

EVOLUZIONE DELLA RIVASCOLARIZZAZIONE CHIRURGICA NELL' ARTERIOPATIA PERIFERICA

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Trieste

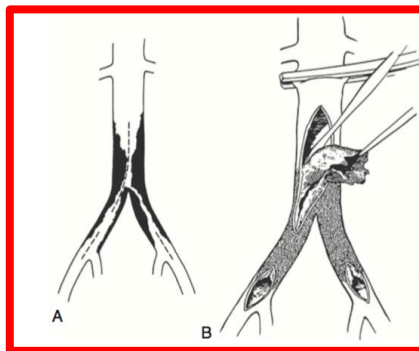




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Introduzione



Anni '50/'60: l'EA diventa gradualmente la terapia standard per le occlusioni aorto iliache

Anni '70/'80: il bypass aorto-bifemorale diventa il gold-standard per la patologia ostruttiva aorto-iliaca

1996-2000: aumento dell'850% dell'utilizzo delle procedure endovascolari per la patologia ostruttiva aorto-iliaca, con una consensuale riduzione della chirurgia open ricostruttiva.



Treatment Guidelines According to Anatomic Disease Classification

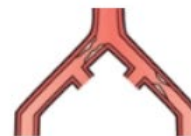
Trans-Atlantic Inter-Society Consensus Classification (TASC II)

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- For **TASC type B and C lesions**, the authors concluded that there was insufficient evidence to definitively recommend one modality over the other
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- *L Norgren, WR Hiatt, JA Dormandy, et al.: TASC II Working Group. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II). J Vasc Surg. 45 (supplS):S47-S53 2007*

Endovascolare

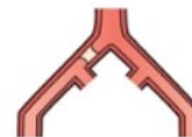
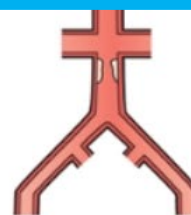
TYPE A LESIONS

- Unilateral or bilateral stenoses of CIA
- Unilateral or bilateral single short (≤ 3 cm) stenosis of EIA



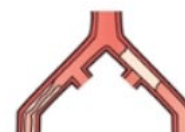
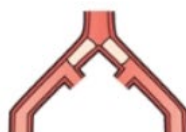
TYPE B LESIONS

- Short (≤ 3 cm) stenosis of infrarenal aorta
- Unilateral CIA occlusion
- Single or multiple stenoses totaling 3-10 cm involving the EIA not extending into the CFA
- Unilateral EIA occlusion not involving the origins of internal iliac or CFA



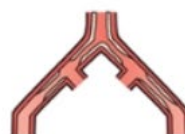
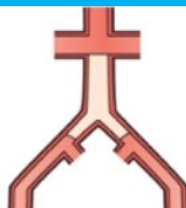
TYPE C LESIONS

- Bilateral CIA occlusions
- Bilateral EIA stenoses 3-10 cm long not extending into the CFA
- Unilateral EIA stenosis extending into the CFA
- Unilateral EIA occlusion that involves the origins of internal iliac and/or CFA
- Heavily calcified unilateral EIA occlusion with or without involvement of origins of internal iliac and/or CFA



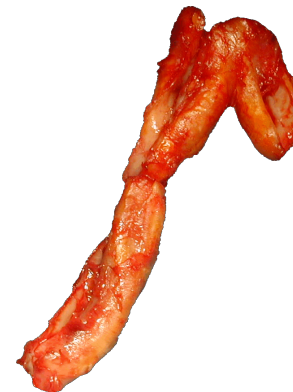
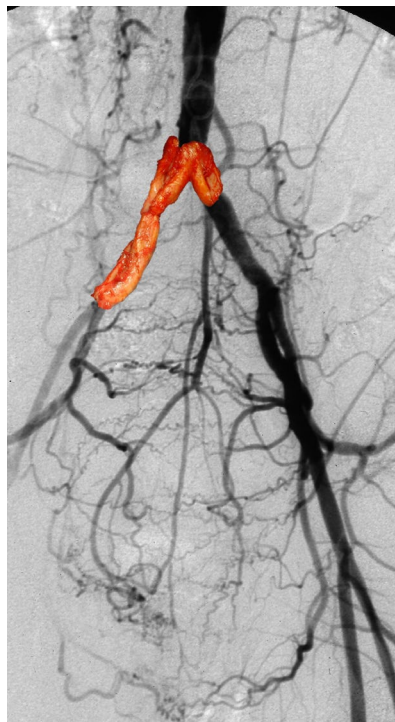
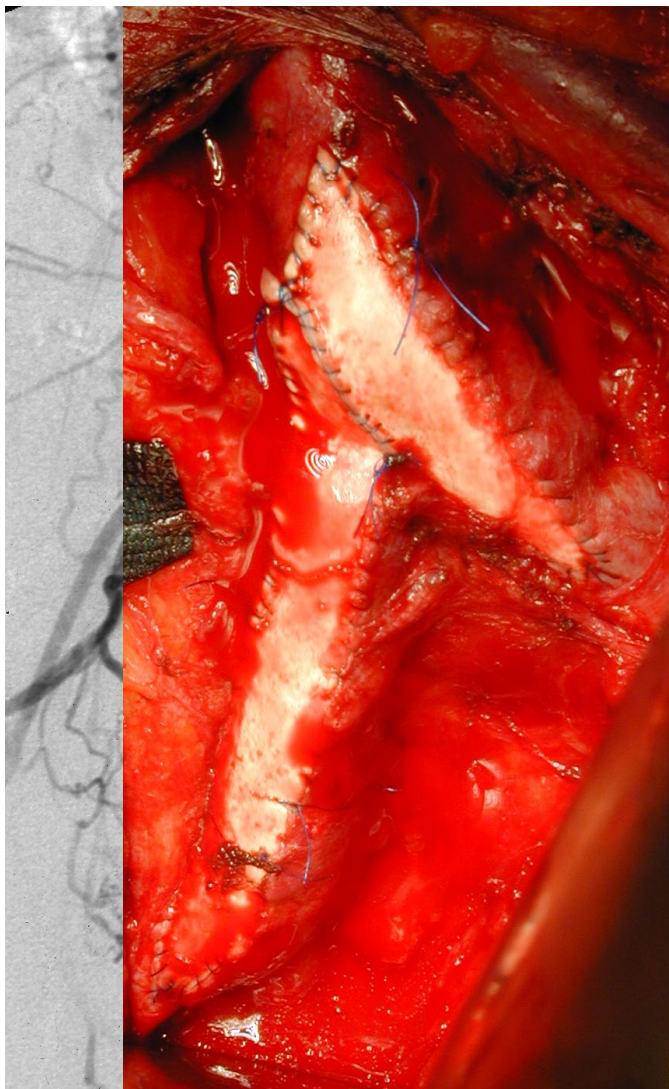
TYPE D LESIONS

- Infrarenal aortoiliac occlusion
- Diffuse disease involving the aorta and both iliac arteries requiring treatment
- Diffuse multiple stenoses involving the unilateral CIA, EIA, and CFA
- Unilateral occlusions of both CIA and EIA
- Bilateral occlusions of EIA
- Iliac stenoses in patients with AAA requiring treatment and not amenable to endograft placement or other lesions requiring open aortic or iliac surgery

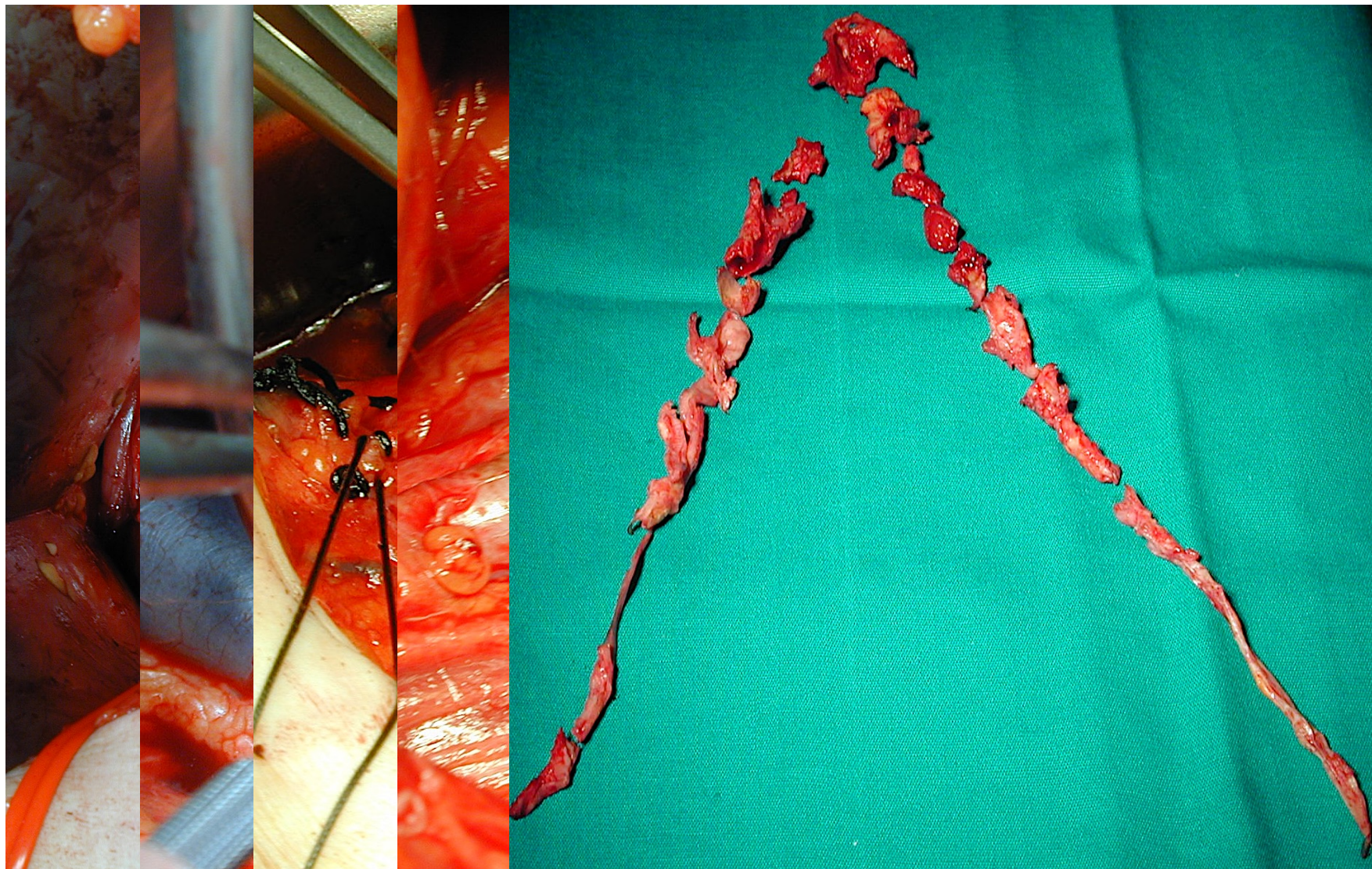


Chirurgia
Tradizionale

Endoarteriectomia iliaca



Endoarteriectomia aorto iliaca





OCCLUSIONE AORTO-ILIACA

Whereas percutaneous treatment of the aorta and iliac arteries was previously limited to short-segment, TransAtlantic Inter-Society Consensus (TASC) type A or B iliac lesions, it is now routinely applied to even long-segment (TASC type D) occlusions extending the length of the iliac arteries. **In no other vascular territory has the shift from open surgery to interventional treatment been more apparent than in the AI segment.**

Most patterns of AI disease may be successfully treated using an **endovascular** approach, frequently employing bare-metal or covered stents. **Surgery** is often reserved for extensive occlusions or after failure of endovascular procedures.

- Jongkind V, Akkersdijk GJ, Yeung KK, Wisselink W. A systematic review of endovascular treatment of extensive aortoiliac occlusive disease. *J Vasc Surg* 2010;52:1376e83.
- Ye W, Liu CW, Ricco JB, Mani K, Zeng R, Jiang J. Early and late outcomes of percutaneous treatment of TransAtlantic Inter-Society Consensus class C and D aorto-iliac lesions. *J Vasc Surg* 2011;53:1728e37.
- Deloose K, Bosiers M, Callaert J, Verbist J, Vermassen F, Scheinert D, et al. Primary stenting is nowadays the gold standard treatment for TASC II A & B iliac lesions: the definitive MISAGO 1-year results. *J Cardiovasc Surg (Torino)* 2017;58:416e21.

The Global Limb Anatomic Staging System (GLASS)

Table 5.2. Aorto-iliac (inflow) disease staging in GLASS

I Stenosis of the common and/or external iliac artery, chronic total occlusion of either common or external iliac artery (not both), stenosis of the infrarenal aorta; any combination of these

II Chronic total occlusion of the aorta; chronic total occlusion of common and external iliac arteries; severe diffuse disease and/or small-caliber (<6 mm) common and external iliac arteries; concomitant aneurysm disease; severe diffuse in-stent restenosis in the AI system

Modifiers: A, no significant CFA disease; B, significant CFA disease (>50% stenosis)

AI = Aortoiliac; CFA = common femoral artery.

A simplified staging system for inflow (AI and CFA) disease is suggested. Hemodynamically significant disease (>50% stenosis) of the CFA is considered a key modifier (A/B).



OCCLUSIONE AORTO-ILIACA

Use an endovascular-first approach for treatment of CLTI patients with moderate to severe (eg, GLASS stage IA) aorto-iliac (AI) disease, depending on the history of prior intervention.

Consider surgical reconstruction for the treatment of average-risk CLTI patients with extensive (eg, GLASS stage II) AI disease or after failed endovascular intervention.

1 (Strong)

B (Moderate)

Jongkind,⁸² 2010
Ye,⁸³ 2011
Deloose,⁸⁴ 2017

2 (Weak)

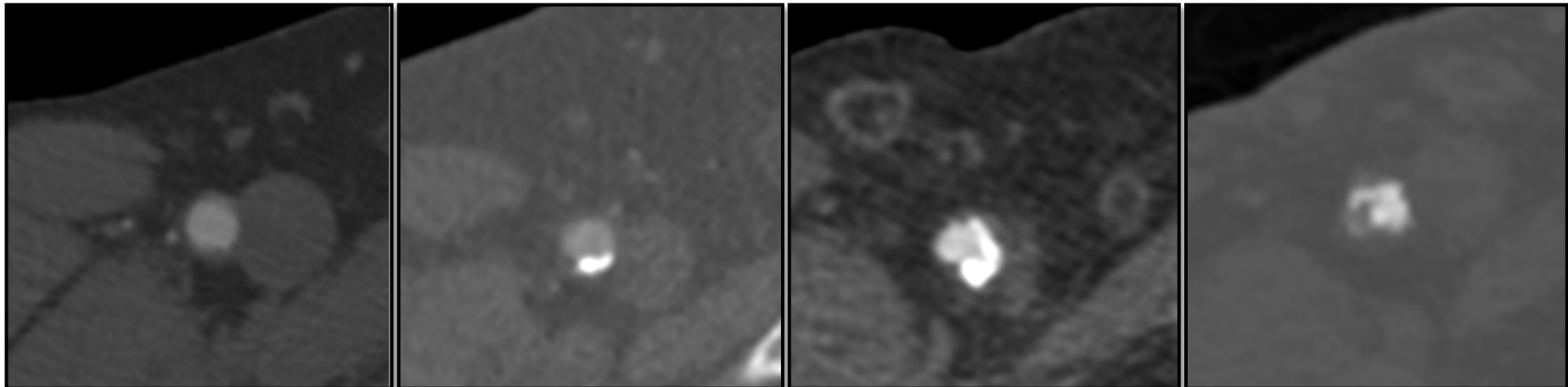
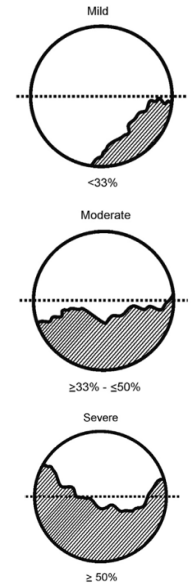
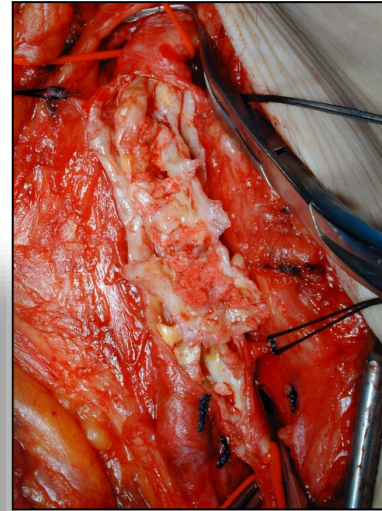
C (Low)

Ricco,⁸⁵ 2008
Chiu,⁸⁶ 2010
Indes,⁸⁷ 2013

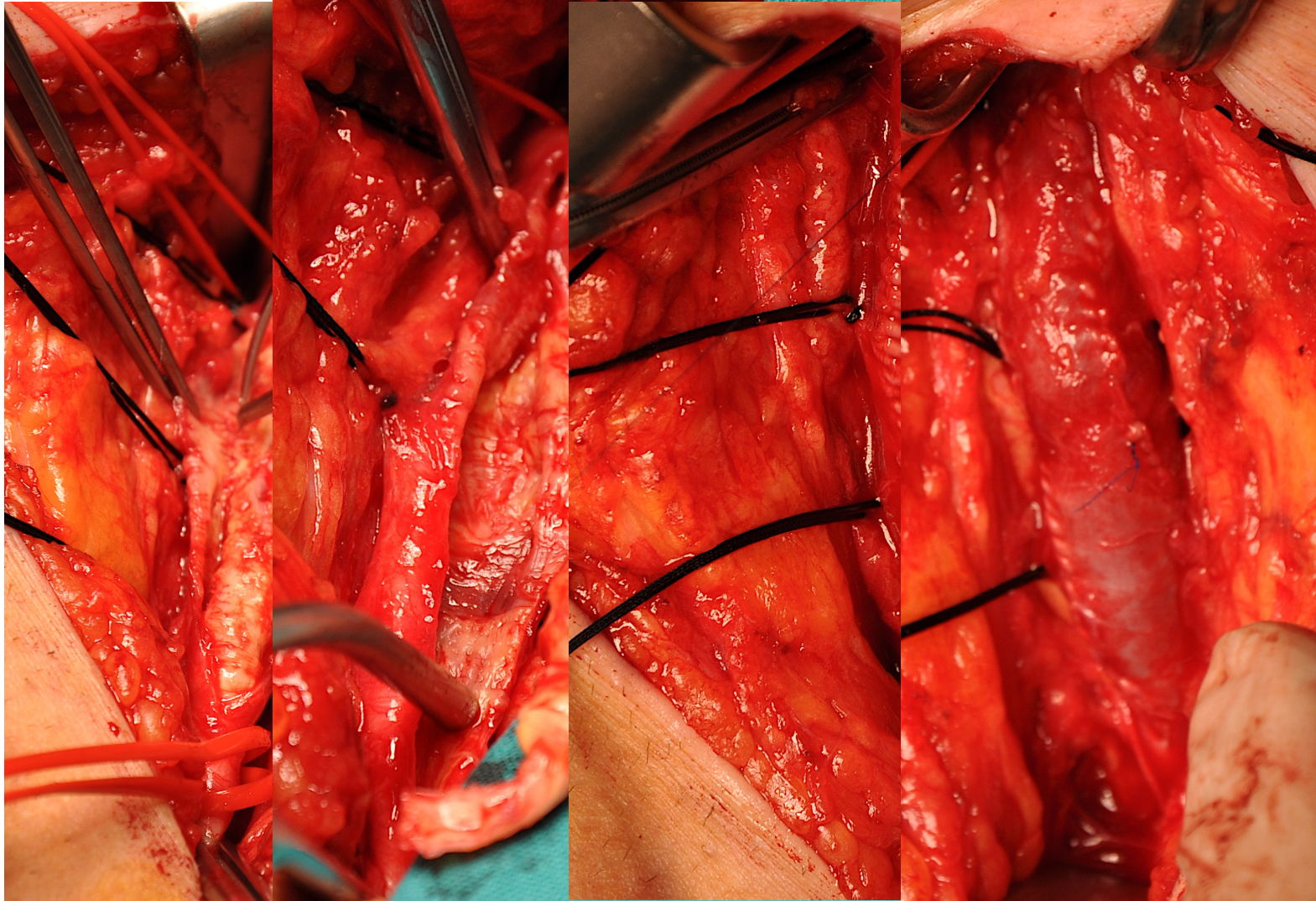


6.27 Perform open CFA endarterectomy with patch angioplasty, with or without extension into the PFA, in CLTI patients with hemodynamically significant ($>50\%$ stenosis) disease of the common and deep femoral arteries.

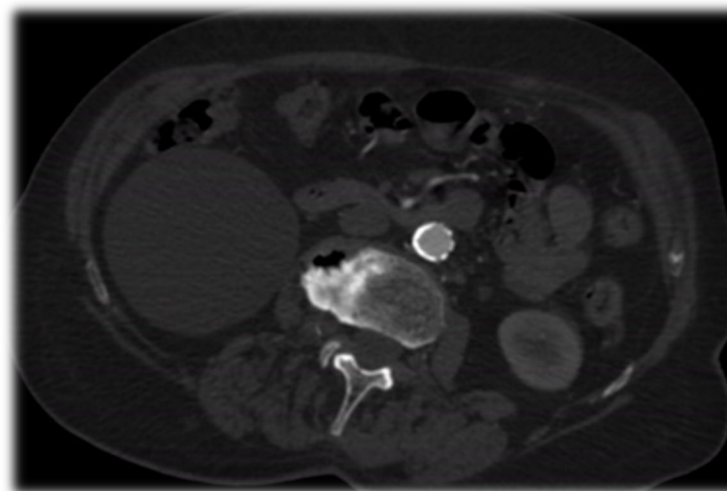
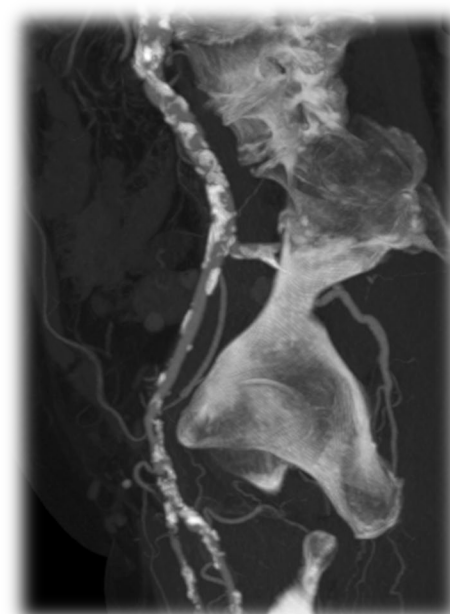
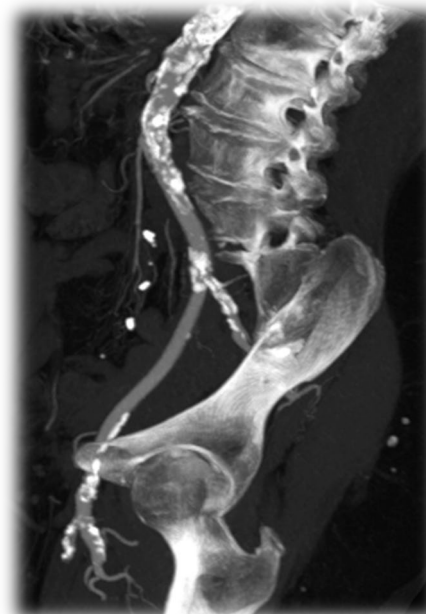
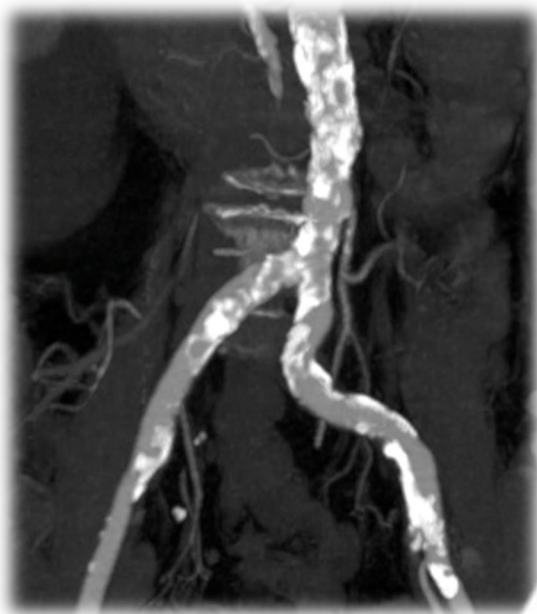
Grade	Level of evidence	Key references
1 (Strong)	C (Low)	Kang, ⁸⁸ 2008 Ballotta, ⁸⁹ 2010



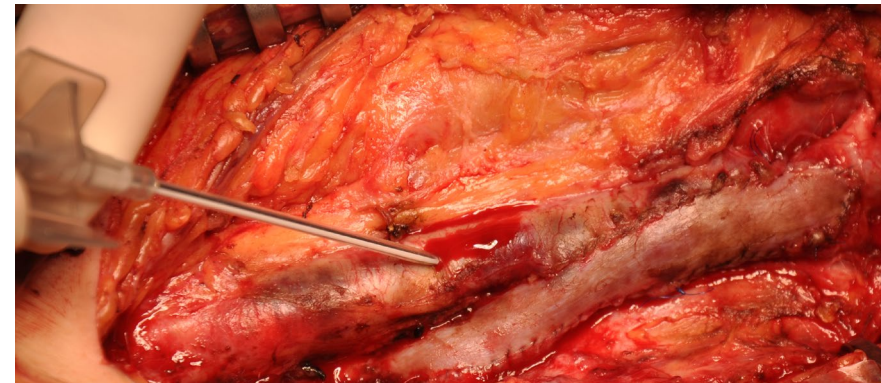
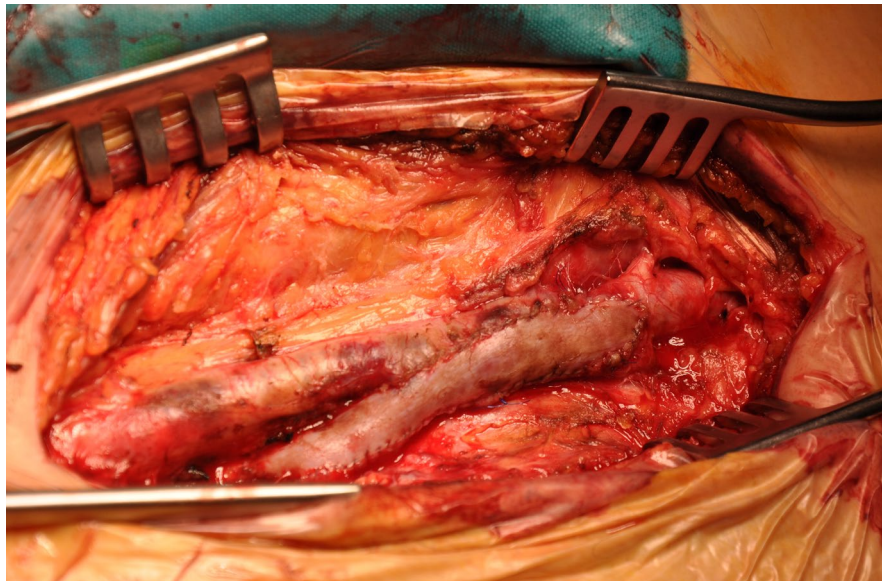
Endoarteriectomia femorale



MALATTIA ILIACO FEMORALE

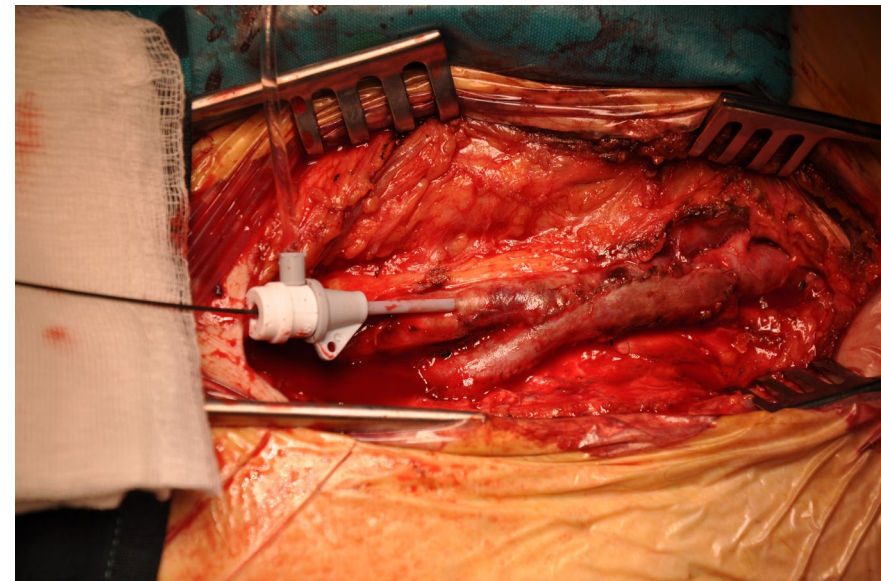


Endoarteriectomia femorale

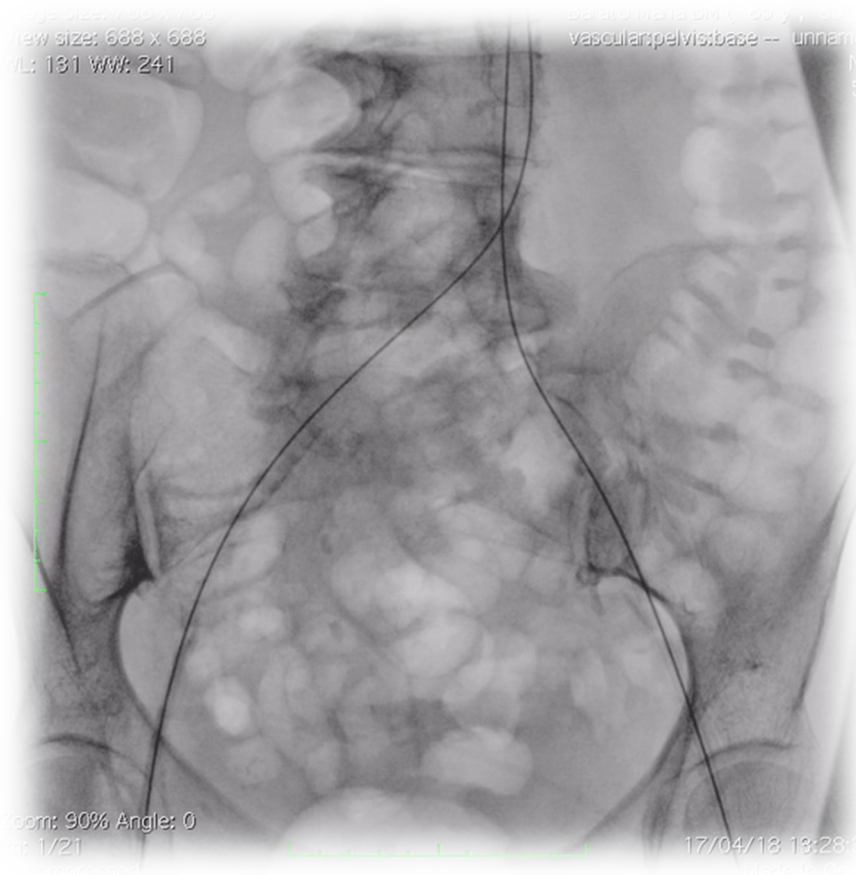


Approccio ibrido:

1^o step Endoarteriectomia femorale comune
+ patch in VGS/pericardio bovino



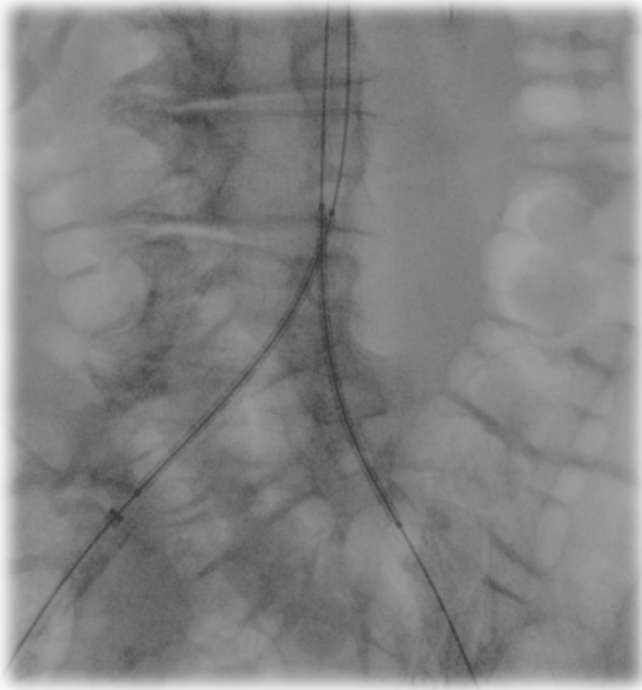
KISSING STENT

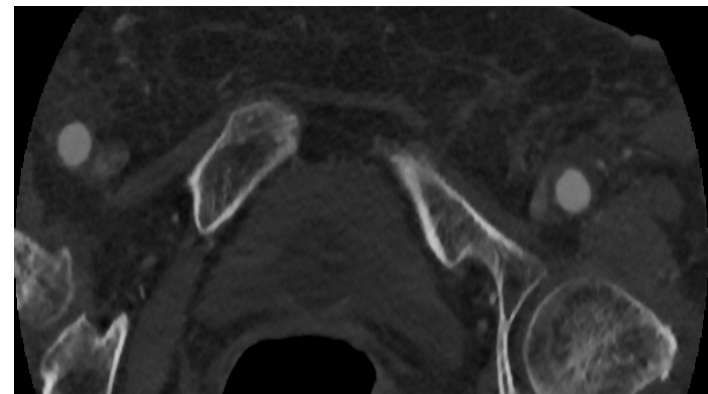
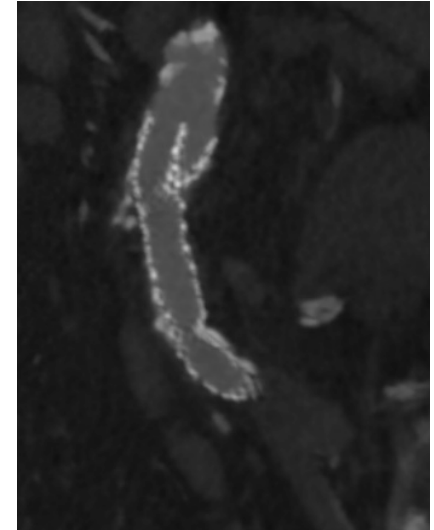
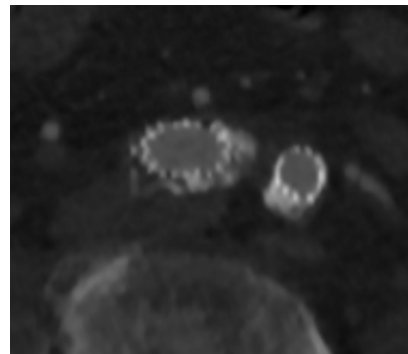
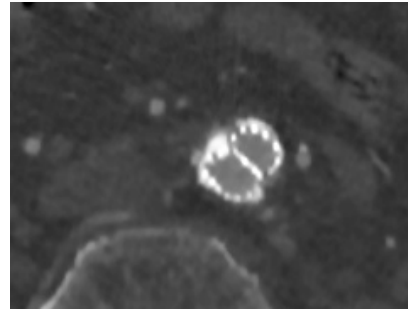
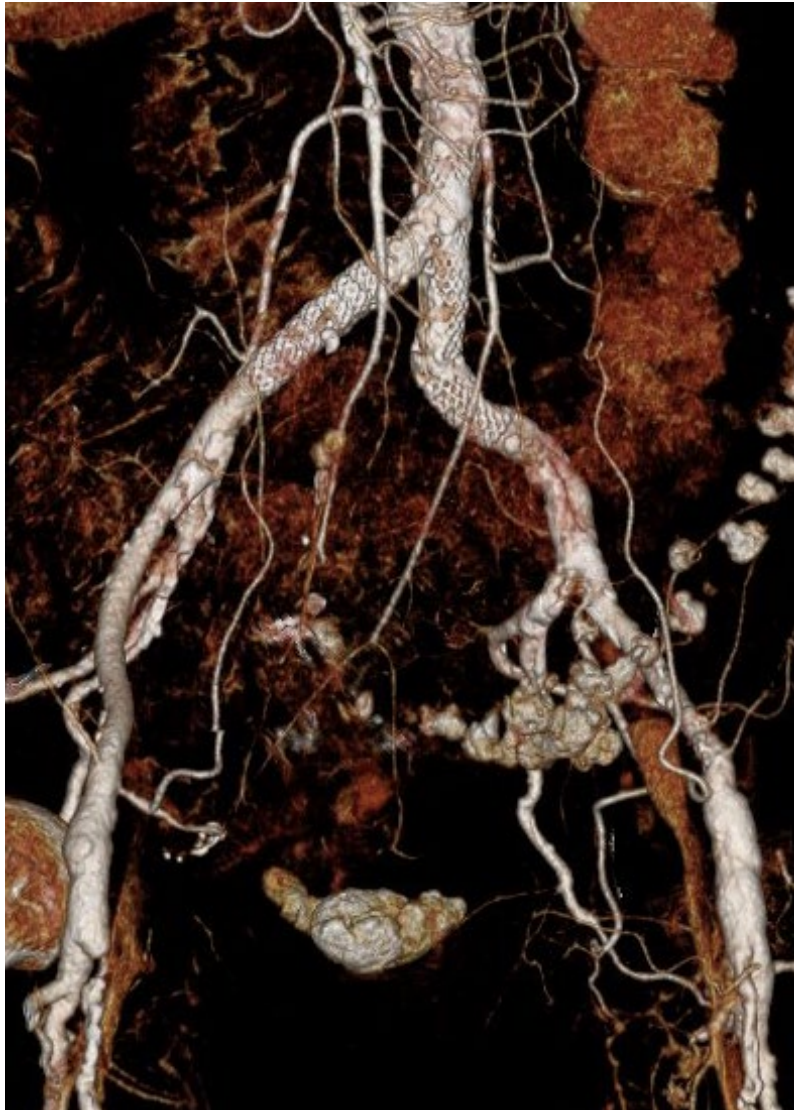


Approccio ibrido:

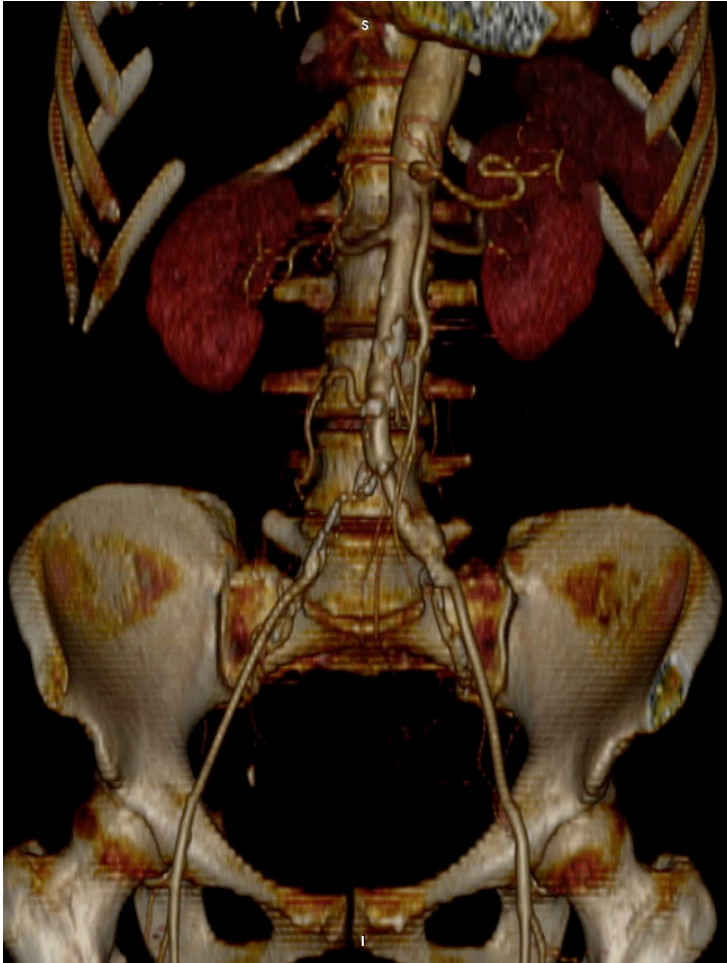
2^o step Ricostruzione del carrefour aortico mediante VBX

KISSING STENT

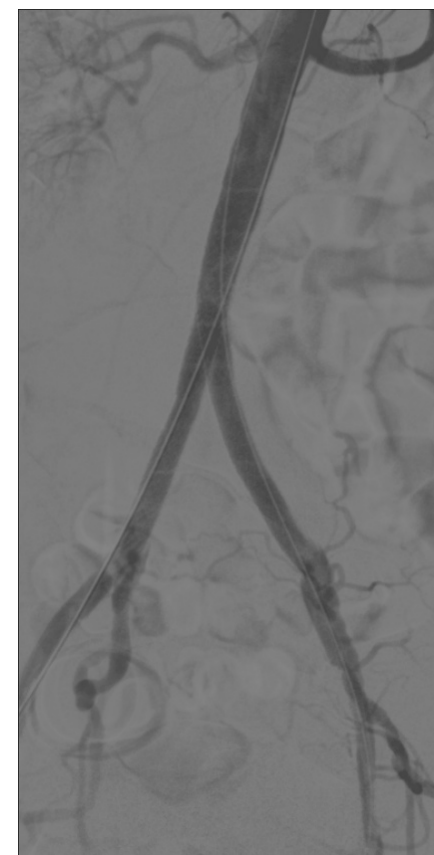
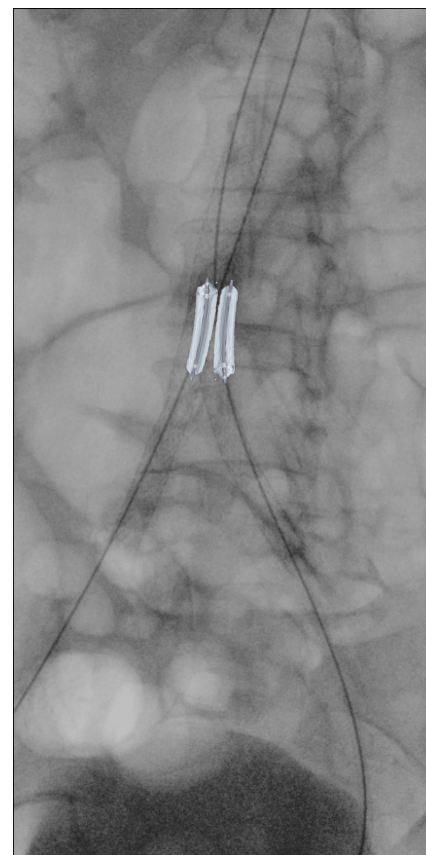
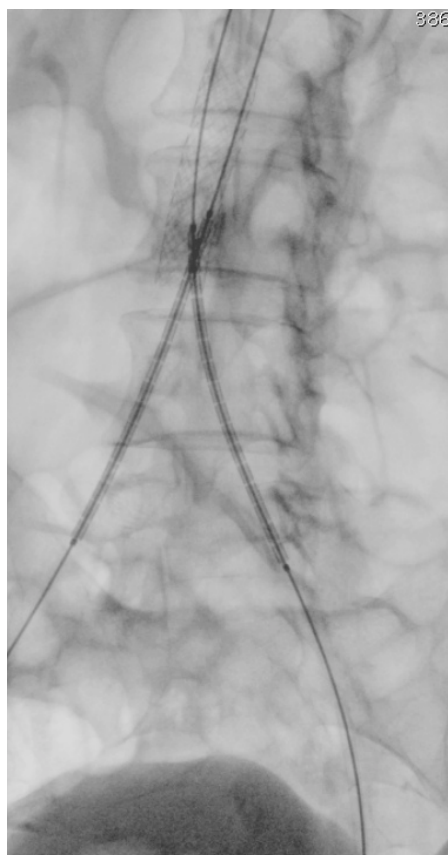




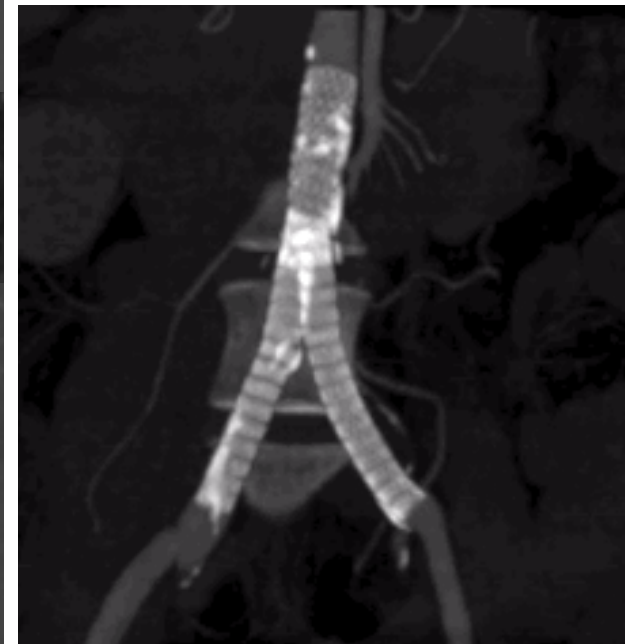
CERAB



CERAB



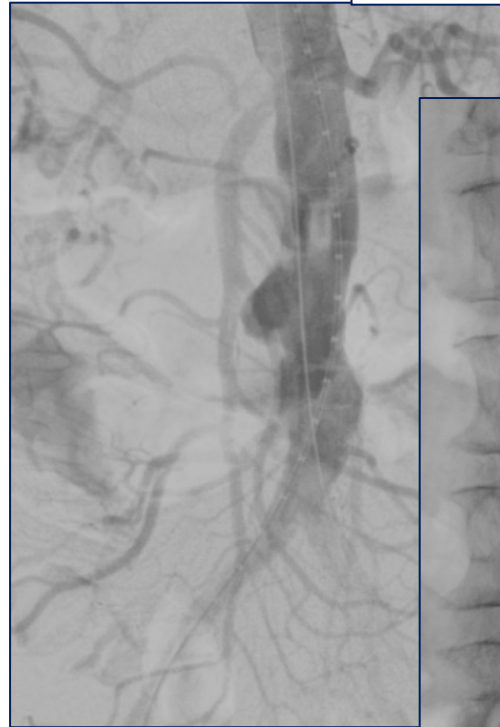
CERAB



**Results of AFX Unibody Stent-Graft
Implantation in Patients With TASC
D Aortoiliac Lesions and Coexistent
Abdominal Aortic Aneurysms**

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Chiara Pranteda, MD¹, Nunzio Montelione, MD^{1,2}, and Francesco Speziale, MD¹



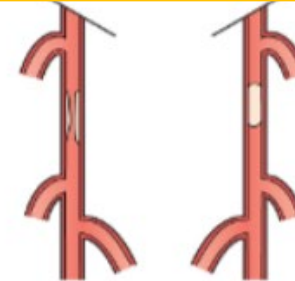
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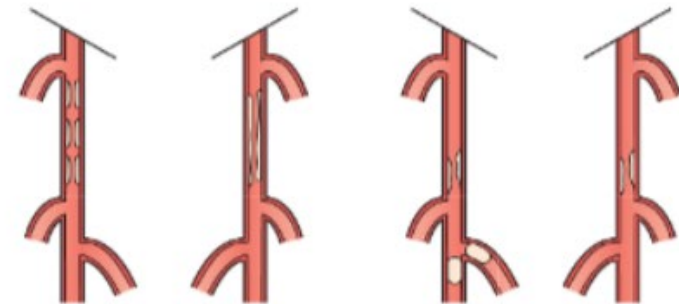
TYPE A LESIONS

- Single stenosis ≤ 10 cm in length
- Single occlusion ≤ 5 cm in length



TYPE B LESIONS

- Multiple lesions (stenoses or occlusions), each ≤ 5 cm
- Single stenosis or occlusion ≤ 15 cm not involving the infrageniculate popliteal artery
- Single or multiple lesions in the absence of continuous tibial vessels to improve inflow for a distal bypass
- Heavily calcified occlusion ≤ 5 cm in length
- Single popliteal stenosis



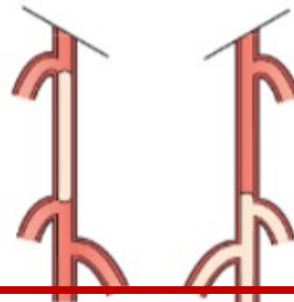
TYPE C LESIONS

- Multiple stenoses or occlusions totaling >15 cm with or without heavy calcification
- Recurrent stenoses or occlusions that need treatment after two endovascular interventions



TYPE D LESIONS

- Chronic total occlusions of CFA or SFA (>20 cm, involving the popliteal artery)
- Chronic total occlusion of popliteal artery and proximal trifurcation vessels





What do the Last Guidelines say?



The Global Limb Anatomic Staging System (GLASS)



Conte MS¹, Bradbury AW², Kolh P³, White JV⁴, Dick F⁵, Fitridge R⁶, Mills JL⁷, Ricco JB⁸, Suresh KR⁹, Murad MH¹⁰; GVG Writing Group. Global vascular guidelines on the management of chronic limb-threatening ischemia. J Vasc Surg. 2019 Jun;69(6S):3S-125S.e40. doi: 10.1016/j.jvs.2019.02.016. Epub 2019 May 28.

VALUTAZIONE DEL RISCHIO OPERATORIO

An **average-risk** patient is defined as one in whom the anticipated periprocedural mortality is $<5\%$ and the anticipated 2-year survival is $>50\%$ (Recommendation 6.4). These patients are potential surgical or endovascular candidates, depending on individual clinical and anatomic factors.

A **high-risk** patient is defined as one in whom the anticipated perioperative mortality is $>5\%$ or the anticipated 2-year survival is $<50\%$. Because endovascular intervention can be performed with reduced morbidity, it may often be preferred in high-risk patients who are otherwise candidates for functional limb salvage.



Patient with CLTI,
candidate for
revascularization

Obtain high quality
**angiographic
imaging** including
ankle and foot

Define the target
artery path (**TAP**)

Conte MS¹, Bradbury AW², Kolh P³, White JV⁴, Dick F⁵, Fitridge R⁶, Mills JL⁷, Ricco JB⁸, Suresh KR⁹, Murad MH¹⁰; GVG Writing Group, Global vascular guidelines on the management of chronic limb-threatening ischemia. J Vasc Surg. 2019 Jun;69(6S):3S-125S.e40. doi: 10.1016/j.jvs.2019.02.016. Epub 2019 May 28.



Grade the femoropopliteal (FP) segment

Grade the infrapopliteal (IP) segment

Conte MS¹, Bradbury AW², Kolh P³, White JV⁴, Dick F⁵, Fitridge R⁶, Mills JL⁷, Ricco JB⁸, Suresh KR⁹, Murad MH¹⁰; GVG Writing Group, Global vascular guidelines on the management of chronic limb-threatening ischemia. J Vasc Surg. 2019 Jun;69(6S):3S-125S.e40. doi: 10.1016/j.jvs.2019.02.016. Epub 2019 May 28.

Femoropopliteal disease grading

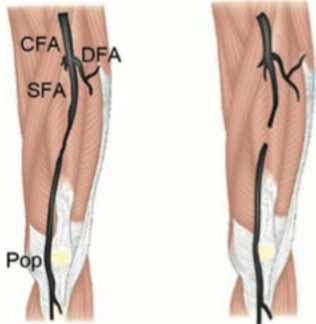
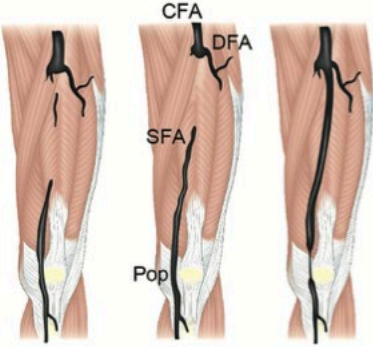
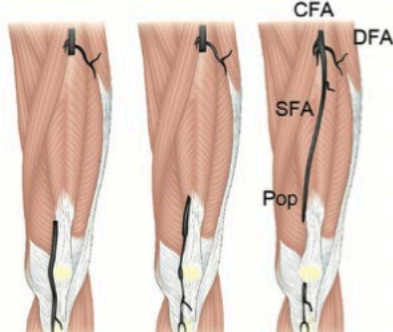
FP Grade 0	Mild or no significant (<50%) disease		
FP Grade 1	- Total length SFA disease <1/3 (<10 cm) - May include single focal CTO (< 5 cm) as long as not flush occlusion - Popliteal artery with mild or no significant disease		FP Grade 3 - Total length SFA disease >2/3 (>20 cm) length - May include any flush occlusion <20 cm or non-flush CTO 10-20 cm long - Short popliteal stenosis 2-5 cm, not involving trifurcation 
FP Grade 2	- Total length SFA disease 1/3-2/3 (10-20 cm) - May include CTO totaling < 1/3 (10 cm) but not flush occlusion - Focal popliteal artery stenosis < 2 cm, not involving trifurcation		FP Grade 4 - Total length SFA occlusion > 20 cm - Popliteal disease >5 cm or extending into trifurcation - Any popliteal CTO 

Figure 5.2. Femoropopliteal (FP) disease grading in Global Limb Anatomic Staging System (GLASS). Trifurcation is defined as the termination of the popliteal artery at the confluence of the anterior tibial (AT) artery and tibioperoneal trunk. CFA = Common femoral artery; CTO = chronic total occlusion; DFA = deep femoral artery; Pop = popliteal; SFA = superficial femoral artery.

Infrapopliteal disease grading

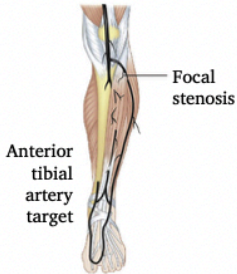
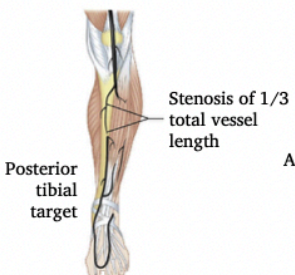
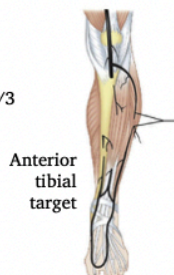
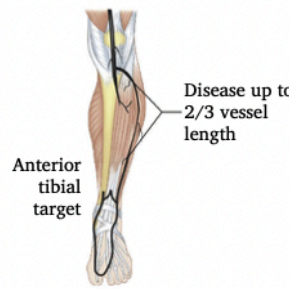
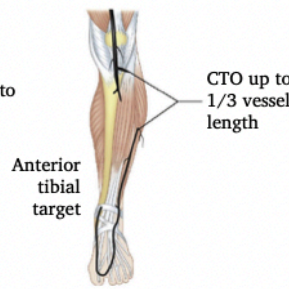
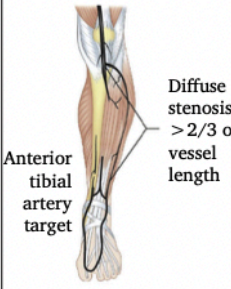
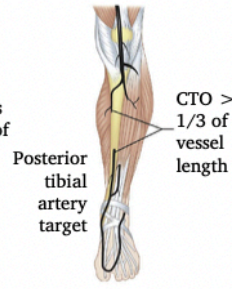
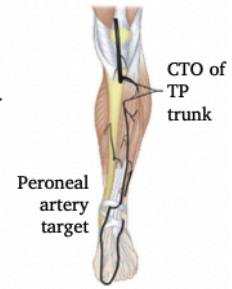
IP Grade 0	Mild or no significant disease in the primary target artery path	
IP Grade 1	Focal stenosis of tibial artery < 3cm	 Focal stenosis Anterior tibial artery target
IP Grade 2	- Stenosis involving 1/3 total vessel length - May include focal CTO (< 3 cm) - Not including TP trunk or tibial vessel origin	 Stenosis of 1/3 total vessel length Posterior tibial target  Anterior tibial target
IP Grade 3	- Disease up to 2/3 vessel length - CTO up to 1/3 length (may include tibial vessel origin but not tibioperoneal trunk)	 Disease up to 2/3 vessel length Anterior tibial target  CTO up to 1/3 vessel length Anterior tibial target
IP Grade 4	- Diffuse stenosis > 2/3 total vessel length - CTO > 1/3 vessel length (may include vessel origin) - Any CTO of tibioperoneal trunk if AT is not the target artery	 Diffuse stenosis > 2/3 of vessel length Anterior tibial artery target  CTO > 1/3 of vessel length Posterior tibial artery target  CTO of TP trunk Peroneal artery target

Figure 5.3. Infrapopliteal (IP) disease grading in Global Limb Anatomic Staging System (GLASS). AT = Anterior tibial; CTO = chronic total occlusion; TP = tibioperoneal.

Inframalleolar/pedal disease grading

Infra-malleolar/Pedal descriptor	
P0	Target artery crosses ankle into foot, with intact pedal arch
P1	Target artery crosses ankle into foot; absent or severely diseased pedal arch
P2	No target artery crossing ankle into foot

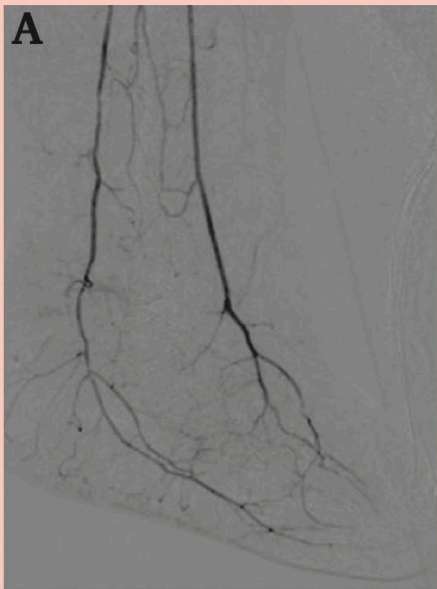
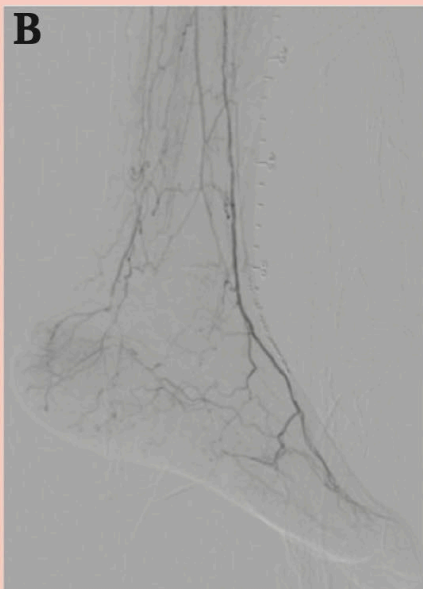
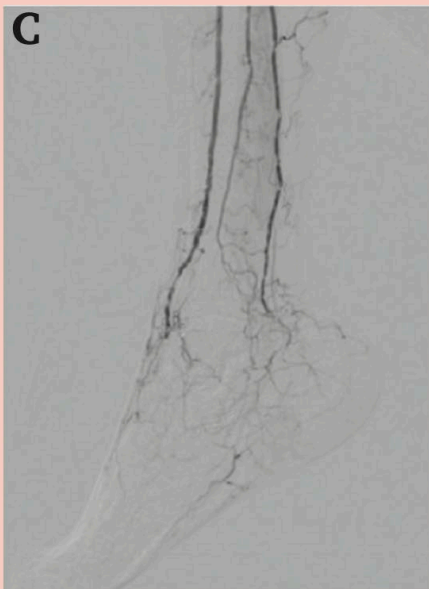
A 	B 	C 
P0	P1	P2

Figure 5.1. Inframalleolar (IM)/pedal disease descriptor in Global Limb Anatomic Staging System (GLASS). Representative angiograms of P0 (A) P1 (B) and P2 (C) patterns of disease.



Look up the overall GLASS stage

Table 5.3. Assignment of Global Limb Anatomic Staging System (GLASS) Stage

FP Grade	IP Grade				
	0	1	2	3	4
4	III	III	III	III	III
3	II	II	II	III	III
2	I	II	II	II	III
1	I	I	II	II	III
0	NA	I	I	II	III

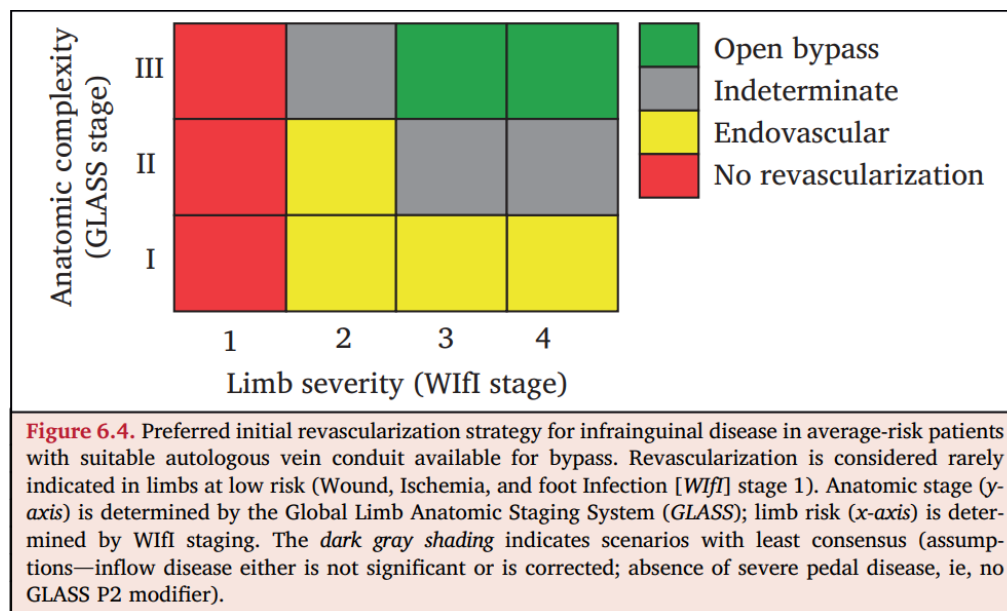
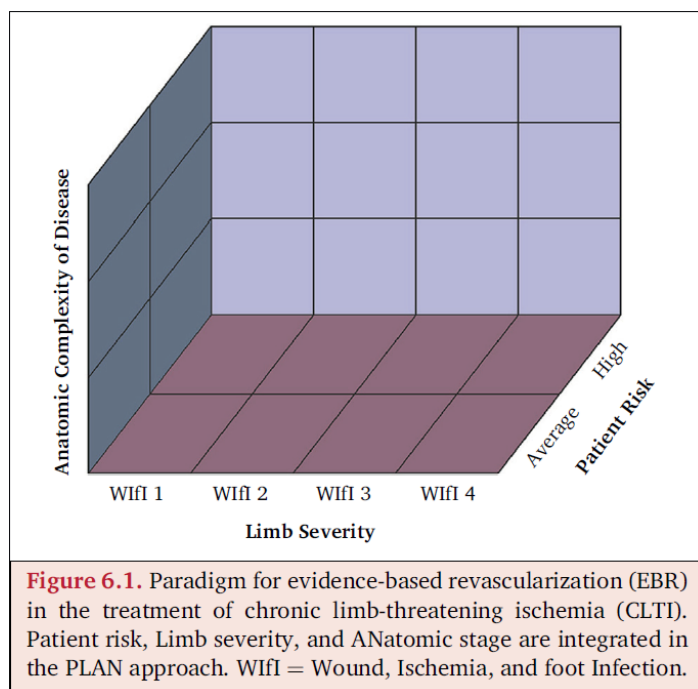
NA = Not applicable.

After selection of the target arterial path (TAP), the segmental femoropopliteal (FP) and infrapopliteal (IP) grades are determined from high-quality angiographic images. Using the table, the combination of FP and IP grades is assigned to GLASS stages I to III, which correlate with technical complexity (low, intermediate, and high) of revascularization.

Conte MS¹, Bradbury AW², Kolh P³, White JV⁴, Dick F⁵, Fitridge R⁶, Mills JL⁷, Ricco JB⁸, Suresh KR⁹, Murad MH¹⁰; GVG Writing Group, Global vascular guidelines on the management of chronic limb-threatening ischemia. J Vasc Surg. 2019 Jun;69(6S):3S-125S.e40. doi: 10.1016/j.jvs.2019.02.016. Epub 2019 May 28.

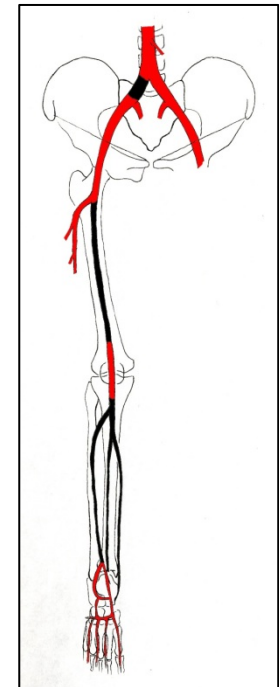
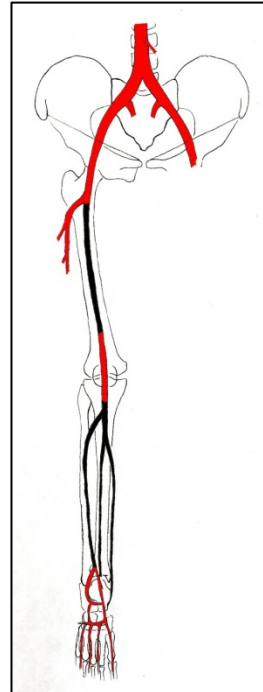
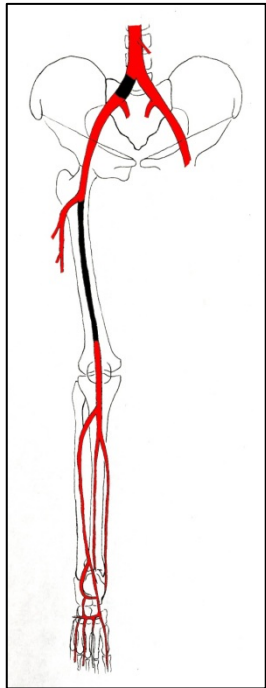


Define the preferred revascularization strategy by integrating patient risk, limb severity (Wifl) and anatomy (GLASS) according to the PLAN concept



CLI: SEQUENTIAL LESIONS

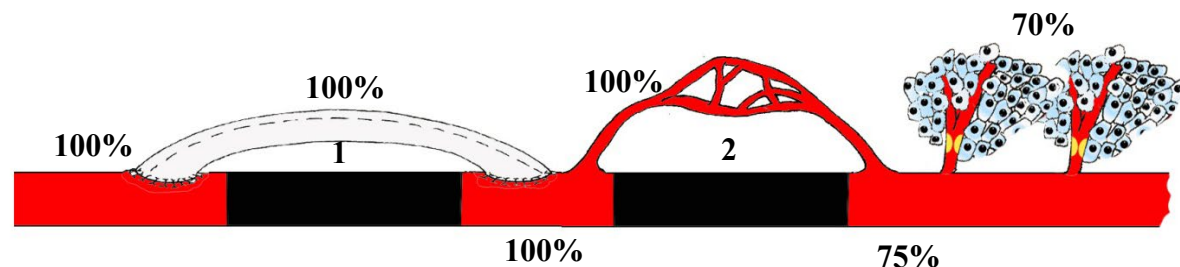
In the patients with CLI, the lesions of the superficial femoral artery are often associated with more proximal (iliac) and/or distal (infra-popliteal) lesions



SURGICAL CRITERIA

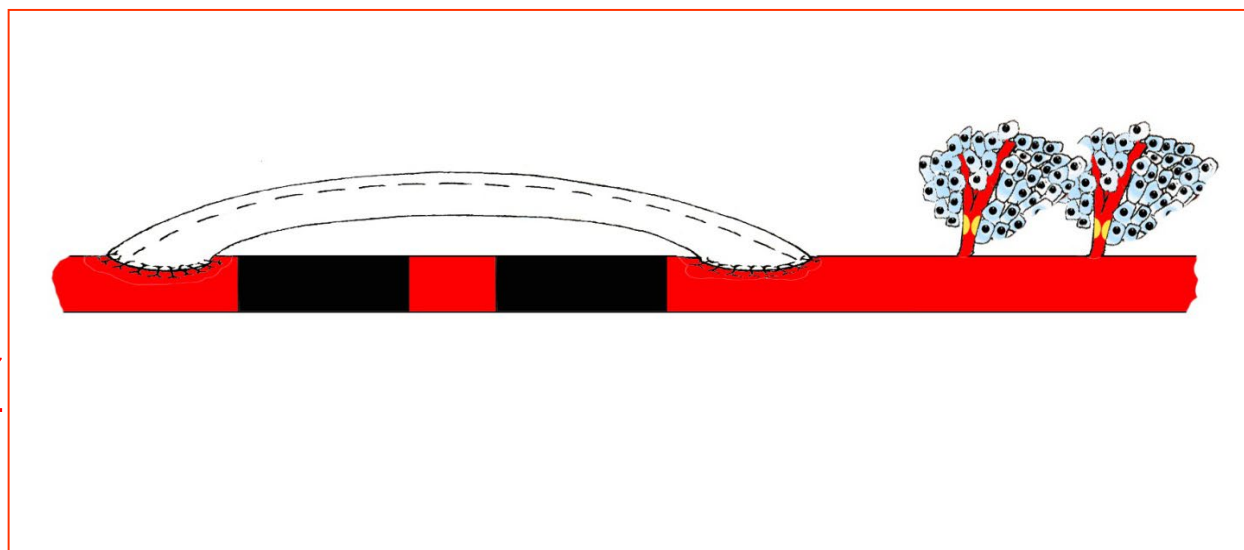
For rest pain or very small skin ischemic lesions.

TREAT ONLY THE PROXIMAL BLOCK



For extended ischemic ulcers or gangrene

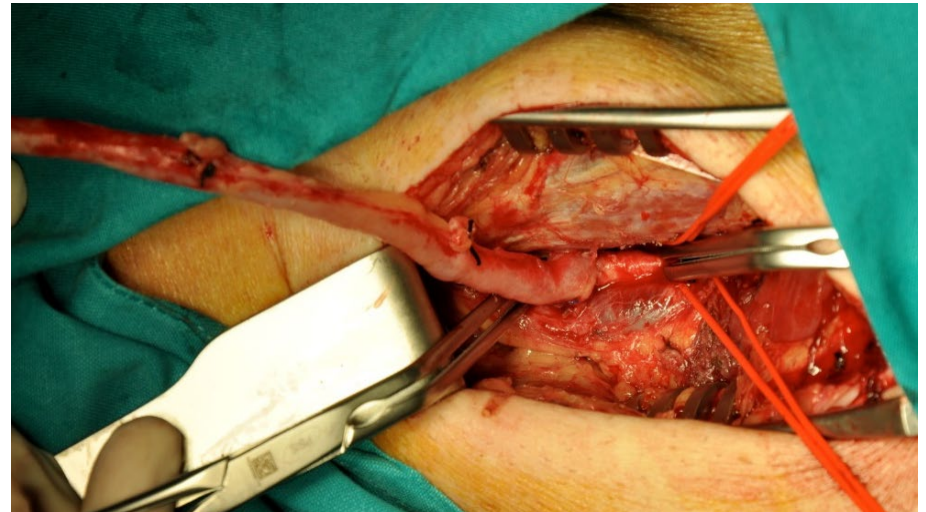
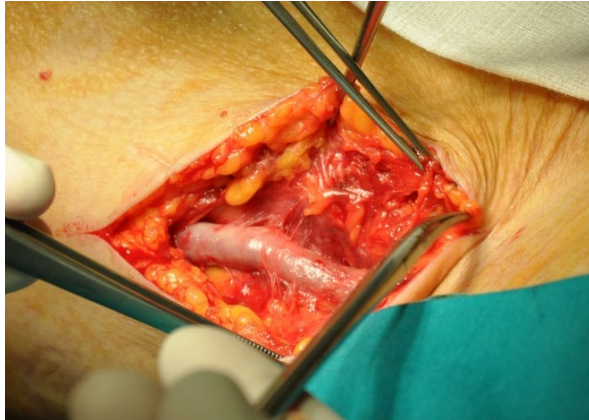
TREAT SIMULTANEOUSLY BOTH BLOCKS



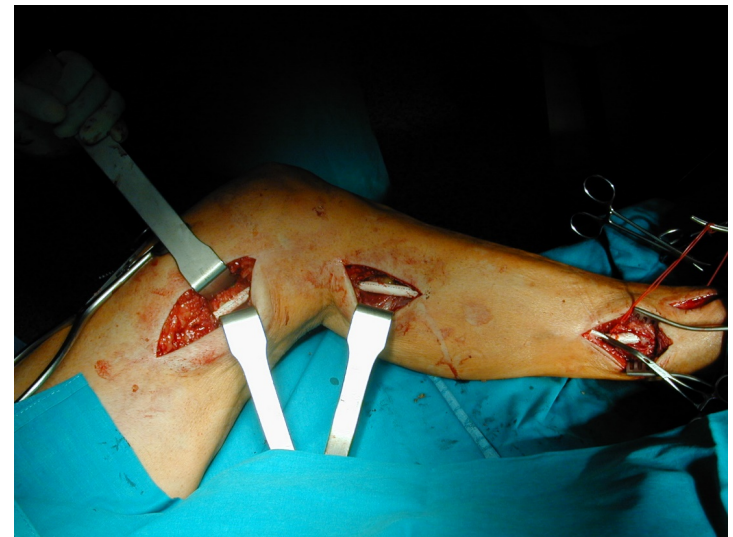
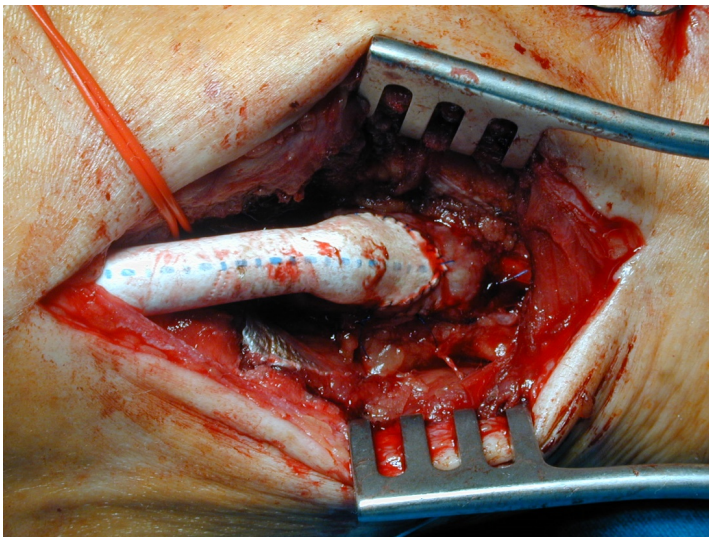
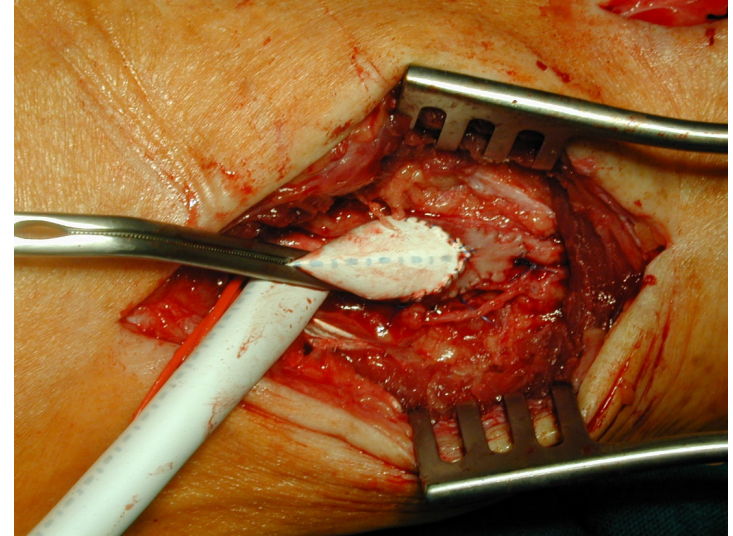
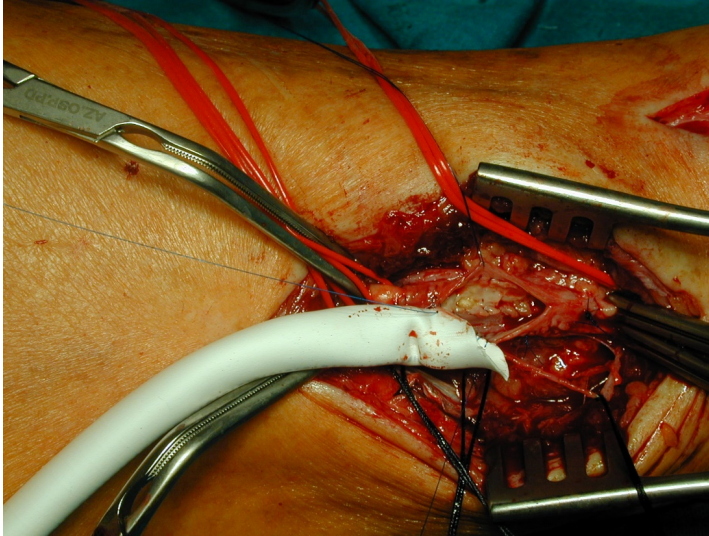
TECHNICAL OPTIONS

- **ENDOVASCULAR SURGERY:** *PTA and/or STENTING*
- **OPEN SURGERY:** *ENDOARTERIECTOMY or BY-PASS*
- **HYBRID TECHNIQUE:** COMBINATION

SURGICAL OPTIONS VGS

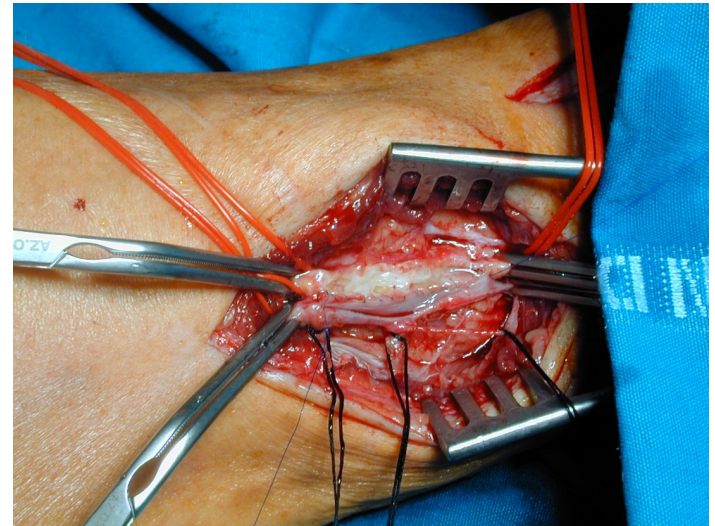
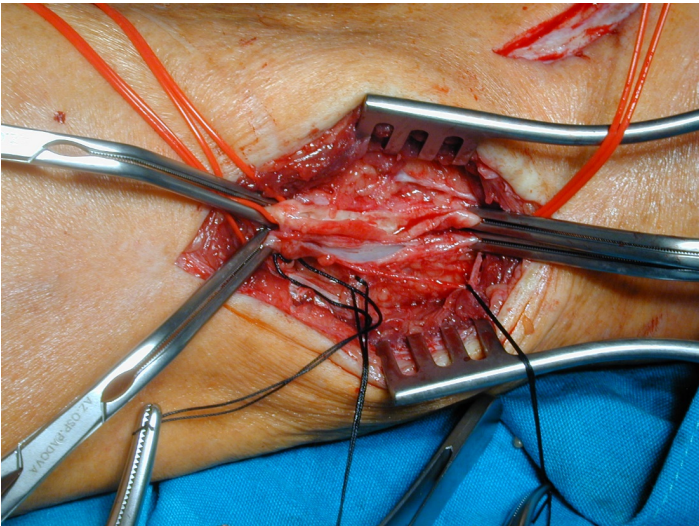
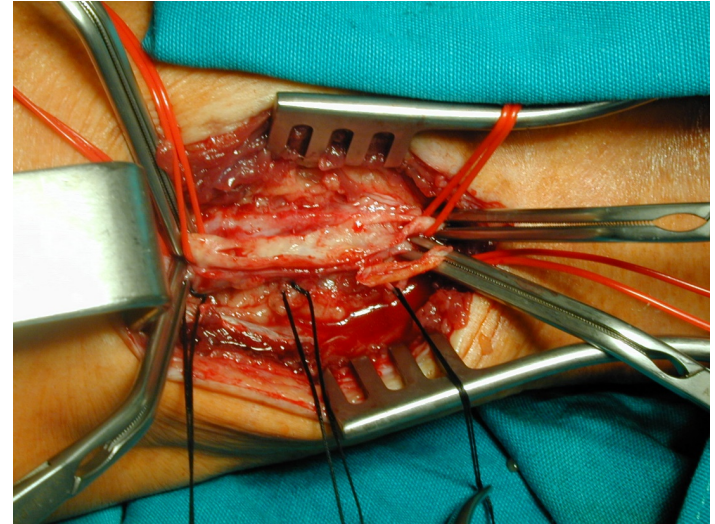
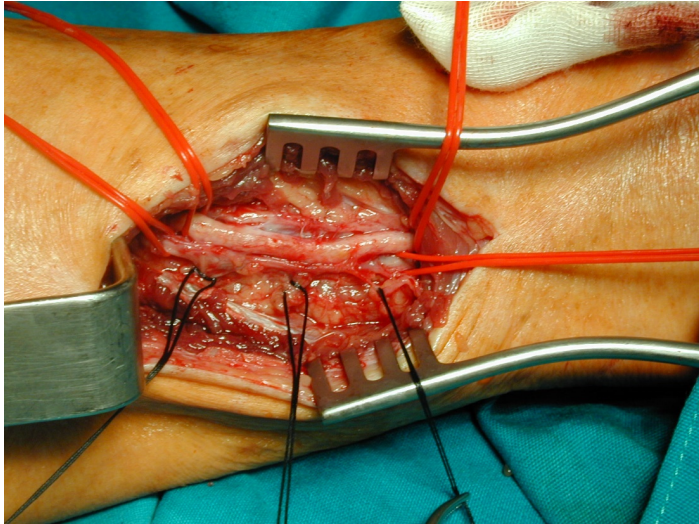


SURGICAL OPTIONS PTFE



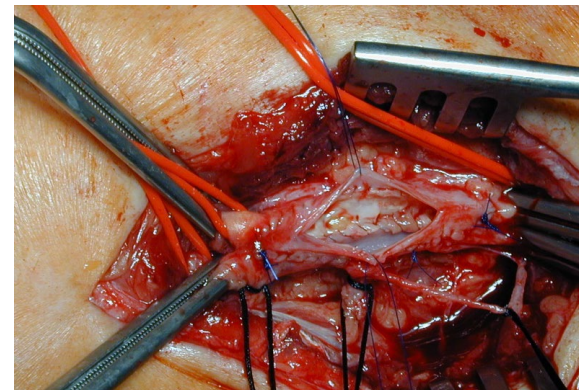
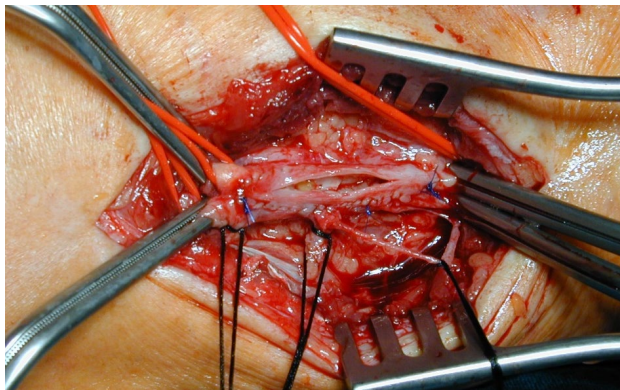
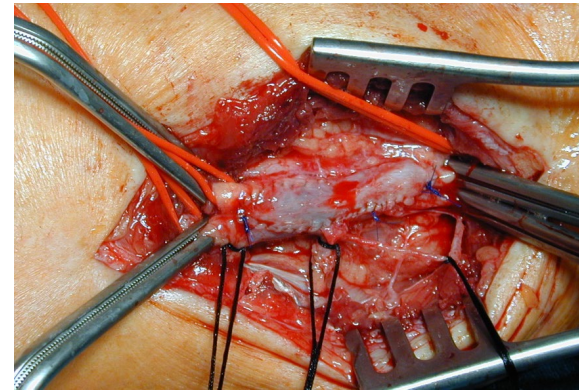
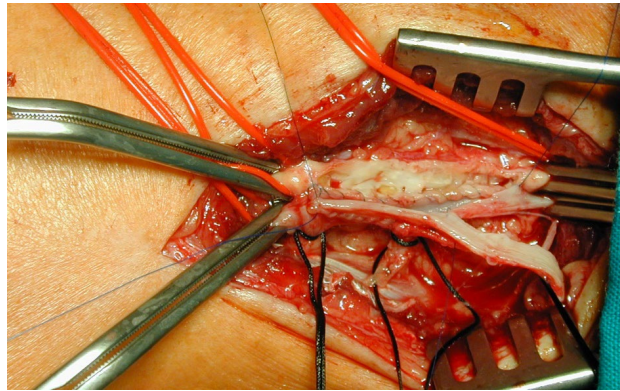
SURGICAL OPTIONS

Distal AVF



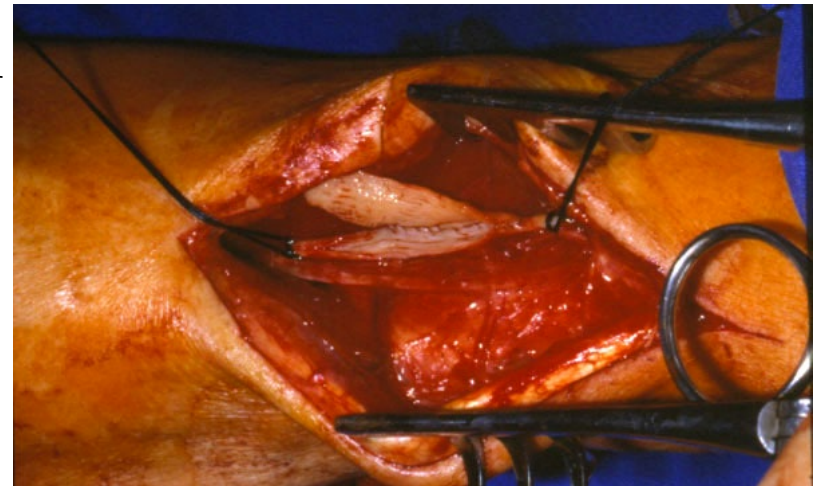
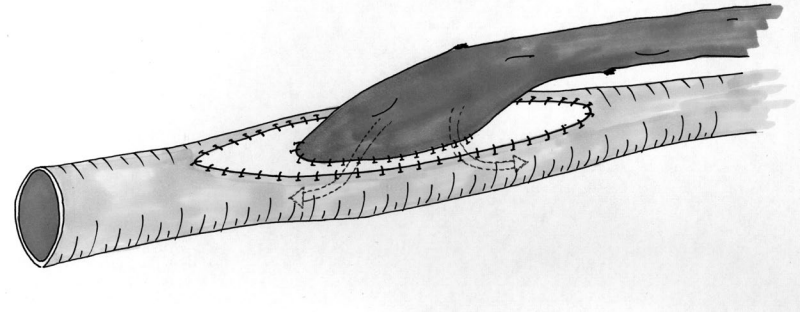
SURGICAL OPTIONS

LINTON'S patch

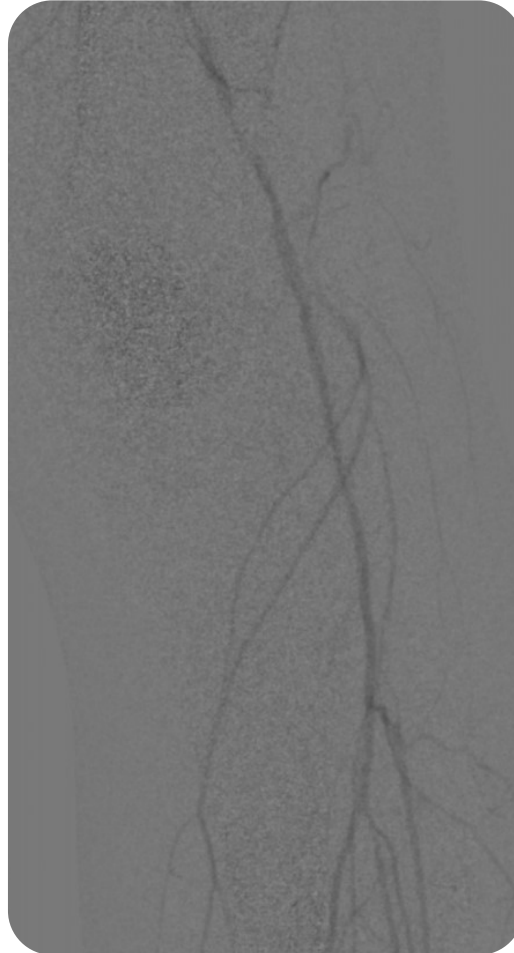


LINTON'S PATCH ADVANTAGES

1. Improves haemodynamic flow
2. Decreases possible technical errors due to diameter mismatch
3. Increases long-term patency in prosthetic bypass

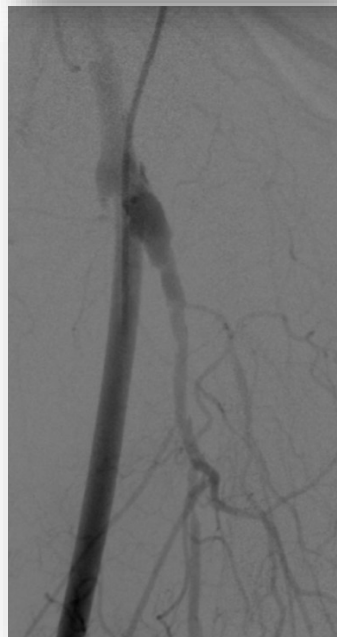


Occlusione completa dell'AFS all'origine



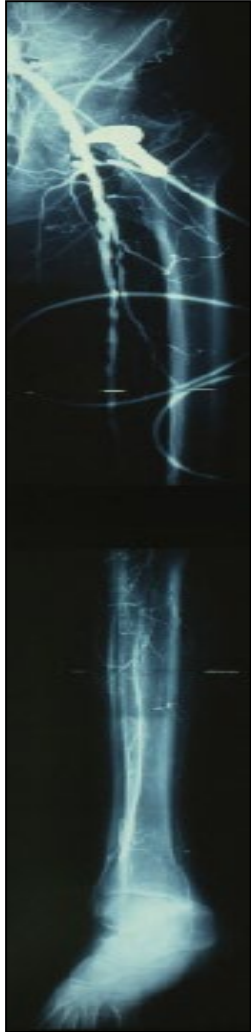
Studio arteriografico iniziale

Bypass femoro-popliteo

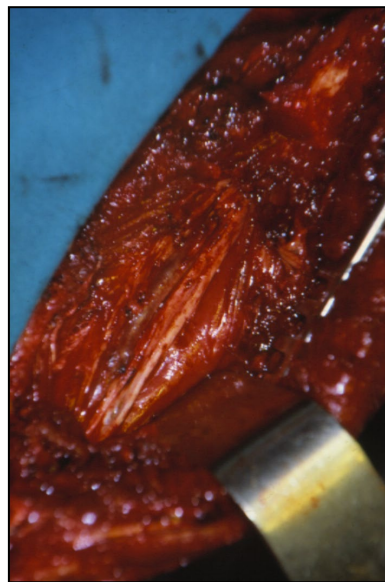
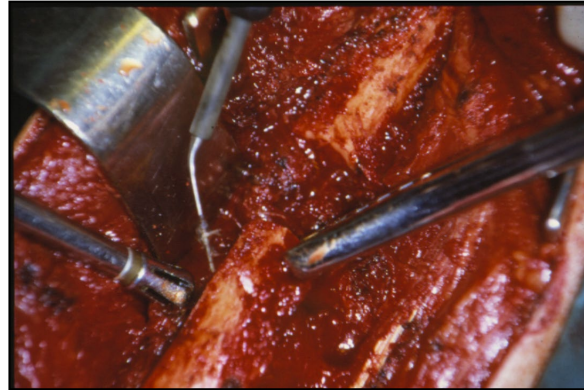


Controllo arteriografico a fine intervento

Bypass femoro-interosseo



Pre-operatoria



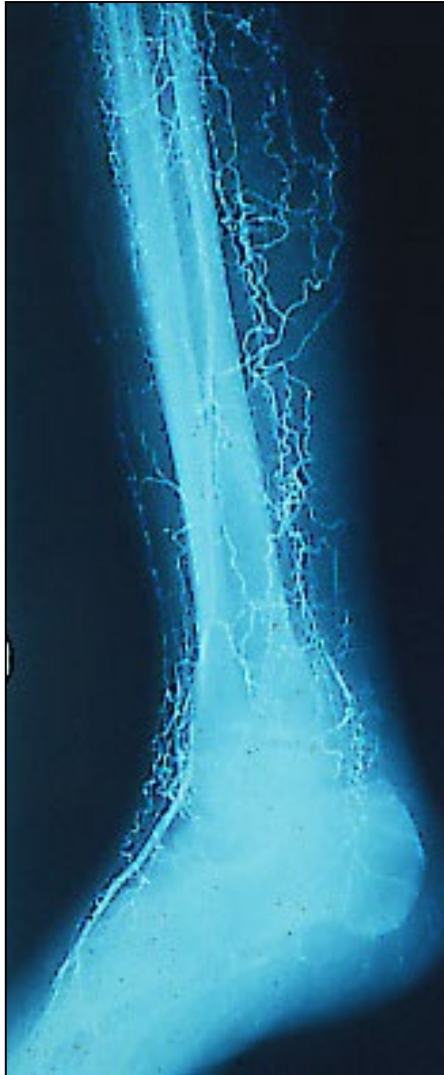
Intra-operatoria



Post-operatoria

Bypass femoro-pedideo

Pre-operative



Post-operative



Bypass femoro-tibiale posteriore al malleolo

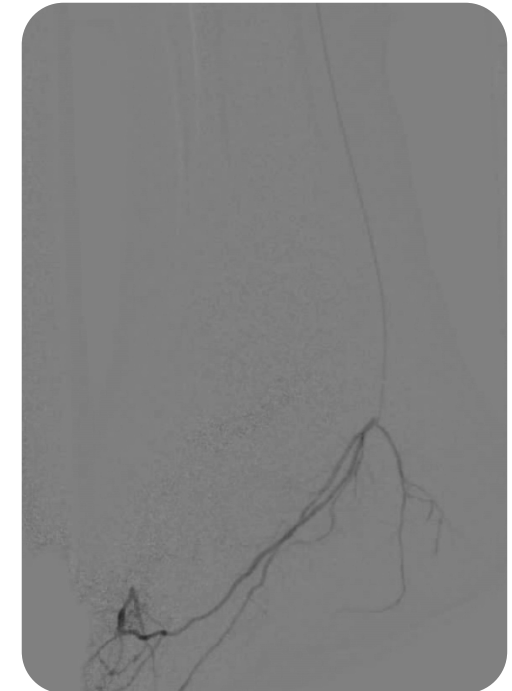
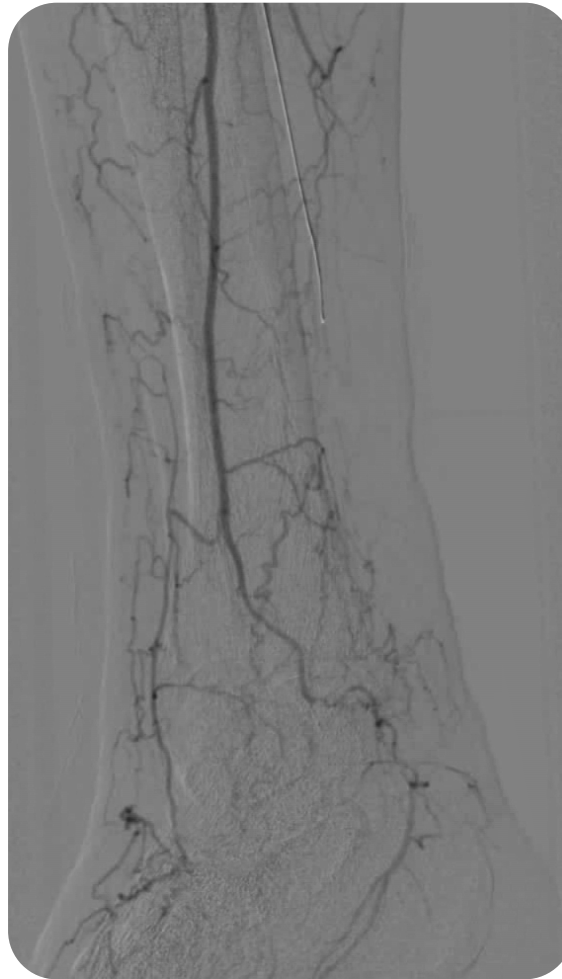
Pre-operative



Post-operative



Chirurgia Ibrida



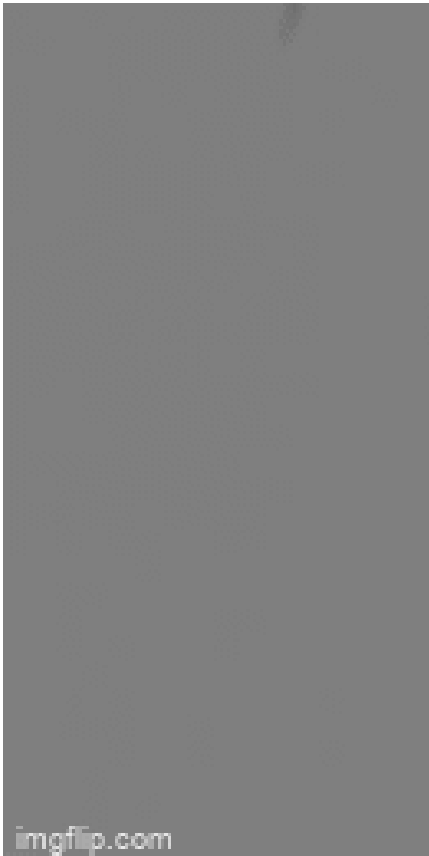
Bypass femoro-tibiale
posteriore all'origine
in VGS in situ

Chirurgia Ibrida



Ricanalizzazione e PTA dell'arteria tibiale posteriore

Chirurgia Ibrida



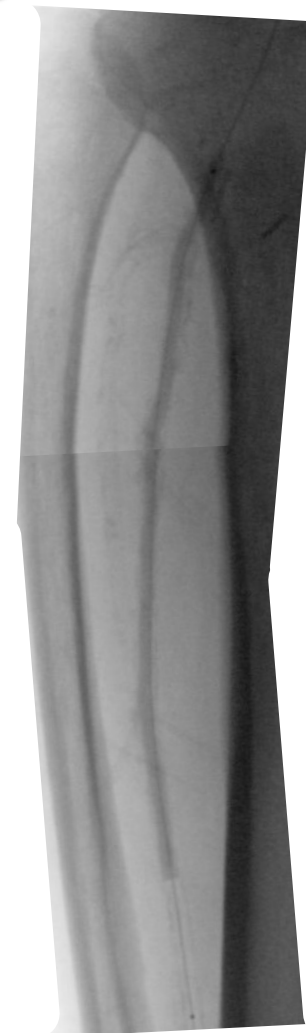
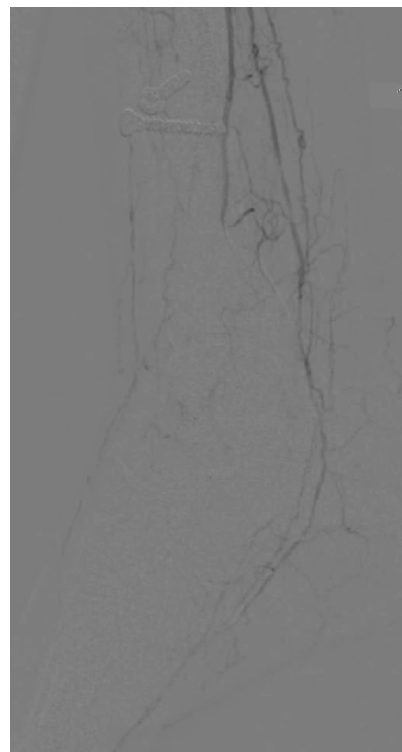
Stenosi post anastomostica in bypass femoro-popliteo sopra-articolare in VGS

Chirurgia Ibrida



Angioplastica del TTP per migliorare il run-off distale del bypass

Chirurgia Ibrida



Angioplastica del ATI per migliorare il run-off distale di bypass femoro-popliteo
in VGS omolaterale invertita

Conclusioni

- Lo sviluppo delle tecniche endovascolari ha rivoluzionato la chirurgia vascolare tradizionale nei pazienti affetti AOAI, ampliando lo spettro delle possibilità terapeutiche e migliorando i risultati a medio/lungo termine
- L'indicazione al trattamento non può basarsi solo sull'anatomia delle lesioni vascolari ma deve considerare anche l'entità del danno tessutale periferico, la presenza ed estensione dell'infezione concomitante, le condizioni cliniche generali e le prospettive di vita del paziente
- Le tecniche di chirurgia vascolare moderna devono essere necessariamente accompagnate da una conoscenza ed esperienza approfondita delle tecniche e dei materiali endovascolari per ottenere il miglior risultato possibile