fixed to the outside of the stent graft and exposed to the excluded aortic sac: considerable reduction of intrasac pressure has been demostrated to be correlated to EVAR success, therefore non invasive pressure transduction is considered a great promise in future surveillance of patients after EVAR [4,5].
Other investigators have suggested that also aneurysm pulsatility correlates with the presence of endoleaks[6]. This measurement has been obtained by a cine-MRA to calculate aortic aneurysm diameter during systole and diastole and it has been found significantly different between the non-endoleak group and type I endoleak or great retrograde endoleak group.
In conclusion, in spite of successful deployment, EVAR patients remain at risk of aneurysm rupture, and expensive follow-up program and heavy radiation exposure is still required, because CT in most studies is considered the gold standard reference[10,11].
The utility of a simple, less invasive and cost-effective approach for EVAR follow-up becomes more and more important with the expansion of this technique and the increasing number of EVAR patients in need of strict surveillance [3,12].

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COMPLICATIONS OF ABDOMINAL VASCULAR SURGERY

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The elective open repair for abdominal aortic aneurysm (AAA) and aortoiliac occlusive disease (AIOD) is safe and effective, with durable long-term outcome [1,2].The current operative mortality rate is less than 3% and the primary patency rate is more than 75% at 10 years [3,4].
If patients continue to smoke, these excellent rates are reduced by half. Symptomatic atherosclerosis in young adults has been reported in the literature as a poor prognostic finding because of multiple vascular bed involvement and the accelerated nature of the disease process, with a 65% 5-year cumulative primary patency compared with 96% in older age group (P<.05) [5].
In addition, occurrence of complications decreased from 13% to 8% from the 1970s to the 1990s, and varies across medical centers, while high hospital volume is associated with improved outcome.
The long midline or flank incision contributes to large fluid shifts, prolonged postoperative ileus, and significant postoperative pain. Incisional hernias develop in more than 10% of midline laparotomies and postoperative flank bulge is noted in up to 20% of retroperitoneal incisions extended into the intercostal space.
Minimal invasive approaches such as endovascular and laparoscopic techniques have recently been advocated to overcome these drawbacks of the standard open procedures.The eligibility rate for AAA endovascular exclusion is commonly less than 60% because unsuitable infrarenal neck or iliac artery access with the endovascular stent-graft devices. Although endovascular graft repair is less invasive and effective in the midterm, the number of complications continues to increase with longer follow-up, leading to a significant rate of endovascular or surgical revisions.
Several complications are related both to AAA repair and aorto-femoral bypass (AFB). Perioperative thrombosis may be a complication of either procedure and is related to technical problems. A plaque dissection, causing restriction in blood flow with consequent thrombosis, may occur as a complication of either procedure, and usually occur at the distal anastomoses. Intraoperative atheroembolism is another complication that may occur during surgical dissection or mobilization of the vessels or following release of the occluding clamps during reperfusion. Furthermore, placement of the distal clamps before application of the proximal clamp may help to reduce the risk of atheroembolisms during any aortic operation. Injury to adjacent structures (ie, duodenum, inferior vena cava, iliac veins, ureters) usually is avoided with careful technique. However, care must be used with mechanical retractors to avoid injury to adjacent structures. Care is necessary in the retroperitoneum and in the groin to prevent injury to nerve adjacent to major vessels. Ischemic colitis is an uncommon, but potentially lethal, complication of open surgical repair of aortic diseases. Clinically evident ischemic colitis develops in 1% to 3% of elective open aortic reconstructions. The true incidence of colon ischemia may be understimated with clinical criteria, because routine postoperative colonscopy demonstrates evidence of ischemia in 6% of patients. Aneurysm rupture significantly increases the incidence of this complication, with as many as 60% of survivors demonstrating endoscopic evidence of colonic ischemia. Other factors associated with development of colonic ischemia include operative trauma to the colon, hypotension and cardiac dysrhythmias, hypoxemia, prolonged cross-clamp time, and failure to ensure adequate pelvic and colonic perfusion.
Careful closure of groin is necessary in order to avoid a lymphocele, which can lead to graft infection. A specific complication related to the use of prosthetic material is development of an infection, which occurs in 0,5-3% of cases.
Late survival decreases over time, and heart-related or cerebrovascular causes, and neoplasms are more frequent. Cumulative survival rates after successful RAAA repair are significantly lower than survival rates at the same intervals after elective repair [6] .
Late graft-related complications include anastomotic pseudoaneurysm (3%), graft limb occlusion (2%), graft-enteric erosion/fistula (1,6%), graft infection (1,3%), colon ischemia (0,7%) [7].
Between 1986 and 2003, 1231 patients underwent surgical repair of an AAA, and 1458 of an AIOD, in our institution. The operation for AAA was elective in 1069 patients (86,8 %) and emergent in 162 patients (13,2 %). The 30-day post-operative mortality rate for elective AAA repairs was 2,4%, 58% for emergent (ruptured AAA) procedures, and 2,1 % for AIOD surgical treatment, respectively. At a mean follow-up of 8,3 years (range, 1 to 17 years), the cumulative survival rate of both diseases was 61,2% and 63,3%; the most common complication was graft thrombosis (3,1%), proximal anastomotic aneurysm (2%), graft infection (1,1%), and duodenal fistula (0,5%).
In conclusion, patients with AAA or AIOD have a durable improvement in their health after operation. Heart and cerebrovascular diseases, as well as lung diseases, have a continued impact on the functional health of patients before and after operation for AAA and AIOD [8].

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18 EPIDEMIOLOGY AND NATURAL HISTORY OF VTE AND RELATED INPLICATIONS FOR TREATMENT

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Deep Venous Thrombosis (DVT) is a chronic recurrent disease. The incidence of DVT in the general population ranges between 1 and 2 cases per 1000 persons per year. The all-cause mortality of this condition is surprisingly high within the first 30 days from the acute episode. Fatal pulmonary embolism (PE) is responsible for mortality in 20 % of the lethal cases. Factors for early death are age, male gender, physical frailty, confinement to bed, heart-lung disease, and malignancy. Risk factors for venous thrombormbolism (VTE) are surgery, medical illnesses, malignancy, pregnancy, hormonal contraceptives, an increased body mass index, and the primary thrombophilias. The trombogenic effect of oral contraceptives is greatly potentiated by the presence of one of the two commonest thrombophilic mutations (of Factors V and II).
Recurrences cumulatively amount to about 16 % within the first 2 years and may reach even 30% in ten years. However the absolute hazard of recurrence per 1000 patients/days sharply declines over time. Main factors for recurrences are idiopathic versus provoked DVT, permanent versus transient risk factors, proximal versus distal DVT, while the role of Factor V and II mutations is still matter of debate. Among patients presenting with PE, the case-fatality rate of recurrent VTE is high. Attempts at prediction of recurrences are presently devoloping. The negative predictive power of D-Dimer measured one month after stopping anticoagulation has been extensively studied by our group. Coupling of D-Dimer with ultrasonographic evaluation of residual vein thrombosis (RVT) greatly enhances the predictive power of D-Dimer and RVT taken alone. In the future, these and other criteria might become useful in order to “tailor” anticoagulant therapy on the individual patient. Only patientes at very high risk of recurrences should be treated with oral anticoagulants for more than 12 months and only rarely for their whole life.
The new oral trombin inhibitors are very promising, and as effective but no safer than coumarins: thus, the same principles are likely to be confirmed also for these new drugs.

19 ECO-COLOR-DOPPLER AND DVT: COMPRESSION ULTRASOUND OR EXTENSIVE VENOUS EXAMINATION?

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Clinical diagnosis alone of DVT is inaccurate, due to the low sensitivity and specificity of signs and symptoms. An objective diagnosis is therefore necessary to avoid the risk of denying or giving potentially harmful treatments to patients who need or do not need the therapy, respectively. Diagnostic DVT procedures should therefore be clinically safe, noninvasive and time- and cost-effective in consideration of the relatively large number of patients that should be assessed, especially in emergency rooms.

DVT diagnosis is now based on the use of non-invasive diagnostic testing by means of ultrasonography, with or without color Doppler capacity. It has been proved that compression ultrasonography (CUS) is highly accurate, simple, fast and reproducible for diagnosing or excluding thrombosis in the popliteal or more proximal deep veins (proximal DVT) (1)..

DVT usually starts in the calf; however, the great majority of patients with symptoms of DVT have a thrombosis in the proximal veins (2), and only up to 13% of symptomatic patients have a thrombosis confined to the deep veins of the calf (3). It is considered that only about 20% of diagnosed isolated distal DVTs subsequently extend proximally (4), this usually occurring within the first week from presentation. Management studies have shown that it is safe to withhold anticoagulation in outpatients with suspected DVT if CUS of proximal veins yields normal results on presentation and on repeated test done 5 to 7 days after the first. Other studies have shown that combining CUS testing with other diagnostic procedures, such as clinical probability assessment, D-dimer assay or both clinical probability and D-dimer (5) allows to reduce the need for repetition of examination after 5-7 days and markedly improves the cost-effectiveness of the diagnostic procedure. These strategies are based on the premise that thrombi confined to the calf do not need to be diagnosed and treated, unless they extend to proximal veins.

Conversely, an extensive ultrasound examination (EUE) of both the proximal and calf veins is largely performed in clinical practice and has recently been recommended as the standard of care for assessment of lower extremity DVT (6). Furthermore, two recent management studies (7,8) have shown that a single EUE has a low technical failure rate, is safe in excluding DVT and is more acceptable for patients and physicians by reducing the diagnostic workup. Of course, this strategy implies that all diagnosed isolated calf DVT are treated with anticoagulants. In the paper by Elias et al. (7) the rate of distal DVT was 14.8%, whereas in the study by Schellong et al (8) it was 4.7% plus 4.6% of isolated calf muscle vein thrombosis. The main clinical issue, therefore, remains that of establishing whether isolated calf DVTs should be looked for and diagnosed carefully enough to allow them to be treated. Specifically designed clinical study are urgently needed to compare the efficacy, safety and cost/benefit of these two strategies.

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VENOUS THROMBOEMBOLISM AND CANCER

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Deep venous thromboembolism is a frequent disease that not only puts patients at acute risk of fatal pulmonary embolism (PE) but also represents an important economic burden. Since Trousseau's initial observations, the association betweeen venous thromboembolism and cancer has been frequently observed. Malignancies are generally associated with a hypercoagulable state, infact in most clinical series describing postoperative DVT, malignancy is overrepresented in the DVT cases . Thrombotic events have been described in patients with virtually all types of cancer, but certain malignant diseases are strongly associated with disorders of haemostasis. These include acute myelogenous leukemia, particularly promyelocitic and monocytic subtypes,mucinous adenomas *(often arising from the gastrointestinal tract and lungs),* pancreatic carcinoma. Malignant is often an occult finding and VTE may be the first manifestation of cancer. In addition to the malignancy itself, the risk for VTE is increased by several treatment-related factors such as long-term venous lines and chemotherapy which appears to promote VTE, perhaps through several mechanisms, including direct damage of vascular endothelium and/or decreased levels of physiological anticoagulant proteins *(antithrombin lll, Protein C and protein S)* and a decrease in fibrinolytic activity.These observations have recently opened a methodological debate about the opportunity of an cancer oriented invasive screening in subjects with idiopatic deep venous thrombosis; regarding this topic some author as like Bastounis et al recomand an invasive screening in every patients with a thromeboembolic event, while Barosi et al have demonstred that the most effective diagnostic diagnostic algoritm in subjects with idiopatic DVT is a breast and colon cancer oriented screening in the women and a lung and colon oriented screening in the men .

A thromboembolic event represent also a predictive factor of cancer incidence as showed by Baron et al in 1998 by a large prospective population study designed to analyse the relationship between venous thromboembolism and cancer on the basis of the Swedish Impatient Register and of the Swedish Nationwide Cancer Registry since 1989 to 1998 and showing an increased standardised incidence ratio *(SIRs)* of cancer in the first year of follow up of a VTE discharge , an higher SIRs of cancer for the ovary, pancreas , brain cancers and for polycythaemia vera and Hodgkin lymphoma so confirming the association of VTE with cancer and extend the risk prediction even 10 years after the thromboembolic event. The reasons for the long term increases in risk are not clear, but these data are consistent with the hypothesis that premalignant changes promote thrombosis or that common factors predispose individuals to both thrombosis and malignant disease.

Indeed Sorensen et al to investigate about the prognosis of patients with cancer discovered at the time of or after a thromboembolic event, conducted a follow-up study using population-based data from the Danish National registry of Patients, the Danish Cancer Registry and the Danish Mortality Files showing that patients in whom the cancer was diagnosed within one year after an episode of venous thromboembolism were more likely to have advanced disease and a poor prognosis than the patients with cancer who did not have venous thromboembolism and how survival was parrticularly poor when the diagnosis of cancer was concurrent with the thromboembolic event suggesting the presence of a more advanced and aggressive disease. So, particularly important appears a thromboprophilaxis in cancer patients and interestingly several reports exist regarding a possible survival increasing in neoplastic patients treated with LMVH ,maybe related to a possible antiangiogenetic action .

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21 SUPERFICIAL VENOUS THROMBOSIS

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Superficial venous thrombosis (SVT) has been considered a disease without considerable thrombus-embolic complications. In the last years, several studies demonstrated the extensions to deep veins between 17% and 40%, with high incidence of PE. The relationship between a delayed diagnosis and the extension of superficial thrombus-phlebitis (TFS) and its complications seems very important for the possibilities prevention. The involvement of the saphenous-femoral junction, the extension to deep venous system and pulmonary embolism have been studied. 60 patients affected by TFS in lower limbs have been enrolled; they have been examined over an 18 month period and divided into three groups, depending on whether they were visited within 48 hours, between 3 and 7 days or after 7 days from the onset of the symptoms. It is evident that the only clinical evaluation of thrombus extension is not very reliable (confirmed only in 48,9% of the patients; $p < 0,01$), and the complications of thrombus increase in number in late diagnosis. Saphenous-femoral junction thrombus extension increased from l6.0 % in the first group to 23.9 % in the third. The deep venous system is involved at the following prevalence rates for each group; 4.0%, 8.7% and 10.9% respectively. The appearance of pulmonary embolism is evident only in the patients of the third group with a percentage of 6.5°/o, while only 3.2% in the total number of the patients. The data obtained confirms the importance of early diagnosis in order to limit the extension of TFS and its complications. The simple clinical evaluation is not sufficient and a confirmation through Colour-Flow-Map is needed. In order of TVS risk factors, other studies were performed to individuate the prevalence of some risk factors for VTE, as AT III deficiency, Protein C and Protein S, Factor V Leiden, Prothrombin G20210A mutation, Factor VIII, hyperhomocysteinemia, pregnancy or puerperium in SVT. We have studied 50 patients with SVT, 30 occurred on healthy vein and 20 on varicose vein; our study detected the extension to deep veins and the presence of genetic risk factors were also searched. Our data confirm the very important role of these alterations and their association, as risk factors for SVT on healthy vein, and indicate also a correlation between their presence and the extension of all SVT (occurred as on healthy and on varicose vein) to deep veins.

22 THERAPEUTIC OPTIONS IN OUT-PATIENTS AND IN-PATIENTS WITH DVT

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Why shall we treat a patient with DVT?
To prevent death due to pulmonary embolism; to reduce morbidity at onset; to minimize the symptoms of post-thrombotic syndrome and, finally, to prevent chronic pulmonary hypertension due to recurrent pulmonary embolism.
Available strategies to achieve these goals are:
– heparin and oral anticoagulants to stop cloth formation;
– thrombolysis to restore canalization;
– inferior Vein Cava filters.

Heparin and oral anticoagulants

How shall we start treatment once we have diagnosed a DVT?
The answer to such question came only in 1992, when a double blind study (comparing heparin in combination with warfarin versus warfarin alone) demonstrated the validity of the beginning of therapy with heparin. This study has shown the superiority of the association to prevent relapses and extension of DVT. But which heparin and which way of administration? Today are usually available:
- unfractionated heparin by intravenous continuous infusion;
- unfractionated heparin by subcutaneous administration;
- low-molecular-weight heparin (LMWH) by subcutaneous administration.

1. Unfractionated heparin intravenously by continuous infusion: individual anticoagulant response varies, because this drug binds nonspecifically to plasma and cellular proteins so that requirement among patients can be notably different. Laboratory monitoring of activated partial thromboplastin time is required, to achieve and maintain therapeutic range. Nomograms based on the variations of the APTT (expressed in seconds or ratio) like those devised by Cruickshank and Raschke, facilitate the achievement of therapeutic anticoagulant effect [1-2].
2. Subcutaneous heparin treatment has been suggested as an alternative to intravenous heparin following the results of a meta-analysis of eight clinical trials that compared these two routes of administration in the acute treatment of DVT.
This meta-analysis showed that subcutaneous heparin is at least as effective and safe as intravenous heparin, when a proper laboratory monitoring is performed in order to achieve a full therapeutic effect [3].

A weight-based nomogram, that allows a quick achievement of correct anticoagulation based on the variations of APTT, has been proposed also for subcutaneous administration. Using such nomogram a recent study shows equivalent effectiveness and safety compared to low-molecular-weight heparin (nadroparin) [4].

An alternative test to monitor heparin therapy is direct dosing of blood heparin levels, measured with protamine sulfate titration or by anti–Xa activity level; these two latter methods are preferable in case of non elevation of the APTT. Patients followed by heparin level control required less heparin than those monitored with APTT [5].

The success of heparin therapy depends on the promptness of therapeutic intervention and the congruity of the dose employed. Prospective randomized trials demonstrated that the duration of initial therapy can be shortened from 10-14 days to approximately 5 days by overlapping oral anticoagulants early in therapy, thereby substantially shortening the period of hospitalization and reducing risk of severe heparin-induced thrombocytopenia without decreasing drug efficacy [6].

A correct use of unfractionated heparin requires considerable expertise, may cause inconvenience and has limitations. Hemorrhage occurs in up to 7 percent of patients during initial treatment; the risk is affected by heparin dose, patient's age and concomitant use or of thrombolytic and/or antiplatelet agents.

Hospitalization is also required to ensure adequate heparinization. Furthermore, this drug is associated with an unpredictable rate of major bleeding, particularly in the elderly [7], and heparin-induced thrombocytopenia [8].

3) Meta-analyses suggest that low-molecular-weight derivatives of commercial heparin are as effective as unfractionated heparin in preventing recurrent venous thromboembolism, and they cause less bleeding [9]. They also present a number of potential advantages over unfractionated heparin: longer plasma half-life, improved subcutaneous bioavailability and less variability in response to fixed doses. They are administered subcutaneously once or twice daily in weight–adjusted doses, without monitoring. Outpatient treatment is unsuitable for patients with massive thrombosis, serious coexisting illnesses, or a high risk of hemorrhage. LMWHs are more expensive than unfractionated heparin, but they cut costs by reducing the frequency of hospital admissions, reducing nursing time and the need for laboratory monitoring. The results of a recent trial demonstrated that long term LMWH administered over a 6 month period in cancer patients reduced the rate of recurrence.

Thrombolytic Therapy (TT)

Thrombolytic agents dissolve fresh clots and restore venous patency more rapidly than do anticoagulants. The duration of therapy needs to be longer in DVT (many hours to day) than in PE They are given systemically or by regional catheter-directed infusion. TT is rarely used in DVT because both routes of administration cause substantially more bleeding than does heparin, and it is unclear whether either agent reduces the incidence of the post-thrombotic syndrome [10].

Inferior Vein Cava filters

Inferior Vein Cava filters are useful in patients who have a contraindication to anticoagulation or those in whom treatment has failed.

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PULMONARY EMBOLISM: DIAGNOSIS AND TREATMENT

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Conventionally, patients with clinically suspected pulmonary embolism (PE) are managed with the ventilation/perfusion (V/Q) scan. Patients with indeterminate results, who represent approximately 50% of all those who undergo this procedure, receive the ultrasound imaging of the leg vein system. In all patients with normal test, who represent more than 80%, pulmonary angiography remains the only test that can confirm or rule out diagnosis. Spiral CT has the potential to simplify this algorithm by obviating the need for pulmonary angiography in patients with indeterminate V/Q scanning and negative leg veins ultrasonography, and even by obviating the need for the same lung scanning, which is so often inconclusive. Its specificity is very high. The problem is how to interpret a negative test result, as in spite of its technological evolution spiral CT cannot accurately visualize small thrombi confined to subsegmentary arteries. Recent studies have shown that PE can be reasonably excluded in patients with negative CT provided they have a negative ultrasononography of the legs and low pre-test probability (1) or a negative serial ultrasound of the legs (2). Although a few small studies suggest that anticoagulation can be safely withheld in patients with negative result, there is not yet conclusive evidence supporting the use of this test alone to confirm or ruled out PE.

Patients with non-critical manifestations of PE have long been treated with unfractionated heparin (UFH) in therapeutic doses. To test the hypothesis that low-molecular-weight heparin (LMWH) treatment can be extended to cover the entire spectrum of patients presenting with acute thromboembolism (thus including also patients with non-critical PE), two multicentre clinical trials have been performed in the second half of the '90s (3,4). In both studies, the investigated LMWH proved to be at least as effective and safe as UFH. In addition, a recent meta-analysis of all available comparative clinical trials has firmly confirmed that for the treatment of PE LMWH is as effective and safe as UFH. Recent studies have put into question the systematic use of anticoagulants alone in the initial treatment of patients with submassive PE. As the risk of an unfavorable outcome seems definitely higher in patients with right ventricular dysfunction, as shown by echocardiography, the use of thrombolytic drugs, that is drugs that have the potential to promptly restore the patency of the pulmonary arterial vessels, might improve the outcome of patients with PE. In a recent prospective controlled study, 256 patients with submassive PE and a contemporary right ventricular dysfunction were randomly assigned to receive heparin plus alteplase or heparin plus placebo (5). Treatment with heparin plus placebo was associated with almost three times the risk of death or treatment escalation that was associated with heparin plus alteplase . No fatal bleeding or cerebral bleeding occurred in patients receiving heparin plus alteplase. The results of this study have the potential to expand the use of thrombolysis in patients with acute PE, at least in those with right ventricular dysfunction.

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24 UPPER LIMBS DEEP VEIN THROMBOSIS

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Upper-extremity deep vein thrombosis (DVT) is a multifactorial disease and represent 2-5% of all DVT. Incidence is higher in patients carriers of central venous catheterization (CVC, up to 28% of cases), but many other clinical conditions can lead to this disease, such as thoracic outlet syndrome (TOS), violent physical working and/or sports efforts, pace-maker, cancer, parenteral nutrtion, limphatyic compression and finally also idiopathic onset (in which you always have to consider thrombophilia). Usually DVT of the upper limbs is considered a benign condition, even if complications as pulmonary embolism (4-12% incidence, higher incidence in patients with cancer and/or CVC) and chronic obstructive edema can occur. Clinical signs and symptoms identification in this setting is easier than in lower limbs DVT. Nevertheless, clinical suspect always has to be confirmed by an instrumental investigation, before starting treatment. Ultrasonography (CUS+CFI) is the first choice diagnostic strategy (sensitivity 96-100%, specificity 93-96%), while venography is considered in doubtful cases or if sending a patient to a surgical planning. Recently, spiral-CT angio o MRI-angio scan seem to be promising diagnostic devices, but up to date validation studies are not available. The treatment of patients with an acute DVT of the arm is divided into the initial treatment (with anticoagulants, thrombolytic therapy, or catheter/surgical techniques) and long-term treatment (or secondary prophylaxis) with anticoagulants and/or elastic bandages. No reliable data are available about the long-term outcome with respect to recurrences, bleeding, and post-thrombotic sequelae. No studies are available with the newly developed anticoagulants, such as pentasaccharides and oral thrombin inhibitors.

RISK FACTORS IN STROKE AND VAD

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World-wide, stroke is the second leading cause of mortality, accounting for 10-12 % of all deaths per year. Moreover, it is the first cause of disability and the second cause of Dementia after the Alzheimer disease. In Eastern countries, stroke is the leading cause of mortality and in any case, two thirds or more of stroke deaths occur in the developing world.

The stroke prevalence and incidence increase with age; in the aged Italian population the prevalence rate is 6,5%, greater in Men (7,4%) than in Women (5,9%). The stroke incidence rate in European population studies, is 8,72 per 1·000 in subjects aged 64 and 84 years. The 75 % of strokes occur in population aged beyond 65 years and in subjects older than 85 years the stroke incidence is included between 20‰ and 35‰.

The ischemic stroke is the most common type (80%), whereas cerebral haemorrage constitutes about the15-20% and subarachnoid haemorrage the 3%.

The risk of recurrent stroke is high after ischemic stroke and transient ischemic attacks (TIAs). In this case the risk of stroke is ten times higher than in a general population of the same age and sex in the first year.

There is besides a higher risk of major cardiovascular events also in other districts (acute myocardial infarction, peripheral occlusive vascular diseases, sudden death).

There are various causes of ischemic stroke: the most common are atherosclerosis, occlusion of small penetrating arteries (TIA or lacunar stroke, cardiogenic emboli. Less frequent causes are haematological disorders, migraine, oral contraceptives or estrogens; unusual causes are inflammatory cerebrovascular diseases, congenital illnesses, and traumas.In a not insignificant percentage stroke has an undetermined cause.

Although the acute stroke therapy (systemic or logoregional trombolysis, acute carotid surgery) as well as hospitalization in stroke units have given good results, the number of patients that can benefit from these type of treatment is still too low (5-10%) to reduce significantly the mortality and morbidity rate of this disease. Prevention is therefore the way to modify the global burden of stroke.

Primary prevention of stroke lies on mass strategies aimed at promoting or modifying pathologic lifestyles in general population and on individual strategies in high-risk patients. GPs have a fundamental role in primary prevention of stroke by anticipating and interventional strategies.

The patient's motivation is however fundamental in order to increase compliance. To this end, it is important to know the relative risk of the single risk factors for stroke and also to estimate the absolute risk of the individual patient. This can be accomplished thought the knowledge and the use of the cardiovascular risk charts.

The fundaments of prevention are the checking and treatment of modifiable and well-documented risk factors. They are: arterial hypertension, cigarette smoking, diabetes, asintomatic carotid stenosis, atrial fibrillation and other heart diseases, hypercholesterolemia. There is epidemiologic evidence also concerning diet, alcohol intake and physical exercise.

Vascular dementia (VaD) is the most common type of dementia after Alzheimer disease; it dramatically increases with age. VaD prevalence linearly increases with age and varies considerably in different countries ranging from 1.2% to 4.2%. The rate of dementia incidence rises exponentially with age and vary from 6.4 per 1000 persons/year in the Gotheborg study to 12 per 1000 persons/year in the Cambridge study.

The putative risk factors for dementia associated to stroke are demographic, atherogenic, genetic, cardiogenic and related to neuroimaging (Gorelick).

Demographic factors are age, sex, ethnic, and education. Atherogenic risk factors are various: arterial hypertension, especially in midlife, cigarette smoking, diabetes mellitus, hypercholesterolemia, homocysteine.

The role of genetic factors has not yet been well established in VaD. Familial cases are less frequent : CADASIL (cerebral autosomal dominant subcortical infarct and leukoencephalopaty) or hereditary cerebral autosomic dominant hemorrage with Dutch-type amiloidosis.

The so-called cardiogenic risk factors, such as myocardial infarction, atrial fibrillation and cardiac failure, are particularly significant.

Systolic hypertension is remarkably associated to cognitive decline in aged patients with cardiac failure. Cognitive assessment must therefore be included in the management of these kind of patients.

Some risk factors directly linked to stroke must be taken into account: the number and localisation of cerebral infarctions, the loss of cerebral matter, cerebral atrophy, silent infarcts.

New risk factors for ischemia like intima-media carotid thickening have been found significantly associated to periventricular white matter lesions and to cognitive decline.

TRADITIONAL AND ENDOVASCULAR CAROTID REVASCULARIZATION

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Introduction: First degree evidence has been obtained concerning carotid endoarterectomy (CEA) for both symptomatic and asymptomatic (>70%) carotid stenosis (CS). Now the best centers present a RNCR (relevant neurological complication rate) _ 1%. An analytical analysis of results from randomized trials shows relevant differences in the results obtained by different surgeons. Carotid angioplasty and stenting (CAS) + cerebral protection device (CPD) for carotid stenosis (CS) is controversial. Data from randomized clinical trials are not yet available on vascular conventional versus endovascular management of CS. In our experience we have defined five specific subgroups of patients in whom we believe the CAS is either comparable or superior to the classic endarterectomy procedure .1)Patients with restenosis after traditional carotid endarterectomy and direct closure , because restenosis is mostly associated with fibrous material . In patients with restenosis after CEA + patch, which appears associated with a soft friable material and CAS which could present a very high risk of embolization during the procedure). 2) patients who have undergone radiation to the cervical carotid area and/or a radical neck dissection 3) patients with previous peripheral cranial nerve injuries 4) patients with severe cardiac diseases,i.e. unstable angina , for whom a combined cardiac and vascular traditional procedure is not indicated. 5) patients with high ICA lesions.(C2-level)

Patients and methods. From September 1999 to September 2004, 2089 patients underwent carotid revascularization at the Vascular Surgery Clinic of Padua University for symptomatic or asymptomatic significant carotid lesions. Of these 123 (5,8 %) underwent CAS + cerebral protection device (CPD) in line with our indications . All CEA were carried out under general anesthesia with EEG monitoring, a routine delayed insertion of the shunt and carotid patch-graft (PTFE) angioplasty; eversion technique was used only for carotid stenosis associated with ICA kinking. CAS were carried out preferably under general anesthesia ,EEG monitoring and femoral approach . In every case we used a cerebral protection device, preferably porous filter (Angioguard) and a nitinol stent. In both groups postoperative pharmacological treatment included anti-platelet drugs and was continued until discharge " sine die".

Results. 1966 patients underwent 2052 CEAs (86 bilateral) and 123 patients underwent 143 CAS (20 bilateral) . No postoperative mortality was observed in the CAS group whereas 4 patients (0,2 %) died in the CEA group. Major strokes in postoperative time , were observed in 2 patients (1,6%) in CAS group and in 14 patients (0,71%)of the CEA group. The RNCR was 0,9% in CEA group and 1,6% in CAS group. In the endovascular group postoperative complications included also, 1 asymptomatic stent occlusion with immediate conversion, with complete success, to CEA + patch , 2 homolateral ocular TIA (, amarosis fugax), 3 homolateral cerebral hemisphere edema with transient aspecific neurologic symptoms and 1 femoral artery access dissection with thrombosis, that requested a femoral artery reconstruction.

Conclusion. The role of CEA for symptomatic and asymptomatic patients for the prevention of stroke is already defined by several trials . The gold standard of CEA should be: no disabling or lethal strokes in the postoperative period, no haemodinamically relevant carotid restenoses or occlusions and no R.N.C.R (relevant neurological complication rate) in the long term follow-up .In order to reach these results ,every amendment of personal technique is justifiable . In our experience EEG monitoring, delayed routine insertion of the shunt and patch graft angioplasty, seem to give the best results.
CAS and CPD is today an acceptable alternative to surgery in the management of internal carotid artery stenosis in selective cases. An accurate patient selection is the basis for excellent results and thus a low relevant neurologic complication rate can be expected .

27 WHICH MEDICAL TREATMENT FOR ASYMPTOMATIC OR SYMPTOMATIC CAROTID PATIENT?

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Atherosclerosis is a wide spread disease with life-threatening effects in the advanced stage: myocardial and cerebral infarction, renal failure. The cause of carotid stenosis is most often atherosclerosis; endothelial injury, inflammation, lipid deposition, plaque formation, fibrin, platelets, and thrombin all contribute to the pathogenesis of the lesion. Carotid atherosclerosis accounts for 10 to 20 percent of cases of brain infarction, depending on the population studied. There are two main strategies for the treatment of carotid stenosis. The first approach is to stabilize or halt the progression of the carotid plaque through risk-factor modification and medication. Hypertension, diabetes, smoking, obesity, and high cholesterol levels are closely associated with carotid stenosis and stroke; control of these factors may decrease the risk of plaque formation and progression. Studies of statin therapy among high-risk patients with signs of subclinical carotid atherosclerosis have shown that plaque regression can be achieved, although it may be restricted to patients with nonstenosing carotid plaque. Treatment with angiotensin-converting–enzyme inhibitors has also reduced the intima–media thickness of the carotid artery and decreased the risk of stroke in high-risk patients. Antithrombotic therapies have been proved to reduce the risk of troke among those with a history of transient ischemic attacks or stroke, whereas a benefit of oral anticoagulants has not been shown.The following antithrombotic drugs are to be considered in treatment of asymptomatic or symptomatic carotid artery disease: aspirin, ticlopidine, clopidogrel, dipyridamole. Aspirin is the most widely studied antiplatelet drug and, until recently, it was the nly drug routinely used. More recently, evidence data indicate that ticlopidine and clopidogrel are also effective for prevention of stroke and other vascular events in patients with cerebrovascular disease. Dipyridamole, combined with aspirin, also is effective for prevention of stroke. The Antithrombotic Trialists metaanalysis assessed the effect of antiplatelet drugs in patients with various manifestations of atherosclerosis. The analysis included 144,051 patients with previous MI, acute MI, previous TIA/stroke, and acute stroke, as well as other patients at increased risk of atherothrombotic events, emphasize the composite outcome of stroke, MI, or vascular death; nonfatal stroke, nonfatal MI, vascular death, and death from any cause. The Antithrombotic Trialists found that overall (in all kinds of patients at high risk for vascular outcomes), antiplatelet agents reduce the odds of the composite outcome of stroke, MI, or vascular death in secondary prevention by approximately 25%. TASS and CATS trials showed the efficacy of ticlopidine, anyway ticlopidine is associated with an approximately 1% incidence of severe neutropenia and 60 cases of ticlopidine-associated thrombotic thrombocytopenia purpura have been reported.

Caprie and a subgroup of Cure trials showed the efficacy of clopidogrel; the drug, compared with ticlopidine has demonstrate lower side effects and a better safety profile. Twenty-five trials compared the combination of dipyridamole plus aspirin vs aspirin alone for prevention of the composite outcome of stroke, MI, or vascular death. The odds reduction for all vascular events was 6%, indicating a benefit favoring the combination of dipyridamole plus aspirin.

Thus the best medical treatment's strategy in the carotid patients critically relies on a fine cardiovascular risk stratification, on close risk factors control, on the appropriate use of antithrombotic drugs. In symptomatic patients,main therapeutical options are thrombolysis in an acute phase and surgery or carotid stenting as elective procedures. Thrombolytic therapy for the treatment of acute ischemic strokehas been the subject of recent intense investigation. In the past several years, nine randomized, placebo-controlled trials have been reported using IV recombinant tissue plasminogen activator (tPA), streptokinase, or intra-arterial recombinant prourokinase (r-proUK). Cerebral infarction evolves rapidly over the first few hours of ischemic insult, and to be effective therapies must be delivered within this logistically restrictive window in order to optimize the prospects for favourable outcomes. Based on currently available data and the principle of early therapy, it is appropriate to provide recommendations based on the time to treatment (0 to 3 h, 3 to 6 h, or 0 to 6 h), the specific thrombolytic agent (tPA, streptokinase, r-proUK), and the route of delivery (IV or intra-arterial). In surgical patients medical treatmente is mainly the same of the general carotid patient, while in stenting candidates evidence to best manage the preatreatment and aftertreatment time is most derived from intervention trials in PCI and coronaric stenting; patients submitted to carotid stenting are recommended to take a stronger antithrombotic prophylaxis, aspirin 100 mg od plus ticlopidine 250 mg bid or, at best, aspirin 100 mg od plus clopidogrel 75 mg od for 1 month after the procedure, followed by an antiplatelet drug forever. Trials designed to investigate the role of GIIb/IIIa inhibitors in carotid stenting are ongoing.

28 PATENCY OF FORAME OVALE AND PARADOXICAL CARDIOEMBOLISM

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Paradoxical emboli have been suggested as the main cause of stroke in case of Patent Foramen Ovale (PFO). Paradoxical emboli can occur whenever right atrial pressure increases above left atrial pressure, provided that a PFO exists. This may occur physiologically during normal respiration, or during the release phase of Valsalva maneuver, but also is possible after permanent causes of increase in right atrial pressure, such as acute and/or chronic pulmonary embolism and right ventricular infarction. Paradoxical embolism can be demonstrated by echodoppler visualizing microbubbles passage through the atrial septum, after injection of shaken saline solution into an antecubital vein. In some cases injection into a femoral vein is to be preferred, if a large Eustachian valve directs preferentially the blood coming from inferior vena cava into the left atrium. Transcranial Doppler is preferred in some cases. Autoptic studies have demonstrated a PFO in approximately 25% of subjects without previous cerebrovasclar accidents, irrespective of gender. In young patients experiencing an ischemic cerebral event PFO is more frequent, in some series up to three times the normal counterpart.

It must be remembered the paradoxical embolism is not the only cause of ischemic event in PFO. Other possibilities are thrombosis in situ, especially if an atrial septum aneurysm (ASA) is present, which increases further the risk of stroke.

PFO can be closed surgically or percutaneously, but recurrency is not rare, which suggests long term administration of antiplatelets agents and, perhaps, anticoagulants. Indication for invasive treatment includes the demonstration of right to left shunt through the defect associated to high risk feature of the defect or high risk for thromboembolism of the individual patient.

29 PERCUTANEOUS CLOSURE OF PATENT FORAMEN OVALE AND ATRIAL SEPTAL DEFECT: WHEN AND HOW

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Atrial septal defect. Transcatheter closure is indicated for ostium secundum atrial septal defect (ASD); other anatomical types of ASD, as ostium primum, sinus venosus or coronary sinus, require surgical repair. The procedure is performed with fluoroscopic and echocardiographic control,either transesophageal or intracardiac; before attempting to implant the device we have to evaluate the anatomic features of the ASD: position, margins, static and “stretched” diameter of the hole.
The most common device used is the Amplatzer, for almost all variety and size of ASD; Starflex and Helex are other devices also available, only for small to moderate size defects.
Patent Foramen Ovale. (PFO). Transcatheter closure of PFO is indicated is patients with previous TIA or Stroke due to presumed paradoxical embolism; contrast echo proven right to left shunt through the PFO is mandatory for indication. More rare indication: platypnea-orthodeoxia syndrome. The technique of implantation is similar to the one used for ASD closure. Various devices are available: Amplatzer, Helex, Starflex, Cardia and other under investigation.
Antiplatelet treatment is required for at least 6 months after ASD/PFO closure.

THE ACUTE ISCHAEMIA OF LOWER LIMBS. HOW TO IMPROVE SURGICAL OUTCOME? INDICATIONS FROM THE ILAILL STUDY (*).

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Introduction and background

Acute limb ischemia (ALI) is both a limb- and life-threatening condition being high, even in recent studies, the incidence of amputation and death after technically successful surgical revascularisation: - 30-day amputation rate 12-35%; - mortality risk reported at 9–17% and even higher in elderly patients (1-6).
There is therefore a high medical need to improve clinical outcome in this setting of patients.
Iloprost is a stable prostacyclin analogue, indicated in the treatment of severe clinical limb ischemia. Pharmacodynamic properties of iloprost have been documented in preclinical and clinical studies, and they may suggest a possible modulation of ischemia-reperfusion complications in ALI patients (7-9).
In a pilot study (10), performed in 30 patients undergoing thrombo-embolectomy with Fogarty's catheter, a trend toward reduction of major complications (amputation and death) was reported (3 vs 5 cases) in patients treated perioperatively with iloprost in comparison to patients receiving placebo; a statistically significant difference between groups in reduction of TcpCO2 levels at trancutaneous oximetry was documented as well (effect more evident in iloprost group).

Methods

ILAILL (Iloprost in Acute Ischemia of Lower Limbs) is a randomised double-blind placebo-controlled study, performed to evaluate the effects of iloprost in patients with acute ischemia (onset of symptomatology < 14 days) of lower limbs undergoing surgical revascularisation. The drug was administered intrarterially and intraoperatively (bolus, 3000 ng) and therefore as standard iv infusion (0.5-2ng/Kg/m' for 6h/day) for 4-7 days post-surgery.
Primary study end-point was the composite incidence of amputation and death during a 3-month follow-up. Secondary objectives were occurrence of each major clinical event (amputation, AMI, stroke, other major events, death), clinical symptomatology and tolerability of treatment.

Results

Three hundred patients (151 placebo, 149 iloprost) entered the study, by 22 Italian Centres of Vascular Surgery (*) in a period of about three years.
Baseline characteristics of patients were well matched between treatment groups as for age, previous/concomitant diseases, duration and class of ischemia.
Thromboembolectomy was performed in 70.9% and 73.1%, and by-pass surgery in 20.5% and 20% of cases in placebo and iloprost group, respectively.
Clinical symptomatology significantly improve after surgery and benefit was maintained during follow-up of patients with favourable outcome, with no difference between treatment group.
Amputation or death during 3 month follow-up (primary end-point) occurred in 30 (19.9%) and 21 (14.1%) patients in placebo and iloprost group (Hazard Ratio 1,561, p=0.122 - Multivariable Cox regression model).
Sixteen patients (10.6%) and seven patients (4.7%) died during the observation period in placebo and iloprost groups (Hazard Ratio 2.610); this difference was statistically significant (p=0.035) in a multivariable Cox regression model analysis, and was evident starting from one-month after surgery. Age >70 years and class of ischemia IIb or more (TASC) appeared as related to clinical outcome results.

Conclusions

In ILAILL Study, iloprost administrated as adjuvant to surgical revascularisation in ALI patients significantly reduced mortality particularly in the late post-operative phase.
This fact, together with a less evident effect of the drug in peripheral complications, seems to support a prevalent systemic and long-lasting effect of iloprost in these patients.
A further larger study may be useful to confirm these data.

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31 THE REFLUX PATTERNS IN VARICOSE VEINS

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With the aim to clarify some diagnostic aspects in varicose veins, we performed descending/retrograde venography as a final diagnostic complement in selected patients (Pts) incoming to surgery for varices.
MATERIAL. Among 10,500 hospitalized Pts (in a 15 years period), we selected more than 1,300 Pts affected by primary varicose veins (but atypical and/or complicated) and recurrent varices (without evidence of post-thrombotic syndrome), varying from C2 to C6 of the CEAP classification. All Pts had Doppler cw and/or Duplex scanning, documenting either venous competence of the junctional valve at Scarpa triangle, primary deep reflux, pelvic varicocele, as well as discordance between clinical and instrumental findings. In these Pts we performed a number of about 1,200 descending venographies. All records were re-examined as a retrospective study.
RESULTS. Such a retrospective study, allowed us to identify 3 major comprehensive Patterns of venous reflux in varicose veins, showing specific hemodynamic and anatomical changes: the 1st presenting with Typical Reflux (Junctional Reflux) in the Greater and/or Smaller Saphenous Vein (GSV/SSV), and commonly competent perforating veins; the 2nd presenting with Composite Reflux (Junctional Reflux in the GSV as well as in the Deep Venous System (DVS), and Incompetent Perforating Veins (IPV); in some cases the reflux is based predominantly in the GSV, meanwhile in others it is predominant in DVS in various combination; the 3rd Pattern presenting with Atypical Reflux (No Junctional Reflux) coming from pelvic or superficial abdominal veins, and segmental varices of the GSV or parasaphenous, and with/out IPV.
DISCUSSION and CONCLUSIONS. The reflux pattern may be complex or difficult the clarify in a specific individual, since it could involve all the three venous system (superficial, deep and perforators) in a variety of combination; in most of these selected cases, descending venography is very useful.
Based on this review, we today estimate that the prevalence of each Pattern in Pts with primary varices should be about 40% for the 1st Pattern, 40% for the 2nd Pattern, and 20% for the 3rd Pattern; nevertheless, statistical analysis is needed in randomized Pts affected by varicose veins.
Since the rationale and the strategy of any treatment in varicose veins deeply depends on the specific reflux Pattern, it seems that a number of the varicose recurrences could be related to incomplete or incorrect hemodynamic assessment of the venous reflux prior the routine surgery.
Actually, on the basis of the documented multiple Patterns of reflux, a specific strategy to plan on different pattern seems to be a reasonable way, in association with - when necessary - other minor surgery or percutaneous sclerotherapy.

CHRONIC VENOUS INSUFFICIENCY (CVI) PATHOPHYSIOLOGY DIAGNOSIS AND MANAGEMENT

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CVI is a clinical picture featured by signs and symptoms related to a venous hypertension deriving from structural or functional alterations of veins. The most frequent causes are:
Primary alteration of vein wall and valves (varicose veins, VV.);
Secondary alterations due to previous deep vein thrombosis (DVT), causing reflux, obstruction or both (e.g. post-thrombotic syndrome, PTS).
It is not always possible to assign CVI to either of these groups by means of clinical history and clinical examination. For this reason a series of diagnostic tests have been proposed to assess the extent of the impairment of calf venous muscular pump, as well as of the obstruction and reflux.
It is known that VV. affect the superficial venous system, while the deep system remains effective in over 90% of cases, and that an early surgical treatment can solve the problem. Nevertheless, the prevalence of CVI from varicose veins is definitely higher than the prevalence of CVI from PTS. A personal study, carried out on a consecutive series of 171 patients (49 men and 122 women) suffering from CVI, showed that the cause was represented by varicose veins in 62% and by PTS in 38% of cases.
The identification of the etiology of CVI is important not only from a speculative point of view, but as the therapeutic strategy can be markedly different between the two types of CVI.
Another cause of CVI can be a primary valvular incompetence of the deep system, which is a particular entity related to congenital anomalies of the venous wall, already described 50 years ago on the basis of venographic studies. Some authors report it as very rare, others as quite frequent. This condition, rather disregarded in the past, is nowadays the object of systematic research thanks to the therapeutic opportunities represented by valvuloplasty or valved vein graft, and its present prevalence is estimated at about 15% of patients with severe CVI.

CVI Pathogenesis

Varicose Veins (VV) - Varicose veins are a primary disease related to structural alterations of vein wall and valves. Main alterations pertain to the structure of connective tissue and cellular matrix, as well as to a dysfunction of smooth muscle cells of the venous wall. The presence of cellular and molecular alterations led some authors to consider VV. as a congenital disease. However, taking into account that the molecular alteration alone does not lead to the onset of VV in the absence of facilitating factors, varices remain a primary disease and the term "congenital" is reserved for indicating a venous disease present from the birth, like the Klippel-Trénaunay syndrome.
If not surgically treated or in case of recurrence, varicose veins develop to CVI.
The critical step is represented by the hemodynamic involvement of perforator veins, whose valvular structures can give in for structural reasons (primary involvement of the valvular mesenchyma) or for hemodynamic reasons. Due to the venous hypertension of incontinent saphenous system, perforator valves begin to give in up to becoming incontinent. During the muscular systoles of the calf, besides flowing upwards from the deep system, the blood shoots through the perforator veins towards the superficial system. The association of the long saphenous reflux with the short reflux from the perforator vein produces the so-called Cockett's water hammer, which represents the early hemodynamic traumatism on venous and perivenous tissues. From this time on, venous hypertension affects both superficial and deep system, and the muscular pump of the calf becomes more and more ineffective.

Post-Thrombotic Syndrome - The venous thrombus, after the acute phase of thrombosis, undergoes a recanalization process, which not always represents a favorable event in the evolution of the clinical picture. In fact, there is a false recanalization, related to fibrin retraction and to adhesion of thrombus to the vein wall, which make the vein lumen partially pervious, as well as a true recanalization due to a local proteolysis, forming of a new canal within the thrombus. The proteolytic process also involves the valves that become incontinent. The reflux established in the deep system affects the perforator veins, which eventually become incontinent, producing a reflux towards the superficial system. If the original thrombus was also affecting the perforator vein, the proteolytic process affects even this latter and the processes of recanalization and reflux are faster.
The severity and the rapidity of onset of PTS in comparison with venous thrombosis depend from the location. In a recent retrospective study, PTS prevalence was 11% in case of leg VT, 37% in case of thigh VT, and 47% when VT was involving the iliac vein. The incidence of PTS after DVT ranges from 3% to 40% among the different case series. The incidence is higher in the first 2 years after the acute event (22.8% after 2 years), increasing during the subsequent 8 to 10 years (29.1% after 8 years).
VT, causing PTS and CVI, pertains the deep system, while SVT is considered a usually benign disease, which does not require special attention. On the contrary, SVT is a serious disease, often underestimated, which can lead to pulmonary embolism and determines a PTS when the process affects the perforator vein's system.

CVI

Whatever the cause of CVI, as soon as venous hypertension involves both venous systems of the inferior limb, both pathogenesis and pathophysiology follow a common evolution. There is an evident clinical picture of CVI, whose onset requires the involvement of perforator veins regardless of the original pathology. The extent of involvement of the perforator system should not be evaluated only from the anatomical point of view (continent or incontinent) but mainly from the functional point of view. In fact, an incontinent perforator can be either compensated or decompensated, and venous hypertension becomes generalized only in the latter case.

While the perforator system remains efficient, both reflux and hypertension are limited to the affected system and they are compensated from the healthy system. When the perforator veins become incontinent, the reflux generates a *system of communicating vessels* with volume overload and generalized venous hypertension. The efficiency of the venous muscle pump diminishes gradually, generating a volume overload, passive venous hypertension and stasis. In turn, the stasis affects the venular side of microcirculation and the capillaries, which, from an initial state of functional suffering expressed by the reticular alterations, leads subsequently to the typical organic alterations of halo formations, with increased permeability and interstitial edema.

Following the onset of stasis and of capillary alterations, CVI enters its tissular phase, where the cutaneous microcirculation plays a particularly important role.

The increased permeability produces an increased capillary filtration accompanied by interstitial edema, which is compensated for a long while by the microlymphatic drainage. As time passes, the compensation capacities come to an end, both because the highest drainage threshold is reached and because of the frequency of microlymphangitis reacting to the huge increase in lymphatic flow. This decompensation is responsible for the increased risk of infections, fibrous evolution of edema, trophic skin alterations, and a possible increased risk of malignant degeneration.

With the increased permeability, not only liquids and crystalloids pass through into the interstitial space, but also macromolecules like fibrinogen.

Fibrinogen, because of a concomitant reduction of the fibrinolytic potency, polymerizes quickly to fibrin, which deposits as a cuff around capillaries preventing tissue oxygenation, as demonstrated by the reduction of $TcpO_2$ in the advanced stages of CVI.

The reduction of fibrinolytic activity, secondary to the endothelial dysfunction caused by venous hypertension, is particularly marked in subjects having a genetic predisposition to DVT, and this would account for the more “rebellious” character of ulcers from PTS in comparison with varicose ulcers.

The hypoperfusion due to the fibrin cuff has been considered the main responsible for ulcer pathogenesis. Subsequent studies neither confirmed nor denied definitely this theory. Pericapillary fibrin cuffs represent a frequently present tissue reaction, often continuing even after recovery.

In CVI, the most likely mechanism accounting for tissue hypo-oxygenation is not just one; it consists rather of a series of microhemodynamic reactions, both cellular and molecular in nature. They are strictly related to each other, ranging from an endothelial dysfunction to an activation of leukocytes that aggregate mainly within the venular district, as well as lipoperoxidation, production of free radicals, microvascular thrombosis, and necrosis.

Clinics and Diagnostic Procedures

In most cases, the clinical diagnosis of CVI is easy to perform. However, it should be always supported by instrumental procedures in order to rule out diagnostic mistakes, even some important ones. The main instrumental procedure is the color-Doppler sonography, which allows for evaluating the venous system from the anatomical and hemodynamic point of view. The main objectives are the identification of an obstruction, a valve incontinence, and a reflux along with the measurement of its duration. The color-Doppler sonography should be also accompanied by infrared photoplethysmography (infrared PPG) for the assessment of the muscular pump efficiency and a global evaluation of reflux.

Management of CVI

The objectives of CVI therapy are:

To reduce venous hypertension, improving the efficiency of the muscular pump;

To reduce capillary alterations (halo formation);

To improve tissue perfusion and to reduce leukocyte activation.

The treatment that proved as effective by criteria of Evidence Based Medicine is elastic compression, carried out with a multilayer bandage, as starting therapy in the uncompensated phase of CVI, and with elastic stockings in the long-lasting maintenance therapy.

The increase in venous tone, the reduction in capillary permeability and the reduction in leukocyte activation are typical of phlebotonic drugs (diosmin) and have been so far supported by C-degree evidences. These drugs are subject to ongoing controlled trials, whose published preliminary results are very encouraging. Endogenous fibrinolysis activators (GAGs, defibrotide) and antithrombotic drugs (heparin) can correct tissue hypofibinolysis and stimulate skin fibroblast proliferation, mainly with the intramesodermal topic administration.

33 COMPRESSION THERAPY IN CVI

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Background

Compression bandages are not old fashioned. There are clear indications in which they cannot be replaced by compression stockings. Evidence based data in the literature show that in patients with venous ulcers high compression is more effective than low compression[1,2] .

Rationale for compression bandages

Ambulatory venous hypertension is the deciding hemodynamic dysfunction in patients with severe chronic venous insufficiency (CEAP C3-C6). This parameter is characterized by a deficit in the fall of peripheral venous pressure in the distal lower leg due to an incompetence of the venous pump during walking. Ambulatory venous hypertension can be reduced by compression if the external pressure intermittently exceeds the intravenous pressure during walking[3]. Depending on the severity of ambulatory venous hypertension pressure peaks during walking are required that come close to the diastolic intravenous pressure, corresponding to a pressure range of 50-80 mmHg,

Compression pressure peaks of this magnitude can barely be achieved with compression stockings.

Long stretch or short stretch material?

Single layer elastic bandages producing such high-pressure values during walking (e.g. 50 mmHg) would not be tolerated in the supine position. Their resting pressure would be too high because the elastic textile will continue to provide a fairly constant level of compression.

In contrary to highly elastic, long stretch bandages (extensibility > 100%) stiff material like zinc plaster applied with a resting pressure of 50 mmHg or more will produce pressure peaks of about 70-90 mmHg during walking that will cause intermittent compression of the superficial and deep leg veins. Similar effects can be produced with multilayer bandages combining material of variable extensibility. Multilayer bandages consisting of several layers of rather elastic material will rather keep a sustained pressure over several days than short stretch multilayer kits.

Practical consequences

We use mainly Unna boot or multilayer, short stretch bandages for the initial compression treatment of patients with severe stages of chronic venous insufficiency like venous ulceration. Such bandages are applied with a resting pressure on the distal lower leg of about 50 mmHg. Already in the first minutes after application the pressure will considerably decrease due to oedema reduction. Completely rigid or short stretch textile may stay over night, since the pressure will go down when the patient lies down. Therefore these bandages need to be changed only after every week. In patients with severe edema the bandage may get too loose and should then be reapplied after few days.

When the ulcers are healed maintenance therapy with elastic material, preferably with elastic stockings is recommended.

Compression stockings are routinely used for patients with milder forms of venous incompetence, for prevention and therapy of oedema (C3) [4]. According to the pressure ranges of medical compression stockings several compression classes have been proposed. Unfortunately these compression classes are varying between different countries.

According to a European Prestandard the following compression classes may be differentiated5:

Class A, light,	10-14 mmHg
Class I, mild,	15-21 mmHg
Class II, moderate,	23-32 mmHg
Class III, strong,	34-46 mmHg
Class IV very strong,	49 mmHg and higher.

The selection of the compression class depends on the severity of the venous disease. When compression stockings are prescribed the ability of the patient to put on the stocking has to be considered since this is a deciding point concerning compliance.

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ELASTIC STOCKING AND QUALITY OF LIFE, IN PATIENTS WITH CHRONIC VENOUS INSUFFICIENCY

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Despite the national and international guidelines for the treatment of Chronic Venous Insufficiency (CVI) suggest the compression therapy with the hardest grade of recommendation, its application, at least in Italy, is certainly lowest than the estimated need coming from the prevalence of CVI in the epidemiological studies. This low prescription is due to different causes, the low compliance of the patients and, probably, the occurrence that often the doctors make just the indication, giving up the choice of the device to the shopkeeper.
In a recent review on Medline Database, we found one hundred eighty papers searching for elastic stocking and CVI, three hundred papers searching for elastic stoking and venous disease and six hundred papers (including acute DVT, sepsis and other leg diseases) searching for compression therapy and venous disease. Searching for compression therapy and quality of life (QoL) we found only eight papers including the treatment of fracture or metastatic bone disease, whilst searching for elastic stocking and QoL we found only four papers. Two of them were about lymphoedema, the first utilised an instrument for assessment of QoL in the Cancer Therapy, and the second does not indicate the utilised instrument. Of the remain two papers one foretell further studies about the follw-up of DVT and QoL to find objective criteria for dyagnosis of post-thrombotic syndrome, and the last one underlines the opportunity of the health-related QoL to assess the effectiveness of new tools for the treatment of venous ulceration.
In spite of the high number of papers about the effectiveness of elastic stocking in CVI, no one has been published about the the impact of compression therapy on quality of life (QoL) of patients with CVI.
This paper refers the results obtained in fifty patients with CVI inhabitants of Triveneto region. The study has been partially supported by the unrestricted educational grant of Sanagens [SANAGENS, Italian Company Agent of Sigvaris (Ganzoni, Switzerland)], covering the data entry and statistical analysis; the patients personally provided for elastic stocking.

Patients and Method

Seventy patients, withdrawn from one hundred twelve patients enrolled in a pilot study on QoL in Chronic Venous Insufficiency carried out in the Trivento Region, received a prescription of elastic stocking, according with the recommendation of the guidelines of Italian College of Phlebology.
The patients have been informed about the target and modality of the study, and gave their informed consent.
After that each patient preliminary received a Mini-Mental State Examination, and four questionnaires to assess the QoL questionnaires, and were asked to fill out them in complete self administration, helped by the nurses only if required.
The utilised instrument have been:
- the SF-36 (a generic questionnaire, the largest utilised instrument to assess QoL, with eight items, four physical [physical activity, physical role, body pain, general health] and four psycho-mental [vitality, social activity, emotional role, mental health]). The results are reported with a single score for each item;
- the CIVIQ-2 questionnaire, a specific instrument for venous diseases with twenty questions; the results are reported as global index score (GIS);
- two utility measurement instruments, the Euro-QoL 5D and the visual analogic scale; the results are reported as single score;

The score scales of all questionnaires have been adjusted to reflect the poorest QoL as 0 and the best QoL as 100.
Thirty patients received the same questionnaires after 30 days to evaluate the test-retest reliability.
After four months all the patients came back to the Vascular Lab, and were asked to fill out a new copy of the questionnaires. The time of four months has been choose because the major part of questionnaires have a specific question related with the status of four months before.
The obtained data have been analysed with the T Student test for paired data.

Missing Data

Twenty patients have been withdraw and not considered in the final analysis, because of incomplete filling of questionnaires at the baseline step, and because of no-show during the follow-up.
The final available data regard fifty (thirty one CEAP class C2 and twenty nineteen class C3-4-5) patients with QoL measurement before and after four months of compression therapy.

Results

The coefficients of correlation for the test-retest reliability were more than 0,85.
The baseline QoL of the patients in class C2 of this study measured by SF-36 did not show significant difference with the normal value of Italian healthy people, except the item physical role.
The patients of the class C3-4-5 showed a significant reduction of QoL, overall for the item physical role and physical pain, involving also the general health and vitality.

After four month of compression therapy, the patients of class C2 showed a significant improvement of QoL with all utilised instrument.
The statistical significance of different items varies from p<0,01 to p<0,04; within the physical scores only the physical functioning did not show significant values, and mental health in the mental scores. Also the cumulative items, vitality and general health, did not reach significant value.
The patients of class C3-4-5 showed significant improvement of QoL in all items of SF-36, including general health and mental health, without significant increase in vitality an emotional role.
The results obtained by other instruments confirmed the general trend of improvement of QoL (GIS p<0,006; Euro-QoL 5-D p< 0,008; VAS p<0,099), but in the advanced stages (class C3-4-5) only the GIS of CIVIQ questionnaire showed a significant changes of the score (p<0,028).

Comments
The general trend of our results unquestionably shows that the compression therapy significantly improves the QoL of patients with CVI, and increases the strength of the strong recommendation.
Hereafter this general sentence on the effectiveness of the elastic stocking, our results suggest also several clinical comments.
About data from SF-36, physical role, body pain and social functioning improve in both group, class C2 and class C3-4-5. Physical activity, general and mental health show significant change in class C3-4-5, but does not change in the class C2. Probably these items are involved only in the advance stage of CVI, and the stocking cannot improve what is still good.
Different comment about emotional role; this item measure the presence or the absence of problems due to the own emotiveness of the patient, and their impact on the patient's activities. Probably in the class C2 the impairment of emotional role is low and elastic stocking improves it significantly, whilst in the advanced stages the impairment is higher worsened and the beneficial effects of compression therapy cannot improve significantly this item.
Besides that, considering that the pilot study enrolled forty seven patients in class C1-2, and that the doctors prescribed elastic stocking only in thirty eight patients, we can imagine that several patients have been considered not eligible for compression therapy. Well, if we compare QoL of patients enrolled in the pilot study and patients of this study receiving compression therapy we can see that in spite no difference in the major part of the items, several of them (i.e. physical role p<0,01) shows a worsen score in the group receiving the elastic stocking prescription, than the cumulative group class C1-2. In other words the global clinical evaluation guided the Doctors to indicate or not the compression therapy. The suggestion coming from our data could be to utilise the QoL measurement for indication of elastic stocking, at least in the doubtful cases.
About the other utilised instruments we underline that the better results have been registered by CIVIQ-GIS and Euro-QoL 5-D, in the class C2. In the class C3-4-5 only GIS showed a significant difference, but lower than the improvement in class C2. These results show a higher sensitivity of CIVIQ-GIS in comparison the other utility instrument; therefore we must declare a less sensitivity of this questionnaire in the advanced stages. This behaviour, probably, because the question of this instrument are calibrated more on symptoms of early stages than on symptoms of advanced stages.
Finally, this study indicates that the compression therapy, largely validate in clinical practice, have also another of the criteria required by EMEA for the drugs and other therapeutic option; the improvement of QoL.
We hope that our paper could contribute to the inclusion of the compression therapy in the treatment of CVI covered by the Public National Healthy Insurance, and we hope also that the Scientific Society and the Manufactory Companies could sponsor the QoL measurement as scientific method to assess the effectiveness and efficacy of different devices, instead to consider only the manufactories modality.

Appendix
SIAPAV Working Group Quality of Life in Vascular Medicine
PILOT STUDY on Quality of Life in Patients with
Chronic Venous Insufficiency "Triveneto Region"
List of Participants Doctors and Vascular Lab

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Dr. Cordova	Rosamaria	Padova	U.O. Angiologia
Dr. Franceschi	Lorenza	ULSS 16 Padova	Angiologia Territoriale
Dr. Fregonese	Vualtiero	Cormons GO	St. Chirurgia Vascolare
Dr. Kontothanassis	Dimitrios	Padova	Clinica Chirurgica
Dr. Longo	Giacomo	Feltre TV	Chirurgia Generale
Dr. Mazzarolo	Giorgio	Conegliano Ven. TV	Ospedale De Gironcoli
Dr. Penzo	Silvia	Treviso	Angiologia Territoriale
Dr. Pfeiffer	Paolo	Udine	St. Chirurgia Vascolare
Dr. Russo	Aniello	Conegliano Ven. TV	Ospedale De Gironcoli
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Dr. Vella	Vincenzo	Piove di Sacco PD	Chirurgia Generale

35 INDICATIONS AND TECHNIQUES OF TRADITIONAL VENOUS SURGERY

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The treatment of varicose veins has five main objectives : relief of symptoms, prevention and/or treatment of complications, prevention of recurrences , a poor aggressive procedure to minimize complications and finally with a good cosmetic outcome.
The primary goal of surgical treatment is to improve venous circulation by correcting venous insufficiency through the correction of reflux points and pathways.
A careful history and physical examination are the first step to developing an appropriate diagnosis: the preoperative anatomical and functional assessment meet in the color duplex ultrasonography an essential tool to a correct treatment plan (particulary in the sapheno-popliteal junction). Plethysmographic tests can be useful in selected cases (role of deep circulation).
Identification and location of reflux points and of length of reflux along the saphenous trunk are the main goals of the preoperative evaluation.
Nowadays surgical procedure are generally performed in an outpatient patient (or ambulatory settting) using spinal block or general anaesthesia (monitored anaesthesia care).
Excisional surgery is performed either with crossectomy,i.e. flush ligation of sapheno-femoral or popliteal junction and with stripping of the saphenous trunk : this procedure reduce the risk of reoperation by two thirds after 5 years.Excision of elongated and stretched varicose veins can be performed alone ore in combination with sclerotherapy.
If incontinent and dilatated, a subfascial ligature of a perforating vein of the tight can be performed.
Evaluation of the length of the reflux (preoperative color duplex ultrasonography) is mandatory to perform short or long stripping . Stripping procedure is performed with the external Mayo stripper and phlebectomy with the Muller technique.
In conclusion traditional varicouse veins surgery should be excisional, in an outpatient treatment setting, cosmetic and “tailored” to the anatomical and fuctional evaluation of the patient.

INDICATIONS AND TECHNIQUES OF HAEMODYNAMIC VENOUS SURGERY

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S-IVCS has an important social and economic impact in western countries because of its high prevalence and high costs for diagnosing and treating it and for the lost workdays as this disease is widely represented in working people[1,2].

Aim of the surgery program must be, therefore, the improvement or the healing from the disease, the prevention of complications and above all the maintenance of results during time.

Standard and "old" surgery uses generally only ablative techniques, as stripping, and aim to eliminate altered vein considered useless for the system which is considered, however, sufficient to continue well functioning.

Venous disease is a systemic disease whose alteration regard all veins and there are no healthy vein which can substitute those eliminated.

Haemodynamic technique is a surgical treatment of superficial venous insufficiency designed to correct the pathological haemodynamic effects of superficial venous insufficiency. Surgical treatment is based on precise preoperative anatomical and haemodynamic mapping performed by duplex ultrasound, providing preoperative ultrasound-guided marking. Surgical treatment consists of dividing the hydrostatic pressure column and disconnecting venovenous shunts by ligation-section of the superficial venous network at precise points determined by the preoperative ultrasound-guided marking. This strategy should achieve a superficial venous circuit draining perfectly into the competent deep venous network normalizing the "haemodynamic crisis" that affects the altered vein system. The operation is performed under local anaesthesia as an outpatient procedure and allows immediate resumption of walking, which promotes a good result due to activation of the calf muscle pump.

The significantly better results observed in CHIVA group in the middle and in the and of follow up are due to the possibility to modulate the haemodynamic correction, as if necessary, with one or more retouches, that are able to complete in a targeted way the haemodynamic correction.

Non invasive explorations of chronic venous disease, particularly ultrasound techniques, have greatly improved our understanding of the underlying pathophysiologic mechanism determining e moduling the surgical procedure in haemodynamic surgery [3,4,5] so it is necessary a trained and skilled ultrasound operator. Most Failures, in fact, are due to poor haemodynamic assessment [3].

2173 patients (Males 545, Females 1628, Age range 21-67, Mean age 44) were treated and followed in a period of 8 years (1994-2002) by Chair of Surgical Clinical Methodology of University "Magna Graecia" of Catanzaro. 1106 patients (Males 331, Females 775) underwent CHIVA procedure (CHIVA group) and 1067 patients (Males 214, Females 853) underwent stripping procedure (stripping group).

Inclusion Criteria were ectasia apparent on standing, presence of pain, oedema, and pigmentation, reflux of the Long Saphenous Vein at the cross evident at ultrasound examination, Deep Venous System normal.

Exclusion Criteria were presence of ulceration, previous surgical treatments for varicose vein, absence of reflux of the Long Saphenous Vein at the cross evident at ultrasound examination, abnormalities of Deep Venous System.

In CHIVA group after a precise preoperative anatomical and haemodynamic mapping performed by ultrasound examination a ligation, with not biodegrading thread, of saphenofemoral junction, after incision of the groin, was performed and subsequently ligation-sections, with not biodegrading thread, of the superficial venous network at precise points determined by the mapping were executed.

The tributaries are removed by stab avulsion phlebectomy with specially designed hooks. Adhesive tape is used to close incisions.

In stripping group, ultrasound examination to evaluate saphenous femoral junction insufficiency and the presence of incontinent collateral veins was performed. Subsequently incision of the groin and calf isolation of the long saphenous vein was performed in order to execute a standard stripping procedure with a disposable plastic stripper. The entire long saphenous vein was eliminated.

The tributaries are removed by stab avulsion phlebectomy with specially designed hooks and adhesive tape is used to close incisions as in CHIVA procedure.

In both groups an intradermic suture, with not biodegrading thread, for the wound of the groin was performed.

All patients underwent elastic bendaging at the end of surgical procedure.

All patients were followed up for 5 years.

Follow up Parameters were: Pain, Oedema, Ectasia, Pigmentation,Ultrasound controls,Recurrence.
607 patients (132 Males, 475 Females) of CHIVA group during follow up underwent some retouches, necessary after ultrasound controls, executed on saphenous axis to complete the haemodynamic correction.
No complications was observed in either groups.
This study shows that nowadays there is no need to argue about ablative or restaurative techniques because every technique can be used if is able to respect some strategic and tactical rules that spring from Haemodynamic studies. We have to argue, therefore, about Haemodynamic surgery which is based on coherent pathophysiological and haemodynamic principles. For its application it requires, also, a rigorous pre- and post-operative ultrasound analysis, necessary for the effective correction of the haemodynamic disorders, resulting, finally, in lasting benefits on the aesthetic, functional and tropic changes associated with Superficial Chronic Venous Insufficiency.

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37 INTEGRATED TREATMENT OF VENOUS DISEASES

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In the last years the attentions that women have for the appearance of their body and in particular way the problem represented by varices not only by an aestetic point of view but especially from a functional point of view is significantly increased. If in theory the idea of taking away
all the evident and diseased veins can seem right and realizable from a chirurgical point of view the results in reality are frequently second rate on both of the two sides aestetic and functional.
The skin always memorizes any chirurgical trauma even if this is executed in the respect of the most rigorous aestetic rules; in the necessity of an intervent we have to always keep present the effects on the skin.
The advance in the preserving metodics has consented a less invasive approach, the commune use of the ecodopler that allows us to map with precision the patient evading cuts on the skin and in some cases to limitate the incisions to small wholes.
Chirurgy, schlerotherapy, endovascular laser frequently in association consent now to obtain better results aestetically and functionally.
Using the endovascular laser has enabled us in some cases to reduce even more the invasiveness of the intervent with even shorter recovering time but especially a better compliance for the patient.
The radiofrequency technique has been from us completely abandoned in favour of the treatment with the laser 980mm that consents the treatment of larger calibre veins and of collaterals; even from a technical point of view the methodic is much more easy and the costs are sensibly inferior.
In the decision of the therapeutic strategy we can't forget the evolution of the venous disease.

38 EPIDEMIOLOGY, DIAGNOSIS AND MANAGEMENT OF LYMPHOEDEMA

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The extension of lymphedema in the world remains still not clear considering the persistent difficulty of a correct diagnosis. Epidemiological data demonstrate that lymphedema is worldwide diffused without large differences regarding the clinical manifestations. It is estimated that 140.000 subjects are affected. 79% of lymphedemas are of primary type while the 21% of secondary. The 76,5% of primary lymphedema affects subjects younger than 45 years old, on the other side 80% of secondary type is developed after 44 years. The most common causes of secondary lymphedema are orthopedic surgery (33%), traumas (25,5%) and tumors (18,3). 90% of secondary lymphedema caused by neoplasms, is after mastectomy. The most frequent localization is at the lower limb (79%). In Italy there are few data regarding primary lymphedemas, estimated around 30-40% of all. 40% occur after mastectomy and 40% after hysterectomy.

Frequently an accurate patient interview and examination may reveal the cause of edema and suggest the diagnosis. To this will follow instrumental diagnosis. Althogh etiology of primary and secondary lymphedema is different, the clinical aspects of both are similar. History of patient eliminates the hypothesis of other pathologies (cardiological and renal diseases) and defines the period, the modalities of presentation and the evolution of the edema. Lymphoscintigraphy and ecography are the techniques mostly utilized for the diagnosis of lymphedema. Lymphoscintigraphy with technetium-99 colloid permits a functional and morphological evaluation of the lymphatic system. Ecography of soft tissues demonstrates the presense of lymph in the suprafascial tissues and in the interstice. The other exams serve to complete diagnosis.

Currently, pharmacological and physical therapy (lymph-drenage and compression) represent the treatment of choice of lymphedema.

Pharmacological therapy although not resolutive, contributes to the patient well-being on the condition that are selected active principles with documented pharmacological action. Such therapy is focused on the symptomatology and prevention of complications. Drugs used are natural, seminatural and synthetical products and most of them belong to the family of flavonoids.

Independently of the different mechanism of action, these agents are utilized when surgical approach is not possible or in association to it.

Physical therapy consists in lymph-drenage and elastic compressive therapy.

Manual lymph-drenage is one of the most diffused methods for all types of lymphstasis. The efficiency dependes on the operator. Elastic compressive therapy is generally not well accepted by the patient mostly because of the aesthetic and functional reasons, moreover physicians use it irregularly because they are not aware of the disposable materials and the application modalities that along with the compression type and the duration of treatment differ in every single patient.

Currently there are many surgical techniques for the treatment of lymphedema. Derivative surgery previews a restitution of the normal lymphatic flow through the creation of lymphatic-venous, lymphatic-venous-lymphatic anastomoses and transpalnts of autologous lymphatics with lympho-lymphatic anastomoses. Lymphatic-venous anastomoses, prototype technique, obtained a great success in the beggining but the long term efficiency is doudtful since it is not possible the evaluation of the patency of the anastomoses. Resective surgery does not follow strictly a physiopathologic rule but it is confined to the demolition of wide areas of cuteaneous, subcutaneous and fascial tissue. Finally combined surgery associates the two concepts.

In conclusion we can affirm that the previously mentioned treatments present aspects of certain interest permiting an improvement of symptomatology and a deceleration of the disease but not a radical resolution of it.

39 SURGICAL TREATMENT OF LYMPHOEDEMA

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Aim:
One of the main problems of microsurgery for lymphedema consists of the discrepancy between the excellent technical possibilities and the subsequently insufficient reduction of the lymphoedematous tissue fibrosis and sclerosis. Appropriate treatment based on pathologic study and surgical outcome have not been adequately documented.

Methods:
Over the past 25 years, more than 1000 patients with peripheral lymphedema have been treated with microsurgical techniques. Derivative lymphatic micro-vascular procedures has today its most exemplary application in multiple lymphatic-venous anastomoses (LVA). For those cases where a venous disease is associated to more or less latent or manifest lymphostatic pathology of such severity to contraindicate a lymphatic-venous shunt, reconstructive lymphatic microsurgery techniques have been developed (autologous venous grafts or lymphatic-venous-lymphatic-plasty - LVLA). Objective assessment was undertaken by water volumetry and lymphoscintigraphy.

Outcome:
Subjective improvement was noted in 87% of patients. Objectively, volume changes showed a significant improvement in 83%, with an average reduction of 67% of the excess volume. Of those patients followed-up, 85% have been able to discontinue the use of conservative measures, with an average follow-up of more than 7 years and average reduction in excess volume of 69%. There was a 87% reduction in the incidence of cellulitis after microsurgery.

Conclusions:
Microsurgical lymphatic-venous and lymphatic-venous-lymphatic anastomoses have a place in the treatment of peripheral lymphedema and should be the therapy of choice in patients who are not sufficiently responsive to nonsurgical treatment. Improved results can be expected with operations performed earlier at the very first stages of lymphedema.

40 CONSERVATIVE TREATMENT OF LYMPHOEDEMA

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Lymphedema is an accumulation of protein-rich fluid in the upper or lower limb caused by damage of the lymphatic drainage mechanism. Primary lymphedema results from congenital defects in the lymphatic system; secondary lymphedema is acquired due to obstruction or interruption of the normal drainage of lymph following surgical removal of lymph nodes or after post-surgical radiation therapy. The lymphedema is more common in types of cancers that need removal of multiple lymph nodes: the risk that a breast cancer patient will develop upper-extremity edema following surgery and radiations is estimated to be between 10% and 44% and up to 23% of patients with cervical cancer risk develop lymphedema if they undergo a radical hysterectomy and bilateral radical pelvic lymphadenectomy followed by pelvic radiation.
Lymphedema can lead to a feeling of heaviness and discomfort in the involved extremity, impairments in function and unsatisfactory appearance; large amounts of fluid in an extremity may cause restrictions in range of motion; chronic lymphedema can compromise the health of subcutaneous tissues increasing the risk to develop infections. Moreover, to all women who suffer from this condition, lymphedema serves as a costant reminder of their cancer diagnosis and they have been shown to have greater psychiatric morbidity and greater functional disability.
People with lymphedema can be treated with pharmacological therapy or surgery, but these treatments have been largely unsuccessful. Physical therapy instead, can offer less invasive treatments for lymphedema. Although a cure is not yet available, conservative treatment aims to reduce and control the amount of swelling in an affected limb, as well as to restore its function.
Physical therapy interventions for lymphedema include skin care, manual lymphatic drainage, low-stretch multilayer compression bandaging (followed by a compression garment when edema is reduced), external compression by pneumatic pump and therapeutic exercises with the bandages in place.
The International Society of Lymphology recommend the combination of all physical therapy modes (so called Complex Physical Therapy or Complex Decongestive Physiotherapy). This approach involves two phases: phase I, the treatment phase, and phase II, the maintenance and optimization phase. This last phase is based on self-care: some practical advice should be encouraged as: scrupulous skin care, exercise involving the affected limb, maintenance of ideal body weight, regular use of prescribed compression garments and periodical clinical controls.

41 PERIPHERAL ARTERIAL DISEASE- "ROLE AND CLINICAL RELEVANCE OF TRADITIONAL AND NEW RISK FACTORS OF ATS"

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Atherosclerosis is a systemic process with variable expression in different vascular beds. Lower extremity peripheral arterial occlusive disease (PAD) is a major public health problem in the USA, affecting at least 8-10 millions People (1). Many projects want to analyse the population to implementer the guidelines to improve CVD prevention. For example Euro-Action is an initiative of the ESC to improve the quality of life by reducing the impact of CVD. Will involve 10.000 patients and their families in eight European countries.
Baseline results are:
-Over 1/4 of coronary patients enrolled were overweight;
-More than 1/4 of patients were recorded as having total cholesterol > 5 mmol/l;
-Over 2/3 of patients had smoked at some point in their life.
-Aims to reduce CDV not only in patients but also in their family.
Interestingly, there is a strong relationship between PAD severity and risk of future cardiovascular events, correlated to all classic risk factors of ATS but traditional risk factors alone, don't sufficiently explain all the clinical and epidemiological aspects of cardiovascular diseases; so, during the past decade, several "emerging" risk factors for atherosclerosis, have been considered.
Classic risk factors can be subdivided in two groups: not treatable and treatable.
Not treatable risk factors are: age, family history of CVD and male sex; treatable risk factors are: smoke, sedentariness, high levels of cholesterol (LDL), and low levels of HDL, hypertrygliceridemia, hypertension and diabetes mellitus.
Smoking likely contributes to atherosclerosis and vascular events in general by several different mechanisms ranging from oxidative stress to specific pro-atherogenic constituents in cigarette smoke.
Smoking appears to dramatically increase the risk associated with other risk factors like cholesterol.
The link between dyslipidemia and the development of CVD was noted in the 1960s when prospective studies demonstrated that elevated plasma cholesterol levels were associated with an increased risk of developing coronary heart disease (CHD). Different studies (MRFIT and Framingham) show a strong correlation between high levels of cholesterol and CVD. New studies (PROVE-IT, A to Z) indicate that patients recently hospitalized for an acute coronary syndrome benefit from early and continued lowering of LDL-C to levels substantially below current target levels. The target levels for total cholesterol, LDL-C and HDL-C and plasma triglyceride have been developed from information obtained from population studies and intervention studies, recognizing that none of reported intervention studies to date have been designed specifically to determine what the LDL-C, HDL-C or triglyceride targets should be.
The guidelines stress the importance of lifestyle measures both as a cause of atherosclerosis and as interventions designed to prevent and reverse the process. Lifestyle measures considered to be important include smoking, physical inactivity and excess weight.
The main focus of the guidelines is the management of subjects at high global risk. The guidelines aim to simplify risk assessment and management of those identified at high risk.
Hypertension is probably one of the most common vascular conditions and one of the most important cardiovascular risk factors. Yet, in about 90% of the patients its precise cause is unknown, as suggested by the term "essential hypertension", and treatment, while effective, is
still symptomatic. Diabetes mellitus is a condition that increase the risk of CVD. The study UKPDS shows that controlled levels of HbA1c are linked with low incidence of cardiovascular events.
Recent studies indicate that patients with PAD have systemic endothelial dysfunction and increased inflammatory status, two conditions that have been considered to play a major role in the initiation, progression and clinical complications of atherosclerosis. A number of emerging risk factors for atherosclerosis such as C-reactive protein, lipoprotein (a), fibrinogen, IL-6, and homocysteine have recently been proposed to identify high-risk individuals.
CRP is a risk marker and plays a role in the pathogenesis of inflammation and atherosclerosis. Ridker et al. have studied the relative risk of future cardiovascular events according to number of components of metabolic syndrome and CRP levels.
Even though an association between high homocysteine levels and the risk of atherosclerotic vascular disease has been known for a long time, the definite role of homocysteine in cardiovascular disease is still a matter of debate.
Over the past ten years it has become clear that cardiovascular disease and atherosclerosis have a 'microinflammatory' component and are often associated with low levels of inflammatory markers that are in the upper part of the 'normal' range. The metabolic syndrome and type 2 diabetes, appear to have a very strong inflammatory component that reflect risk for 'vulnerable plague', myocardial infarction and for other cardiovascular diseases. The inflammation's process includes coagulation, fibrinolysis, complement

activation, antioxidation, immune response and hormonal regulation through the hypothalamic-pituitary-adrenal axis. Furthermore, genetic variation, differences in exposure to environmental influences and the mass of inflammation-producing tissue can all influence responses. The relationship between atherosclerosis, the metabolic syndrome and inflammation is extraordinarily complex.
The metabolic syndrome is characterized by a constellation of metabolic risk factors, including abdominal obesity, atherogenic dyslipidemia (elevated triglycerides, small, dense LDL, low HDL cholesterol levels), elevated blood pressure, insulin resistance (with or without glucose intolerance), and prothrombotic and proinflammatory states. The ATP III provided criteria for the diagnosis of the metabolic syndrome, which is made when > 3 of the risk determinants are present.
The prevalence of the metabolic syndrome, as defined by the ATP III, is approximately 22%, based on analysis of data on 8,814 US men and women > 20 years of age from the National Health and Nutrition Examination Survey (NHANES) (1988 to 1994).
ApoA-1 Milano is a variant of the ApoA-1 gene. Carriers are characterised by very low levels of HDL (10-30 mg/dL) with antioxidant properties, longevity and very low incidence of atherosclerosis.
Even the infection seems to have a role, so, in last years, one virus (Cytomegalovirus) and two bacteria (Chlamydia pneumoniae and Helicobacter pylori) have gained interest as potential pathogens causing clinical manifestations of atherosclerosis, based upon experimental, sero-epidemiologic, or pathologic evidence.There are several pathogenetic mechanisms by which microbial infection could induce atherogenesis, thrombosis, and plaque rupture.
Further studies are needed to evaluate the clinical and therapeutic implications of the role of the emerging risk factors and to confirm the important responsibility of the classic risk factors.

42 ENDOTHELIAL DYSFUNCTION: PROGNOSTIC AND CLINICAL APPLICATION

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Introductory paragraph. Endothelial dysfunction (ED) is the earliest measurable functional abnormality of the vessel wall in atherogenesis. It is closely related to risk factors of atherosclerosis, to their intensity and duration. The involvement of ED in cardiovascular disease is also suported by its relation to cardiovascular events.

Text. Healthy endothelium plays a central role in cardiovascular control. Therefore, (ED), may have a particularly significant role in the pathogenesis of atherosclerosis. ED is a consequence of the harmful effects of risk factors of atherosclerosis on the vessel wall and is closely related to the number of risk factors, to their intensity and their duration. ED has been demonstrated in subjects with hypercholesterolemia, diabetes, hypertension, smoking and in patients with atherosclerotic disease (coronary, peripheral arterial). It was also shown that ED is an early event in type I and II diabetes and that it is related to the development and progression of diabetic vascular complications. In one of our studies on type I diabetic patients it was shown that ED (demonstrated by flow mediated endothelium dependent dilation) is inversely related to the extent of microalbuminuria.
The involvement of risk factors in ED is also supported by results of intervention studies that showed regression of ED with treatment of risk factors. Improvement of ED may be achieved by elimination of risk factors, by substitution of natural protective endothelial substances (e. g, L-arginine), inhibitors of endothelium-derived contracting factors (eg, ACE inhibitors, angiotensin II receptor antagonists), cytoprotective agents (eg, free-radical scavengers such as superoxide dismutase), lipid-lowering drugs or diets and by physical exercise (3). We also observed improvement of ED during physical training of patients with polymetabolic syndrome. Further, improvement of EF was registered during growth hormone replacement in growth hormone deficient patients. All these data show that ED is reversible and by treatment of risk factors it is possible to restore vascular function.
ED promotes progression of atherosclerosis and probably plays an important role in the development of thrombotic complications in the late stages of the disease. As ED is a key underlying factor in the atherosclerotic process, markers of endothelial abnormalities have been sought, particularly those involving disturbed endothelium-dependent vasomotion or related cellular products – circulating markers. Using these tests it is possible to follow the dose - response of harmful effects of risk factors, and the effects of preventive procedures on vessel wall function.
Determination of ED also has important clinical implications. It was shown that ED is significantly and directly correlated with the occurrence of cardiac events and that cardiac events increased as ED worsens.

43 MANAGEMENT OF STABLE CLAUDICATION

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In patients with intermittent claudications, the clinician must always keep in mind two related but different goals of therapy. The obvious goal is to improve walking capacity. In this regard, the most effective intervention is a supervised exercise rehabilitation program which, however entails elevated direct and indirect costs thus preventing many patients from becoming adherents to exercise. Available medications include Pentoxifylline, the efficacy of which is minimal in several structured reviews and metanalysis, Cilostazol (not available in Italy), Propionylcarnitine which acts through a metabolic mechanism, and statins (Simvastatin and Atorvastatin). A more important, and unfortunately often overlocked goal is to prevent the rates of myocardial infarction, stroke and vascular death which are all increased in claudicant patients. A multifactorial approach, which may include life style modification (e.g cigarette smoking cessation, diet, and exercise), antiplatelet drugs and medications for cardiovascular risk is necessary. In particular, among patients with peripheral arterial disease, antiplatelet therapy, ramipril and sinvastatin have been shown to induce a significant reduction in the risk of myocardial infarction, stroke and death for cardiovascular disease. In any case, cionside4ring that intermittent claudivcation is a underdiagnosed and undertreated disease, a national educational program in needed to improve the awareness of intermittent claudication and its consequences, and ultimately decrease systemic cardiovascular risk.
Definition and Management of the Severe Claudication

44 DEFINITION AND MANAGEMENT OF THE SEVERE CLAUDICATION

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There is nor clear cut definition on what a severe claudication is. It results in a severe limitation in exercise performance and walking ability. Apart from a poor but not critical hemodynamic situation the individual reduction of quality of life is important. It is possible now to estimate that by some disease specific questionnaires.
Usually the diagnosis can be made easily and safely. The leading symptom is the painful reduction of the walking distance. Pains are mainly located at the calf and strongly dependent from walking activities. They never occur at body rest ! If – in addition - ABPI is < 0.9 and pulse palpation abnormal the diagnosis of claudication is made.
If intervention is planned an imaging procedure should be indicated.. Mostly duplex scanning can give all informations needed. If not, digital (intravenous) subtraction angiography (at least for the aorto-iliaco, femoral, and popliteal arteries) is adequate. To visualize the lower leg arteries the intraarterial route is appropriate. Magnetic Resonance Angiography and Spiral Computer Tomography are rapidly improving and are used in case of contraindications against contrast media, pregnancy and other situations. However, these cost-effective techniques have not yet been accepted as generally to replace angiography.
As to the managemen first question in severe claudication with highly reduced quality of life is: Is the patient suitable for interventional catheter procedures ?
Usually that is the case in patients with stenoses and short occlusions in the iliac and femoro-popliteal region. Percutaneous transluminal angioplasty and/or stent implantation are the treatment of first choice if that obviously can be easily and safely done.
However, in case the patient is in a good shape and there are only less comorbidities and it is only a single arterial segment which is occluded (i.e. superficial femoral artery with a good function of the deep femoral artery) exercise training might be highly effective. This therapeutic option should always be offered to the patient – above all in case of being satisfied with a limited improvement of walking distance (say: by 200 – 400 m) – as can be expected from exercise programs.
In case of long femoro-popliteal occlusions with or without affection of the lower leg arteries which are not suitable for catheter interventions or in case of non successful intervention supervised exercise programs are the first line treatment.
If not successful pharmacotherapy comes into play. There are only three groups of agents being recommended as evidence based on a high level: Cilostazol (approved in USA, UK, Ireland, Japan, and some other Asian countries), Naftidrofuryl (approved in most European and a lot of non European countries), and prostaglandin E_1 (not approved in any country but is off-label used intravenously – at least in Germany – in case of really severe claudication).
Failure to respond to all efforts to improve the claudicant's situation would lead to the next level of decision making, which is to consider limb revascularization. However, this is only true for patients with high graded discomfort in their every days life. A careful balancing between advantages and disadvantages including long term results of any surgical procedure is mandatory!
Beside the special management of stage – II- patients the claudicant must be regarded as a vascular high risk patient and has to be submitted to a general and long term treatment of his vascular risk factors. Life expectancy of claudicants is dramatically reduced due to co-existing coronary and cerebral vascular diseases leading to a high rate of fatal vascular events. So, screening programs for claudicants to detect vascular lesions in other vascular territories are needed.

45 ILIAC, FEMORAL AND POPLITEAL ENDOVASCULAR PROCEDURE IN CLAUDICANT PATIENTS.

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The interventional therapy in claudicant patients, first reserved to subjects with single and not complicated arterial stenosis, in recent years has increasingly affirmed itself gaining greater indications with a consequential increase of the number of executed procedures.
During this presentation we will try first to list the actual indications to the execution of interventional procedures in the symptomatic peripheral arterial disease; then separately we will show the short and long term results of the interventional procedures at the level of the iliac and femoro-popliteal segment.
The indication to the execution of interventional procedures in patients with intermittent claudication depends on various factors as pain free walking distance, number and site of arterial injuries (iliac, femoral, popliteal), type of injury (stenosis or obstruction) and presence of associated pathologies.
In the treatment of a patient with intermittent claudication the evaluation of pain free walking distance is the first step, as mentioned above. Therefore patients will be interviewed to understand how claudication interferes in its normal life. A pain free walking distance of 100 mt can, in fact, be sufficient for a patient over 70, but disabling for a 40 years old subject.
It would be therefore useful to divide patients into 2 groups: subjects with disabling claudication and subjects with not disabling claudication instead of referring to Fontanie classification.
The patients with disabling claudication will be certainly treated with surgical or interventional revascularization. In those patients it will first be executed an accurate anatomic characterization of the arterial district of the inferior limbs. For this purpose the vascular Echo-Color-Doppler is a quite enough precise technique (at least concerning the femoropopliteal segment) to select those patients which can undergo revascularization by interventional procedures avoiding the execution of a preliminary diagnostic angiography, so reducing the cost and the damage linked to a double arterial catheterization and a repeated contrast medium administration. The vascular Echo-Color-Doppler is, in fact, able, if done by experts, to give all the essential information for a correct planning of the interventional procedures (site, number, type and extension of arterial injuries).
The importance of anatomic characterization of arterial injuries has been underlined by the TASC which in the various arterial districts (iliac, femoro-popliteal and infrapopliteal) has divided the arterial injuries in classes of increasing gravity indicated with the letters A, B, C, D (see fig. 1). The authors of the TASC underline, however, that the interventional procedures can be tempted in all type of arterial injuries with the awareness of a scarse possibilities of success in patients with type C and D injuries.
The injuries of the iliac artery segment, especially those of class A and B in TASC classification, better respond to the interventional treatment (high percentage of success and distance patency).
On the contrary, the arterial injuries of class C and D, being theoretically treatable with interventional procedures, are actually considered to be treated surgically (especially in class D).
The stenoses and obstructions of the common femoral are seldom treated with PTA/stenting because the vessel is not suitable to stents placement, which, in fact, being near the coxo-femoral joint, can undergo displacement or angolation. Besides, the surgical simplicity and the good short-and long-term results of the femoral TEA recommend the surgical approach in these patients.
The indication to interventional treatment in claudicant patients with superficial femoral and popliteal arteriy stenosis or obclusion is still being discussed nowadays; the stenting results of these patients are in fact disappointing and the PTA only is not able to give average/long-term results higher than the simple medical therapy.
It is nevertheless important to point out that if the clinical indication is sufficiently severe (disabling claudication) PTA can be executed reserving to surgery a percentage of failure. Finally recent technological developments (medicated stents, brachytherapy) may in the next future improve the long-term results in the femoro-popliteal PTA/stenting enlarging its possibilities.
The last factor to be considered for therapy choice is comorbility. The coexistence of associated pathologies will have, in fact, to be carefully evaluated. For example the presence of a coronaropathy or a bronchopneumopathy increases the surgical/ anaesthesiological risk and makes advisable an interventional revascularization rather than surgery.
The coexistence of renal insufficiency, on the contrary, represents a relative contraindication to the execution of interventional procedures for the risk of a further impairment of the renal function after contrast medium administration (toxic effect). Patients with short life expectation (for ex. patients with cancer or affected by severe cardiopathy) obtain insufficient benefit from the interventional procedures. They present, in fact, a higher risk of acute thrombosis after the procedure (hypercoagulability, low cardiac output) and, in case of complications requiring an urgent peripheral by-pass, are subjected to a high surgical risk.

For what concerns the short and long-term results of the interventional procedures, the iliac district is, as mentioned before, the best for this kind of treatment. For example Henry and Coll report, in a case-record of patients with iliac segmentary occlusion and subjected to PTA and stenting, a percentage of immediate success and a distance patency (8 years follow-up) respectively of 90% and 76%; the patency percentage after 8 years follow-up, however, goes down to 61% if only angioplasty is used.
Even better is the prognosis of patients with focal iliac stenosis that after a 3 years follow-up present a patency percentage of 97% (Saha 2001).
Less satisfactory are, on the contrary, the results of PTA executed on the stenosis of femoro-popliteal segment: in this case, in fact, after a 2 years follow-up we have a 58% patency with a simple PTA and a 46% patency in patients with stent implantation (Pozzi Muccelli 2003).

Conclusions:

1) The indication to interventional procedures requires a careful clinical evaluation of the patient (pain free walking distance, comorbility) and an accurate study of the arterial injuries (site, number and type).
2) The arterial injuries with an iliac localization can better respond to the interventional treatment.
3) The femoro-popliteal segment injuries are conditioned by an elevated percentage of long term risteosis/obstruction, therefore the selection of patients to be treated should be made with great accurancy.

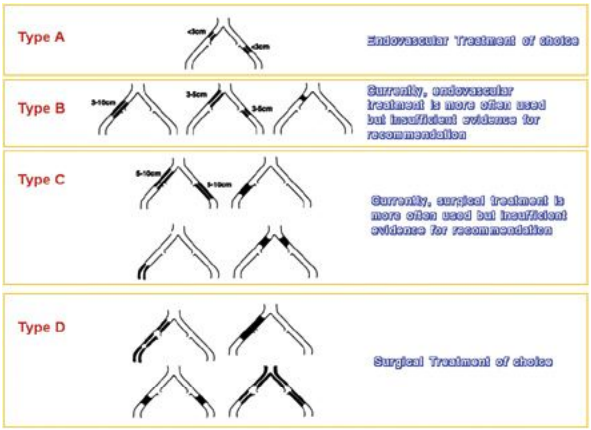

Fig 1: Summary of preferred options in interventional management of iliac lesions (modified from TASC 2000)

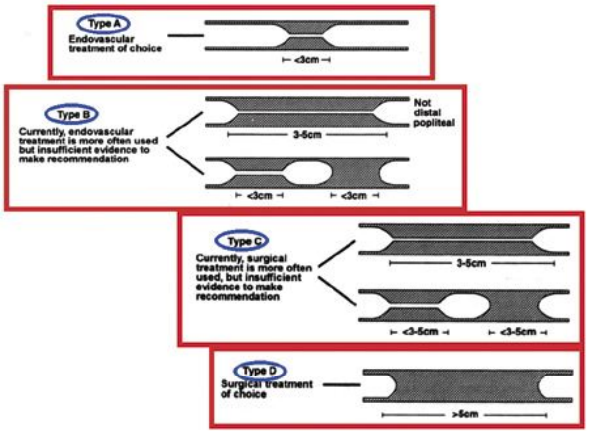

Fig 2: Summary of preferred options in interventional management of femoro-popliteal lesions. (modified from TASC 2000)

THE PHYSICAL TRAINING IN PATIENT WITH PERIPHERAL ARTERIAL DISEASE

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The role of the physical training in the treatment of the early stages of the peripheral arterial disease of the lower limbs is actually well recognized by many studies (1, 2). It has in fact stated that the exercise training increases the walking distance of beyond 100%, therefore limiting the disability of the patient, and he besides acts favourably on several risk factors, determining a reduction of the incidence of cardiovascular events. The physical exercise is, in fact, able to improve the metabolism of the carbohydrates, with consequent reduction of the glucose blood levels, and of the lipids, lowering total cholesterol levels and increasing HDL cholesterol (3). His favourable effects are probably mediated also through improved walking biomechanics, cardiovascular adaptations, and improvements of the psychological condition of the patient. If the effectiveness of the exercise training in the treatment of the intermittent claudication has been widely demonstrated, less is known on the exact mechanisms it acts with. Some of these mechanisms could involve the induction of angiogenesis or an improvement of the blood flow (or at least a flow redistribution), probably mediated from an increased release or a better use of nitric oxide. Moreover the physical exercise may induce favourable modifications of the muscular metabolism and of the hemorheologic abnormalities observed in patients with peripheral arterial disease (4). It may also slow down the progression of the atherosclerotic disease. The walking biomechanics and the conditions of the locomotive apparatus are also improved (5). A reduction of the pain perception induced by the physical activity, probably mediated from an increase of the endorphins release was at last described.

The principal problem, not completely resolved, concerning the use of the exercise training in the treatment of the patient with intermittent claudication is still that of the identification of the key elements of the more effective exercise protocol, in particular as regards the kind of activity and the workloads to use.

Many types of trainings have been proposed, like treadmill or track walking, cycling, steps climbing, sometimes combined to resistance training or to other exercises. As regards the intensity of the exercise, some authors suggest stopping exercise before the beginning of calf pain to improve muscle oxidative metabolism, other authors propose heavier workloads to enhance the ischemic tolerance through an ischemic preconditioning mechanism. The latter protocols, mostly adopted in United States, are based on repeated treadmill walking prolonged up to near maximal pain followed by rest to the subsiding of the pain (6). Such protocols did not demonstrate to be more effective than those based on lower workloads (7) and may contribute to progression of atherosclerotic damages through the production of free radical and the activation of inflammatory processes (8). Therefore, on the basis of the current knowledge, training protocols with workloads within the point of calf pain are more appropriated. An effective exercise training program should be based on treadmill walking at least 3 times the week, with a workload of 70-80 percent of the pain free walking distance, 1-2 minutes rest between repetitions, and a total exercise time of at least 30 minutes. Such training modality is mandatory in particular when treating patients with more severe intermittent claudication (at Fontaine stage IIb) who are most likely to be affected by the enhancement of the oxidant injury already activated by the pathology itself.

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NEW DEVICES FOR DISTAL REVASCULARIZATION DIFFERENT STRATEGY (PTA OR BYPASS) FOR DIFFERENT PATIENTS ?

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INTRODUCTION

Chronic critical limb ischemia (CLI) is defined as 1) rest pain (for at least four weeks) needing regular analgesia and/or 2) a tissue lesion (ulcer or focal gangrene) in the lower extremity where an arterial insufficiency can be verified as the underlying cause. CLI is typically observed not only in atherosclerotic patients but also in diabetes and CLI has prognostic significance with a high risk for limb loss and decrease in life expectancy.

The most relevant goal of distal arteries revascularization and of prevention of the progression of thrombosis is the limb salvage or at least to avoid limb major amputation.

In most patients, the various options such as endovascular techniques, arterial surgery or thrombolysis have to be carefully weighted. In general, if both surgical and endovascular treatment are possible for a particular case, endovascular treatment should be preferred.

Rapidly advancing endovascular technology for enabling safe intervention of long occlusive segments of the femoro-popliteal and infra-popliteal artery continue to emerge. New devices lake the SafeCross wire, microcatheters, angioplasty (PTA) monorail catheter, bare metal stents and drug eluting nitinol stents, cryoplasty catheter and new atherotomy systems are shifting the paradigm for therapy from surgical to more endovascular treatment even for the most complex disease presentation. While in 1990 the SCVIR study (1) proposed the use of endovascular treatment of CLI only in the patients with limited disease, ten years later the TASC study (2) demontrated that also the patients with a worst condition can have a benefit with such procedures.

In general, a good result of any endovascular procedure, mainly in CLI, is achieved if the patients receved a correct anticoagulant treatement before the procedure and a good anticoagulant or antiggragating treatment after.

The treatment of CLI with stenosis rather than occlusion is certainly a condition that may improve the efficacy of the procedure (3). However, an adequate distal runoff represents foundamental condition for a good result of any revascularization procedure. In spite of the treatment adopted, the inflow of the proximal arteries and the runoff of the lower arteries are decisive factors for the final result of treatment (4). Finally, the efficacy of the endovascular treatment does not correlate only with the artery maquillage but also with the improvement of oxigen foot superficial tension (TcPO2) of at least 50 mmHg (2).

FEMORO-POPLITEAL ENDOVASCULAR TREATMENT

In the TASC study (2) has been demonstrated that PTA is not indicated only in the complete occlusion of common femoral artery.

While in the past (1) only limited stenosis or short occulusions were suitable for endovascular approach, at present almost all the pathologies of femoro-popliteal arteries may be treated with at least one of the PTA techniques.

In an old study (3) PTA alone was successfully performed in 96% of cases; the patency was reduced to 89% at 1 month, to 62% at 1 and to 38% at 4 years of follow up. Other Authors (5) found that the long term success of the procedure was better in the patients treated for claudication than in those treated for limb salvage (62% and 43%). Lammer (6) considering in a review more than 1200 cases with CLI treated with femoro-popliteal PTA confirmed these results.

Some recent works gave evidence to the efficacy of the use of PTA + stent (7) and of PTA + drug-eluting stents (8).

INFRA-POPLITEAL ENDOVASCULAR TREATMENT

If the use of PTA in femoro-popliteal arteries is improved, in recent years the use of PTA for infrapopliteal stenosis is become much more relevant. In fact, while in 1990 only stenosis of no more than 1 cm was treated with PTA (1), at present, both stenosis and occlusions, independently of their lenght, may be suitable of PTA (2). In the case of infra-popliteal PTA a good runoff in the pedidial artery and/or in the plantar arch is mandative (4).

The data of Sapoval (10) suggested that the combined use of PTA plus stent give a better patency duration than the use of PTA alone in patients undergone treatment for infra-popliteal CLI. However, other Authors (11) in a prospective study showed that PTA with or without stent had a similar primary patency rate.

At present, in the CLI of infra-popliteal arteries, the higher efficacy of PTA plus stent compared to PTA alone is not clearly demonstrated. In contrast, the combined use of small hydrophilic guidewire, thin and long baloons and rotational atherotomies seems to give better results in CLI if compared to the use of PTA (12).

The technical success of infra-popliteal PTA is considered to be greater than 90% in most publications (13) and the limb salvage is 60-86% after 2 years.

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DISTAL ARTERIAL REVASCULARIZATION IN DIABETIC PATIENTS

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Vascular complications of Diabetes mellitus has a major impact on fate of patients . Based on statistics approximately 1/3 of patients with occlusive arterial disease have diabetes, but among amputees its incidence is almost 60 percent. Pathological consequences of this metabolic disorder are typical at medium sized arteries of the lower extremities like medial calcification of the femoropopliteal and crural arteries. Earlier observations supposed
limited opportunities for arterial reconstruction in these cases because of lack of sufficient outflow tract. Recent morphometric studies proved
the higher rate of open perimalleoler and plantar vessels than it was
supposed earlier providing better chances for distal revascularisation. Progress in surgical techniques resulted in increasing number of limb
saving procedures in diabetic patients.
Other major sequeale of the diabetes is the neuropathy which frequently leads to circumscribed trophic ulceration of the foot and rapid
progression septic process like phlegmone and ostemyelitis. The septic complication may led to severe disturbances of the metabolism
reducing operability of the patient urging amputation - sometimes in patints with peripheral pulses. Since Doppler ultrasound investigations have limited value in diabetes arteriography is inevitable to clarify vascular morphology. Endovascular treatment may be indicated in short segment femoropopliteal stenoses or occlusion, but its use in case of infragenicular manifestations is very restricted. Surgery using autologous procedures -if they are amanable at
all- may provide significant improvement of the arterial supply of the
foot. Only successful revascularisation shoud be followed by wide exposure of the septic plantar region and necrectomy. If no revascularisation is possible amputation of the septic foot is scarcely
avoidable.
Lumbar sympathectomy is generally not accepted modality of treatment since some kind diabetic desympathisation has been supposed . In
selected cases- when sympathic innervation still remained intact and proved - with crural or pedal occlusions and very distal necrosis
lumbar sympathectomy can also be taken in consideration. Wide spectrum antiobiotic treatment , meticulous correction of the metabolic disturbance and administration of vasoactive drugs like prostaglandins etc. should be part of the complex medical treatment what these patients need.

49 PATHOGENESIS, CLINICAL FEATURES AND MANAGEMENT OF CHARCOT'S FOOT

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Neurogenic osteo-arthropathy (NOA), also known as Charcot's foot, represents a serious late complication of diabetes mellitus. Its prevalence has been calculated to range between 1 and 7 ‰, with an incidence of 3 ‰ per year. The clinical course of NOA can be asymptomatic, leading to progressive and worsening disruption of the bony architecture of the foot, ulceration and infection, often requiring therapeutic amputation. In a recent study carried out on 140 patients with NOA, an active process was found in 36% of cases with a prevalence of ulcers as high as 37%.

The presentation of Charcot's foot is often unexpected, unrecognised and its severity under-estimated because of the difficult identification of subjects at risk. Intimate pathogenesis of NOA is still largely unknown, but weakening of bone structure, impaired autonomic regulation of vessel tone and hypo-anesthesia have all been suggested as main pathogenetic mechanisms responsible for NOA.

diabetes is associated with an overall depression of bone neo-synthesis, and under this circumstance, neuropathy may enhance bone reabsorption favoring increased urinary excretion rate of many bone reabsorption markers. The picture is very much like the one associated with post-menopausal osteoporosis, where an increased risk of spontaneous fracture and reduced resistance to minor traumas also exists. Once a small fracture occurs, the ensuing inflammatory response will further enhance bone reabsorption, as indicated by the elevation of ICTP levels.

One of the most indicative features of Charcot's foot is the increased local arterial circulation, as well as the presence of artero-venous shunting, due to autonomic impairment. At variance with the iscaemic foot, TcPO2 levels at the dorsum of the foot is usually augmented and the tskin temperature is increased. An indirect confirmation of such a situation is in the frequent re-activation of Charcot's foot problems in ischaemic patients, secondary to re-vascularizing procedures.

Management of Charcot's foot implies the offloading of the foot during acute and chronic phases and eventually surgery to correct deformities which could eventually be not suitable with gait.

2nd International Educational Course of Central European Vascular Forum (CEVF)

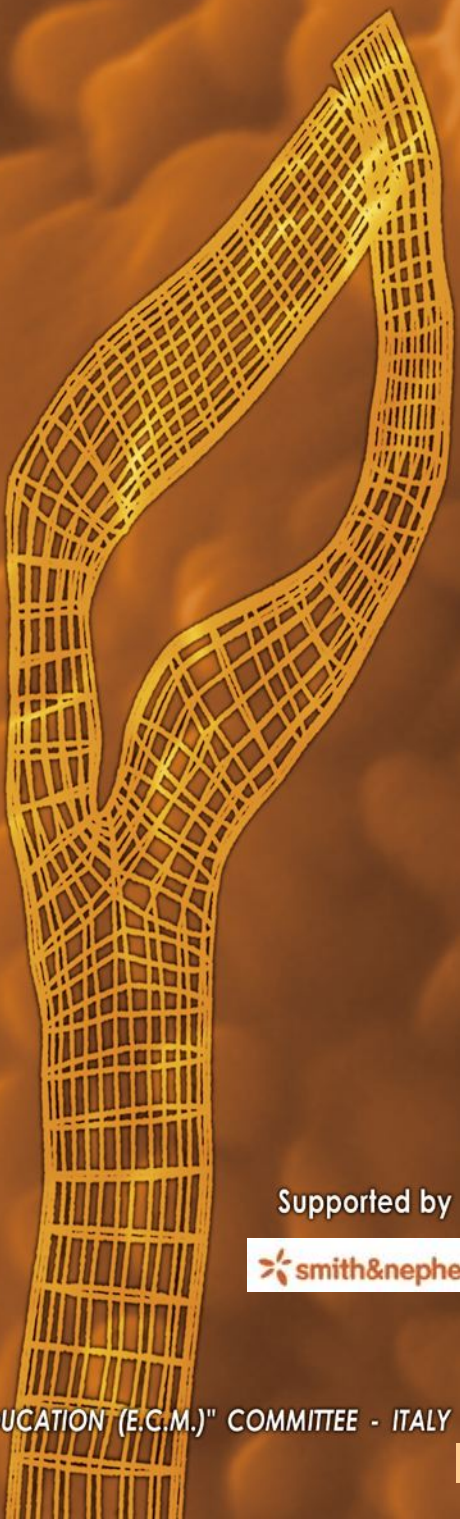
SATELLITE SESSION / SESSIONE SATELLITE

Training Course for Nurses

"Wound Bed Preparation in venous leg ulcers management: TIME principles"

Corso di Formazione per Infermieri

La wound bed preparation nel trattamento delle ulcere dell'arto inferiore: i principi TIME.



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SCIENTIFIC PROGRAMME

9:00 AM *Registration*

9:30 AM **Wound Bed Preparation: the principles of TIME**
La wound bed preparation e i principi TIME

Chairpersons: Piero Bonadeo (Milano), Maria Alessandra Scomparin (Padova)

9:50 AM Piero Lui (Mantova)
T: The removal of necrotic and devitalised Tissue
T: Tessuto necrotico e devitalizzato. Come rimuoverlo

10:10 AM Piero Lui (Mantova)
I: The management of Infection and Inflammation
I: Infezione e infiammazione. Come gestirla

10:30 AM Piero Lui (Mantova)
M: Maceration and desiccation. Moisture imbalance
M: Macerazione e secchezza. Lo squilibrio dei fluidi

10:50 AM Piero Lui (Mantova)
E: The management of Epidermal and non advancing edges
E: Epidermide: margini che non progrediscono sul letto della ferita: come intervenire

11:15 AM *Break*

11:30 AM **Interactive session: how to manage the principles of TIME**
Sessione interattiva con i discenti: le diverse modalità di gestione degli elementi del TIME

Chairpersons: M.A. Scomparin (Padova), P. Bonadeo (Milano), P. Lui (Mantova)

12:00 PM Pathophysiology of venous leg ulcers and principles of compression
Fisiopatologia dell'ulcera dell'arto inferiore e introduzione all'elastocompressione
P. Bonadeo (Milano)

1:00 PM *Lunch/Pausa pranzo*

2:00 PM Educational laboratory: management of venous leg ulcers.
From local treatment to compression therapy (M.A. Scomparin)
Laboratorio didattico:gestione delle ulcere dell'arto inferiore.
Dal trattamento topico alla terapia elastocompressiva

5:40 PM ***CME Questionnaire***
Distribuzione del questionario ECM

6:00 PM Chairpersons summary and conclusion
Conclusione dei lavori

Dr. Piero Bonadeo

Istituto di Chirurgia Vascolare, Università di Milano (Direttore Prof. Agrifoglio).
Past President Associazione Italiana Ulcere Cutanee.

La wound bed preparation

Con l'espressione Wound Bed Preparation si indica l'insieme delle corrette procedure di gestione di una ferita che ha l'obiettivo di accelerare i processi endogeni di guarigione e promuovere l'efficacia di altre misure terapeutiche. La Wound Bed Preparation consente di definire in maniera sistematica i punti sui quali si deve articolare la strategia di trattamento delle ferite croniche attraverso la comprensione dei meccanismi scientifici che stanno alla base dell'alterazione del fisiologico processo di riparazione tessutale. Un approccio di questo tipo andrebbe preso in considerazione per tutte le ferite che non tendono a progredire normalmente verso la guarigione.

Fisiopatologia dell'ulcera dell'arto inferiore e introduzione all'elastocompressione

Le ulcere cutanee croniche degli arti inferiori sono causate più frequentemente da condizioni patologiche quali la flebostasi, l'arteriopatia obliterante cronica e la neuropatia prevalentemente di tipo diabetico.

Esistono anche le ulcere miste, legate ad una duplice eziologia, ischemica cronica da arteriopatia legata ad insufficienza venosa.

Meno frequenti le ulcere microvascolari, emopatiche infettive, vasculitiche e neoplastiche.

La complessità eziopatogenetica di tali forme impone la necessità di un preciso bilancio clinico-strumentale volto ad istituire un corretto atteggiamento terapeutico per la risoluzione definitiva del problema.

La pubblicazione da parte del Collegio Italiano di Flebologia delle Linee guida sulla terapia compressiva e la loro successiva revisione nell'ambito della stesura delle LG 2003, ha rappresentato per questo tipo di trattamento un momento di accurata rivalutazione critica. Dalla revisione della letteratura sono emerse poche certezze che potessero essere applicate alla clinica, alcune raccomandazioni forti e molte indicazioni di consenso.

Le certezze:

- Prevenzione TVP in pazienti a moderato rischio
- Prevenzione della sindrome post-trombotica
- Trattamento dell'ulcera venosa.

Dr. Primo Lui

Specialista in Dermatologia, ASL di Mantova

I principi TIME

L'acronimo TIME ha lo scopo di fornire al clinico una guida pratica per ricordare il processo della Wound Bed Preparation, la strategia volta ad accelerare la naturale guarigione delle ferite croniche o a facilitare l'efficacia di eventuali misure terapeutiche. La WBP comporta la gestione del paziente con ulcera cronica secondo un approccio olistico, in cui il trattamento locale della lesione non può prescindere dalla valutazione dello stato di salute globale del paziente. Per accelerare i processi endogeni di riparazione tessutale occorre eliminare le barriere che li ostacolano, oltre che mantenere un corretto equilibrio biochimico all'interno della lesione. Tale obiettivo è raggiungibile esclusivamente attraverso una valida preparazione del letto della ferita. Il TIME permette di concentrarsi sulle tappe patogenetiche fondamentali della lesione cronica e di apportare le misure terapeutiche che servono a convertirne l'ambiente cellulare e molecolare in quello di una ferita avviata alla guarigione. Il TIME consente di scindere tutti i vari aspetti del trattamento della ferita nelle componenti individuali, focalizzando secondo un approccio coordinato tutti gli elementi critici per la guarigione dell'ulcera quali il debridement, il bilancio batterico e la gestione dell'essudato, pur mantenendo una visione globale dell'obiettivo che si intende raggiungere.

Per ricordare come:

- effettuare una revisione sistematica delle caratteristiche visibili della lesione
- decidere gli interventi più opportuni per ottenere un letto della ferita ben preparato
- individuare i risultati che ci si deve aspettare

occorre far riferimento all'acronimo TIME

T- Tessuto necrotico o devitalizzato
La presenza di tessuto devitalizzato ostacola la guarigione: impedisce la valutazione delle dimensioni, della profondità della lesione e delle strutture interessate al processo ulcerativo; è focolaio di infezione, prolunga la fase infiammatoria, ostacola meccanicamente la contrazione e disturba il processo di riepitelizzazione.

I- Infezione o infiammazione
L'infezione ostacola la guarigione della ferita contribuendo alla sua cronicizzazione; la continua presenza di microrganismi virulenti porta a una risposta infiammatoria massiccia e persistente e l'aumento di citochine e di attività proteasica, unito alla ridotta attività dei fattori di crescita, contribuiscono a danneggiare l'organismo ospite.

M- Macerazione o secchezza: squilibrio dei fluidi
La disidratazione cutanea rallenta la migrazione delle cellule epiteliali, mentre l'eccesso di essudato causa la macerazione dei margini della ferita e promuove un ambiente biochimico ostile che blocca l'azione dei fattori di crescita.

E- Epidermide: margini che non progrediscono sul letto della ferita
La mancata risposta agli stimoli dei fattori di crescita condiziona un arresto della proliferazione e della migrazione dei cheratinociti perilesionali, con conseguente mancata chiusura della lesione.

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