

SYMPOSIUM REPORT

Current Reflections of the Vascular Surgeon on the Assessment and Treatment of Critical Limb Ischaemia

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Introduction

The present strategy of vascular surgeons in the diagnosis and treatment of chronic critical limb ischaemia is based not only upon current clinical experience and research, as crystallised in the European Consensus Document,¹ but also upon uncertainties: epidemiological factors, such as the risk profile and natural course of the disease, the prediction of imminent limb death, and the choice of the most suitable treatment.

The Fontaine classification in combination with non-invasive blood pressure measurements, has formed the basis of the definition of critical limb ischaemia, as proposed by the European Consensus, but the solidity of this definition is criticised.^{2,3} Other diagnostic tools are proposed to enhance discrimination of the severity of the disease, including skin microcirculatory investigation,⁴⁻⁶ the assessment of peripheral resistance in crural vessels peroperatively⁷ or by using pulse-generated run-off.^{8,9}

Most of the patients with critical limb ischaemia need treatment for leg salvage, unless a primary amputation appears eligible. Percutaneous catheter and surgical interventions become increasingly aggressive, and the site of the bypass anastomosis reaches more and more distally,¹⁰⁻¹² while amputation of the limb is associated with a lower survival and quality of life.¹³ Thus, more effort is to be dedicated to obtain information about the arterial outflow situation. For this purpose, not only are Duplex ultrasound

scanning and digital subtraction angiography used to visualise the proximal vessels, selective angiographical visualisation of the crural arteries and plantar arch is also necessary^{14,15} to assess whether or not the patient is operable, because should a distal tibial or foot artery be patent and an adequate autogenous vein available, distal arterial reconstruction can be performed with a high degree of success.¹⁶

When a patient is regarded as inoperable or surgical treatment has failed, which may amount in up to one-third of the patients having undergone vascular reconstruction,¹ non-surgical procedures, e.g. pharmacotherapy^{17,18} or spinal cord stimulation (SCS)^{19,20} may be useful as an adjunctive or last-resort therapy. In spite of several publications reporting positive results, SCS is still a controversial therapy, mainly due to the absence of prospectively randomised trials. Jivegard *et al.*²¹ are the first to publish a prospective randomised study.²¹ At 18 months follow-up, limb salvage rates in the SCS and control groups were 62% and 45%, respectively. This indicative difference was not statistically significant, mainly due to the limited number of patients. The ongoing Dutch multi-centre randomised trial²² is awaited for further knowledge as to the clinical impact and pathophysiological microcirculatory effects.

Drawing up an inventory of the strategies applied and problems encountered by vascular surgeons may be useful to assess the general thought about critical leg ischaemia and the practical applicability of certain methods of diagnosis and therapy. In this paper an overview is presented of the results of the computer-interactive voting session held during the Satellite Symposium 'Spinal cord stimulation in critical limb

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ischaemia' at the VIIth Annual Meeting of the ESVS in Barcelona, 22 September, 1993, in which the opinions of 158 specialists in the field of vascular pathology concerning their personal experience, diagnostic and therapeutic approaches were gathered and combined. Thus, an attempt was made to assess the present strategy of the vascular specialist as to critical limb ischaemia.

The symposium on SCS in non-reconstructable critical limb ischaemia was attended by 400 specialists. A computer-interactive voting system was installed in the lecture hall and 158 voting pads were connected to the computer. Each pad had five buttons. Five papers were presented, discussing the subject of critical limb ischaemia, including the results of bypass surgery and SCS. Following the presentations 23 multiple-choice questions were asked with five possible answers involving personal experience, diagnostic techniques, surgical procedures and non-surgical approaches. By means of a computer-interactive voting system the answers of 158 randomly chosen attendees were collected. Some questions were cross-linked with others, providing additive information. The results of the interactive voting were expressed in percentages and bars.

Results

The majority of those present were vascular surgeons (82%) and general surgeons with special interest in vascular surgery (14%). Only 4% were angiologists. The geographical distribution of the audience is shown in Fig. 1. Of the total, 77% were surgeons with more than 5 years of experience, 48% of them more than 10 years.

The criteria of critical limb ischaemia according to

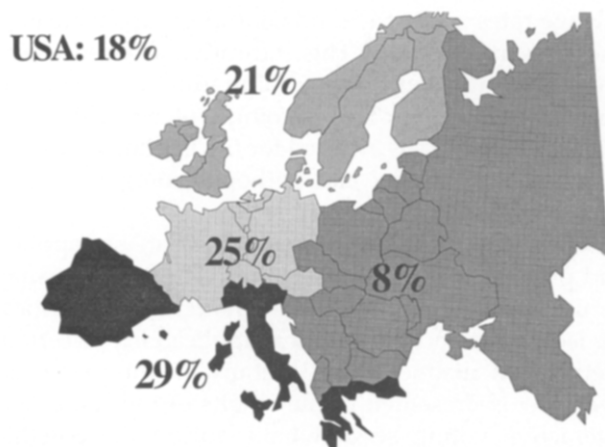


Fig. 1. Geographical distribution of the vascular surgeons present.

Table 1. Frequency (%) of the criteria chosen to define critical limb ischaemia. The question asked was: 'The European Consensus on critical limb ischaemia defines critical ischaemia as: ankle pressure < 50mmHg or toe pressure < 30mmHg. Which would you choose?'

Ankle systolic pressure < 50mmHg	55%
Ankle systolic pressure < 70mmHg	4%
Toe systolic pressure < 30mmHg	28%
Toe systolic pressure < 50mmHg	1%
Microcirculatory parameters	12%

the European Consensus¹ appears to be well-accepted (Table 1): 83% agreed on either an ankle pressure of < 50 mmHg or a toe pressure of < 30 mmHg. Only 4% voted for an ankle pressure borderline of 70 mmHg and 12% would prefer to add microcirculatory parameters. Angiography is currently performed using either conventional selective angiography (31%) or intra-arterial DSA (62%). Translumbar aortography and intravenous DSA are rarely used. Regarding the preoperative non-invasive work-up in patients with critical leg ischaemia, 22% of the surgeons perform toe systolic blood pressure measurements in addition to ankle pressure measurements. Twenty-three per cent use Duplex ultrasonography to investigate the aortoiliac segment, 9% apply transcutaneous oximetry, and 8% measure the pulse-generated run-off. However, most surgeons (38%) only perform ankle pressure measurements as a preoperative work-up.

The yearly numbers of arterial reconstructions performed by the surgeons' teams are shown in Fig. 2: more than 80% of the teams perform more than 100 reconstructions per year. The individual annual score for infrapopliteal bypasses ranged from zero to more than 50, the majority (65%) being 10–50 a year. The final decision with regard to the treatment of critical ischaemia is taken by either the vascular surgeon himself (90%) or the vascular surgeon in the multi-disciplinary group (10%).

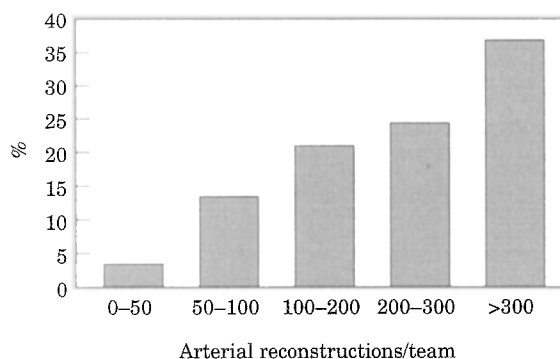


Fig. 2. Frequency histogram of the annual number of arterial reconstructions performed per surgical team.

Table 2. Frequency (%) of current solutions for artificial distal grafting. The question was: 'What do you do if you have to use an artificial graft (absence of vein) and you find a considerable mismatch with the recipient crural artery?'

End-to-side anastomosis	28%
Adjunctive arteriovenous fistula	6%
Miller cuff	41%
Linton patch	18%
No surgery	7%

Table 3. Frequency (%) of current solutions when only one crural artery, but no saphenous vein is available. The question was: 'Imagine you consider the patient "reconstructable". You have only one outflow crural artery but no vein available. What do you do?'

Arm vein	36%
PTFE graft	25%
PTFE graft + adjunctive procedure	19%
Vein allograft	13%
No surgery	7%

Table 4. Frequency (%) of the reasons for abstaining from reconstruction in patients with occluded superficial femoral and popliteal artery. The question was: 'When do you consider a patient with critical limb ischaemia and an occluded SFA and popliteal artery "non-reconstructable"?'

Only one patent crural outflow artery	6%
Occlusion of all crural arteries, but patent foot artery	15%
One patent crural artery, but absence of vein	9%
One patent pedal artery, but absence of vein	31%
Not without exploration of the vessel(s)	39%

The most distal bypass performed by the surgeons present was distal crural in 33% and pedal in 45%. By cross-linking these results with the surgeons' experience, the distal grafts were applied by all surgeons, irrespective of their duration of practice, illustrating the aggressive policy of surgeons in general. In 99% the first choice of the conduit for an infrapopliteal bypass was autologous vein: 47% reversed and 52% *in situ*. In patients in whom a vein is absent and an artificial graft is needed, facing a considerable diameter mismatch with the recipient crural artery, a variety of solutions is chosen (Table 2): almost 70% of the surgeons would choose an adjunctive procedure, of which the Miller cuff²³ was the most popular. In patients who are elected for arterial reconstruction, but have only one crural outflow artery and no saphenous vein, the alternatives are listed in Table 3. The majority of the surgeons would search for an arm vein, a PTFE graft or a PTFE graft with an adjunctive procedure. A small percentage would refrain from surgery.

When is a patient with an occluded superficial femoral and popliteal artery regarded as non-reconstructable? The general opinion obtained is shown in Table 4. Occlusion of the crural arteries means "non-reconstructable" to 15% of the surgeons. When no

suitable vein is available, 40% of the surgeons abstain from reconstruction. Thirty-nine per cent of the surgeons will consider the patient reconstructable until the exploration of the crural and pedal vessels, indicating their zeal to perform an arterial reconstruction.

During the session two angiograms were shown (Figs. 3, 4). The first shows contrast in the proximal calf, but without further outflow. When asked what kind of action the surgeons would take, the majority

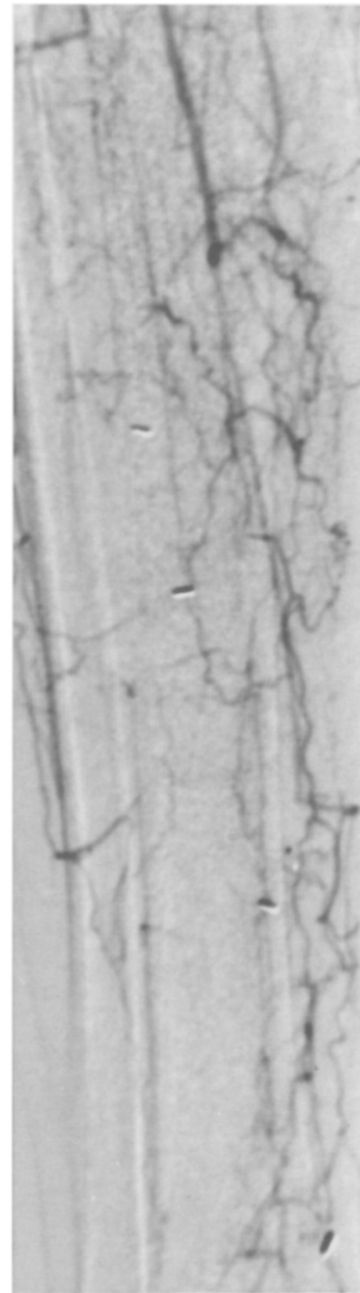


Fig. 3. Angiogram of the calf arteries.

said they would ask for a new and better angiogram before taking any decision. The second angiogram visualised clearly a pedal arch and distal outflow and the audience was asked whether they obtained comparable results: 39% of the vascular surgeons stated they obtained similar angiograms, 47% a lower quality of X-ray.

If a patient with critical limb ischaemia is considered non-reconstructable, the treatments of choice besides analgesics are listed in Table 5. By cross-linking these results with the surgeons' geographical distribution, sympathectomy apparently is equally popular, but SCS is mainly performed in southern Europe (Fig. 5). Current experience with SCS is presented in Table 6, which shows that at least 48% have had some experience with SCS. After the symposium 22% of those present had become more sceptical about SCS. Twenty-five per cent of them had not changed their opinion. By contrast, 53% of the surgeons were more interested in SCS or would like to join a prospective study or would like to have more information. It has to be emphasised that all speakers presented their SCS experience in a rather self-critical approach, which possibly explained why 22% of the surgeons were more sceptical about SCS following the presentations.

Reimbursement of SCS implantation is a problem in Europe: in 35% of the centres it is not reimbursed, most commonly in Northern and Western Europe. If the stimulator system is reimbursed, the money comes from the hospital budget (25%), national health care

programme (15%) or private insurance (5%). In 20% of the centres the system is reimbursed in all patients.

The indications proposed for SCS besides non-reconstructable rest pain and/or necrosis were Buerger's disease (47%), reconstructable critical limb ischaemia (18%), and intermittent claudication (2%). One-third of those present saw no other indication.

Discussion

Although the voting procedure was performed only by a subgroup of the specialists present during the symposium, there is little reason to believe that this would have caused any bias in the results due to different specialisations, since the vast majority of the participants were vascular surgeons, whose opinions were desired. There was no bias in geographical background. The audience consisted mainly of experienced vascular surgeons, who performed a high number of arterial reconstructions per team per year. This suggests a valuable amount of experience with critical limb ischaemia, in particular because more than 90% of the surgeons were responsible for the final decision as to the treatment of critical ischaemia. However, the audience was a selected one in that they were present at a scientific meeting, which may imply that they have come from university-affiliated or research-based centres in which more facilities are available for specialised surgery, as opposed to surgeons working in non-academic or less-specialised

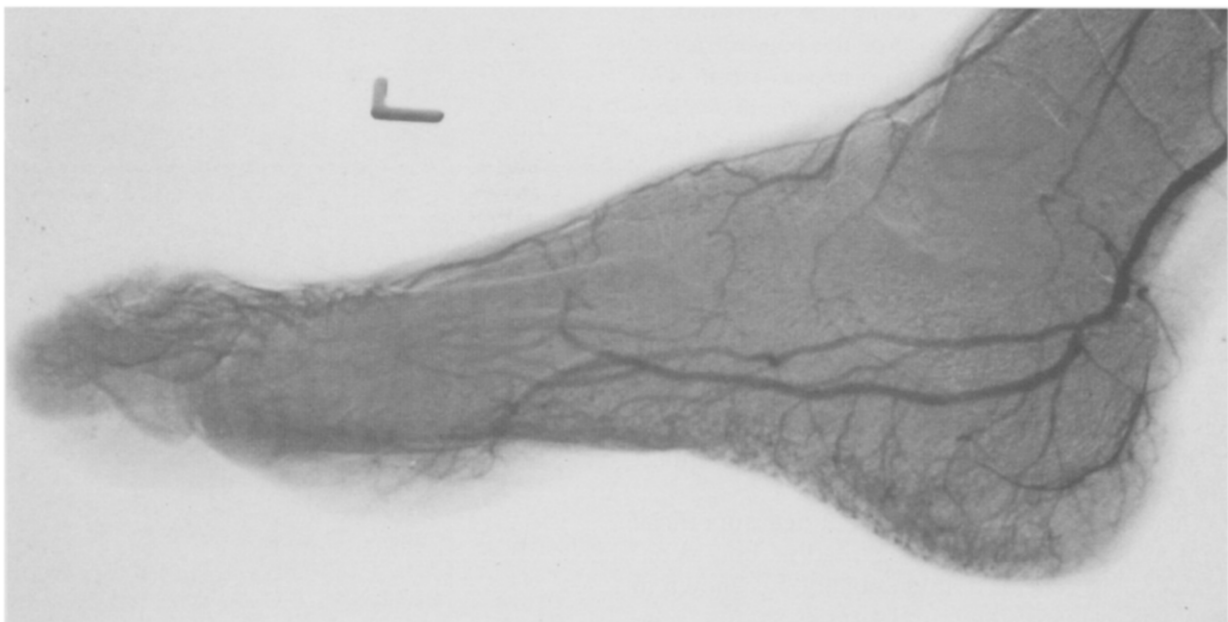


Fig. 4. Angiogram of the foot arteries.

Table 5. Frequency (%) of treatment alternatives of non-reconstructable critical limb ischaemia. The question was: 'If your patient is "non-reconstructable", what is your treatment of choice?'

Primary amputation	16%
Lumbar sympathectomy	24%
Vaso-active drugs	22%
Analgesics only	12%
Spinal cord stimulation	26%

hospitals. It can therefore be assumed that the audience represented a proper sample for assessing present strategies regarding non-reconstructability. Surgeons using SCS, however, might have been overrepresented, because of their interest in this subject, although more than 50% of the audience did not have experience with SCS.

A vast majority (83%) agreed with the European consensus concerning the blood pressure cut-off values in the definition of critical limb ischaemia. However, additive investigation, such as toe blood pressure and microcirculatory parameters, are frequently appreciated. This, combined with the aggressive diagnostic (pedal angiogram, exploration of distal vessels before a patient is found non-reconstructable) and surgical (femoropedal bypass) attitude illustrates the surgeon's urge to save the patients' ischaemic limbs. It might be accentuated that the number of surgeons performing crural (33%) and pedal (45%) grafts as their most distal bypass was surprisingly high.

If a patient is found non-reconstructable, various alternative forms of therapy are in use, of which SCS is most frequently applied, despite the fact that the system is not paid for by most hospitals or countries. Again, we emphasise that the audience may have been overrepresented by vascular surgeons with special interest in SCS. Results of ongoing studies of the effects of SCS will hopefully smooth the reimbursement procedures.

The key issue is when to consider a patient non-

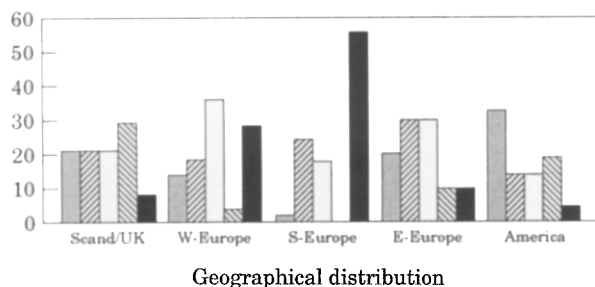


Fig. 5. Cross-link between the therapy for non-reconstructable critical limb ischaemia preferred by the surgeon and geographical location. (□) amputation, (▨) sympathectomy, (▤) vaso-active drugs, (■) SCS.

Table 6. Frequency (%) of experience with spinal cord stimulation. Question: 'What was your experience with SCS before this symposium?'

Never heard of it	3%
No experience	18%
No experience and sceptical	31%
Limited experience	26%
Extensive experience	22%

reconstructable. Apart from absence of vein, the decision mainly depends on the presence of a crural or pedal vessel. It is therefore mandatory that selective angiograms visualising crural and pedal vessels are available to evaluate whether a patient's vasculature is truly unreconstructable. The fact that a considerable number of surgeons did not get optimal angiograms underlines the further need for this optimal assessment in the decision of how to treat the patient with critical limb ischaemia.

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