

DİYABETİK AYAKTA TANIDAN TEDAVİYE NEREDEYİZ?

Dr. BURÇAK GÜMÜŞ

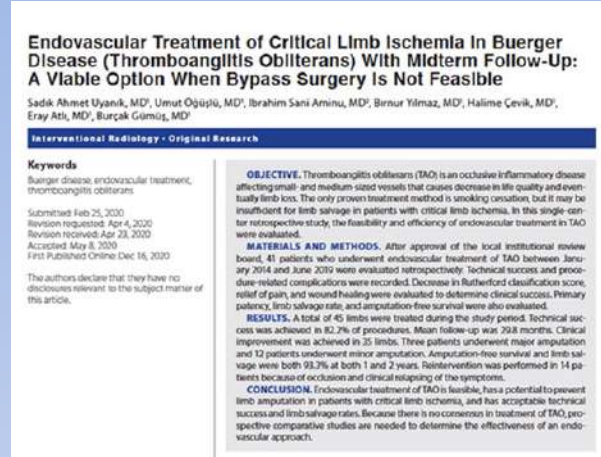
UDAİS 2024

Kritik Ayak İskemisi



- CLI periferik arter hastalığının en ilerlemiş safhasıdır.
- İnfrapopliteal hastalık , hayat kısıtlayıcı kladikasyo ve KAİ nin en sık sebebidir.
- **İnfrapopliteal hastalık insidansı ile DM prevalansı arasında çok güçlü bir korelasyon bulunmaktadır.**
- 6 aylık mortalite % 20 ve 5 yıllık mortalite % 50 olarak bildirilmektedir (Eşlik eden diğer kardiyovasküler hastalıkların varlığına bağlı olarak).
- 6 aylık amputasyon oranı % 10-40 arasında değişim göstermektedir.
- **KAİ, tüm dünyada gerçekleştirilen ampütasyonların yaklaşık % 90 ından sorumludur.**

MULTİLEVEL HASTALIK-1



- **CLTI hastalarında multilevel arteriyel tutulum % 90 lara ulaşabilir.**
- **Klinik ilerleme ve stabilite sağlamak için bu hastalarda çok seviyeli revaskularizasyon hayatidir.**
- **Eğer bu hastalarda sınırlı ya da basamaklandırılmış revaskularizasyon girişimleri hızla ekstremitte kaybına ve ölüme sebep olabilir.**
- **CLTI de endovasküler, açık by-pass cerrahisi ve hybrid yöntemler önerilebilir.**

MULTİLEVEL HASTALIK-2

- Açık cerrahi seçenekler, **%8** i bulan **mortalite** ve **% 24** ü bulan **morbidite** oranlarıyla oldukça yüksek riskli olarak kabul edilmektedir.
- **Cerrahi seçenekler** ayrıca hastaların **% 40** ında eşlik eden **ciddi komorbiditeler** ve **düşük yaşam beklentisi** nedeniyle mümkün olamamaktadır.
- **Hybrid tedavi seçenekleri** ve **endovasküler revaskülarizasyon** bu frajil hasta grubunda cerrahinin invaziv natürüne iyi bir seçenektir.



DİYABETİKLERDE KAI

Diabetic foot ulcer severity predicts mortality among veterans with type 2 diabetes

Meghan B. Brennan^{a,b,c}, Timothy M. Hess^{a,b}, Brian Bartle^c, Jennifer M. Cooper^d, Jonathan Kang^b, Elbert S. Huang^{c,d}, Maureen Smith^a, Min-Woong Sohn^{c,e}, and Christopher Crnich^{a,l}

^aUniversity of Wisconsin School of Medicine and Public Health, 1685 Highland Ave, Madison, WI 53705

Article

Impact of Diabetes Mellitus on Critical Limb Ischemia With Below the Knee Disease: Japan Below-the-Knee Artery Treatment Subanalysis

Conclusions: Mortality, AFS, and TVR showed no significant difference between the 2 groups, but major amputation was more frequent in DG. Not only revascularization but also infection and diabetes control were very important for limb salvage in DG.

Angiology
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DOI: 10.1177/0003319713499406
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- KAI, diyabetiklerde ortaya çıktığında bunun anlamı bu bir tıbbi acil durumdur.
- Major amputasyon riski normal popülasyona göre diyabetik grupta **10-30** kez artmıştır.
- Başlangıçta ki diyabetik ayak ülserinin ciddiyeti, takip eden mortaliteyi gösterme açısından koroner arter hastalığı, periferik arter hastalığı veya stroke a göre çok daha anlamlı bir göstergedir.

DIYABET ve KAI

Article

Impact of Diabetes Mellitus on Critical Limb Ischemia With Below the Knee Disease: Japan Below-the-Knee Artery Treatment Subanalysis

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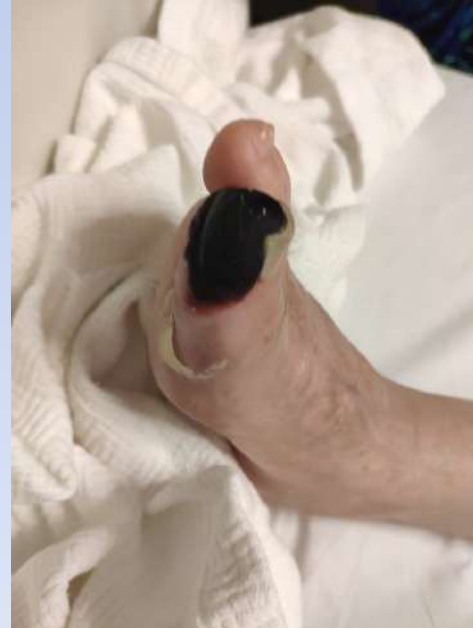
Conclusions: Mortality, AFS, and TVR showed no significant difference between the 2 groups, but major amputation was more frequent in DG. Not only revascularization but also infection and diabetes control were very important for limb salvage in DG.

- Yara iyileşmesinde gecikme
- Amputasyon
- Kötü QOL
- Kardiyovasküler hastalık
- Prematür ölüm
- DFU ve LEA QoL için kötü göstergeler olmalarının ötesinde prematür ölüm içinde bağımsız risk faktörleridir.



PROGNOZ-1

- Diyabetik hastaların **% 19-34** ü hayatları boyunca ayak ülseri geliştirirler.
- **Ülser rekürrensi** için de insidans oldukça yüksek olup bu oran ilk sene için **% 40** a, 5 sene de **% 65** e ve 10 sene içinse **% 90** a ulaşmaktadır.
- **Diyabetik ayak ülseri için en büyük riskte geçirilmiş DFU dir.**



PROGNOZ-2

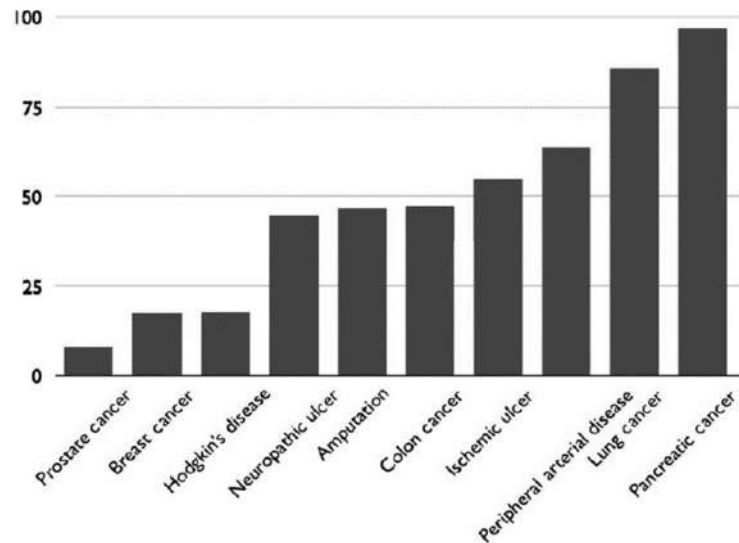


- ALARM veren bir başka data ise alt ekstremitte amputasyonuna giden hastaların **% 50 si** 5 sene içerisinde hayatını kaybediyor.
- Charcot, DFU, minör and major amputasyonlar için **5 yıllık mortalite** sırasıyla **% 29.0, 30.5, 46.2 and 56.6** olup bu oran özellikle **kronik böbrek hastalığı** ve eşlik eden diğer **ko-morbiditeleri** olan gruplarda daha da yüksektir.

KANSER VE DİYABET

Guest Editorial: Are diabetes-related wounds and amputations worse than cancer

ARTICLE #7 INTERNATIONAL WOUND JOURNAL · JANUARY 2008



Armstrong et al. *Journal of Foot and Ankle Research* (2020) 13:16
<https://doi.org/10.1186/s13047-020-00383-2>

Journal of
Foot and Ankle Research

COMMENTARY

Open Access

Five year mortality and direct costs of care for people with diabetic foot complications are comparable to cancer

David G. Armstrong*, Mark A. Swerdlow, Alexandria A. Armstrong, Michael S. Conte, William V. Padula and Siccio A. Bus

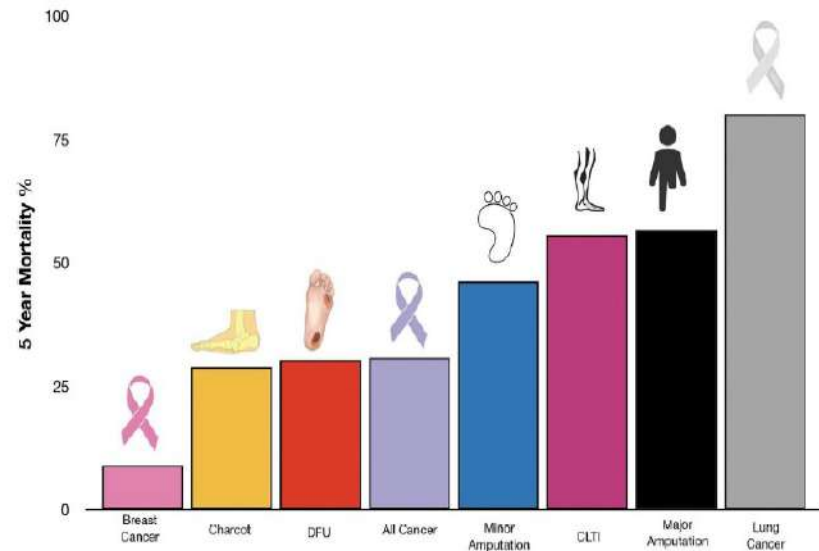


Fig. 1 Five Year Mortality of Diabetic Foot Complications and Cancer. Diabetic foot complications compared to cancer. DFU = diabetic foot ulcers [11] = 30.5%. Charcot = Charcot neuroarthropathy of the foot [14]. All Cancer = pooled 5 year survival of all cancers [11]. CLTI = chronic limb threatening ischemia [28, 29]. Major Amputation = above foot amputation [20–22, 26, 27]. Minor Amputation = foot level amputation [17, 27]

DİYABETİK VASKÜLOPATİ

- Yoğun **KALSİFİKASYON** yükü
- DM varlığında **OKLUZİV** lezyonlar **STENOZ** lardan daha sıktır.
- Çok seviyeli, uzun segment ve **multisegmenter** hastalık
- Hem **inflow** hem de **outflow** lezyonları
- **Kollateral** azlığı

Table 1 Comparison of PAD Characteristics [1, 23, 76–79]

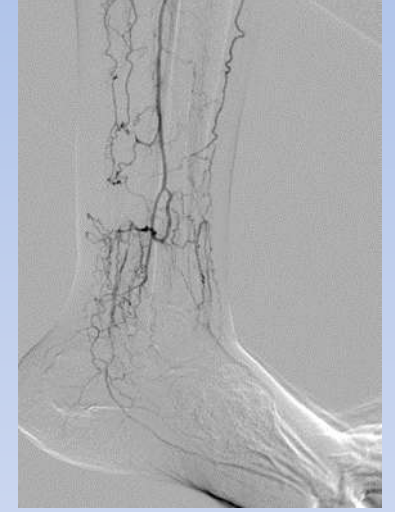
	Patients with Diabetes	Patients without Diabetes
Age of onset	Younger	Older
Disease progression	Aggressive	Gradual
Anatomical localisation	<ul style="list-style-type: none">• Mainly distal• Distinctly infrapopliteal affliction, frequently involving all three tibial region arteries: Anterior Tibial, Posterior Tibial and Peroneal artery• Relative sparing of inframalleolar pedal arteries (e.g. Dorsalis Pedis) and supragenicular arteries (e.g. Femoral and Aortic-iliac arteries).	<ul style="list-style-type: none">• Mainly proximal• Lesions tend to affect the Femoral and Aortic-iliac arteries more frequently than the distal arteries
Type of atherosclerotic lesions	<ul style="list-style-type: none">• Stenosis < Occlusions (severe)• Diffuse, and occurring over long segments	<ul style="list-style-type: none">• Stenosis > Occlusions• Focal, and occurring over short segments
Calcification	Commonly present	Absent
Collateral network	Poor	Unaffected

- **DİYABET NİSBETEN PEDAL SİRKÜLASYONUN KORUNDUĞU UZUN SEGMENT OKLÜZİV LEZYONLARIN DOMİNANT OLDUĞU TEMEL OLARAK DİZALTI TUTULUMUYLA SEYREDEN BİR VASKÜLOPATİYE SEBEP OLUR.**



DİYABETİN VASKÜLER AYAK İZLERİ

- **İliak** tutulum çok nadir (% 1 in altında)
- **Femoropopliteal** tutulum rölatif olarak az
- Tüm lezyonların **% 74 ü dizaltında**
- Bunların da **% 66 sı oklüzyon**



- Dizaltı tutulumunun **% 50 sini 10 cm nin üzerinde oklüzyonlar oluştururken, bu oran femoropopliteal bölgede sadece % 11 dir.**

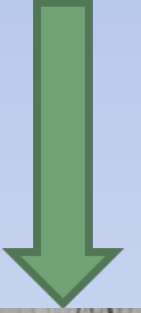
DIYABETİN VASKÜLER AYAK İZLERİ

KALSİFİKASYON YÜKÜ

- Revaskülarizasyon güçlüğü
- Tromboembolik komplikasyon artışı
- Artmış restenoz oranı

AZALMIŞ KOLLATERAL

- Akut okluziv hadiselere tolerans
- Yara iyileşmesinde

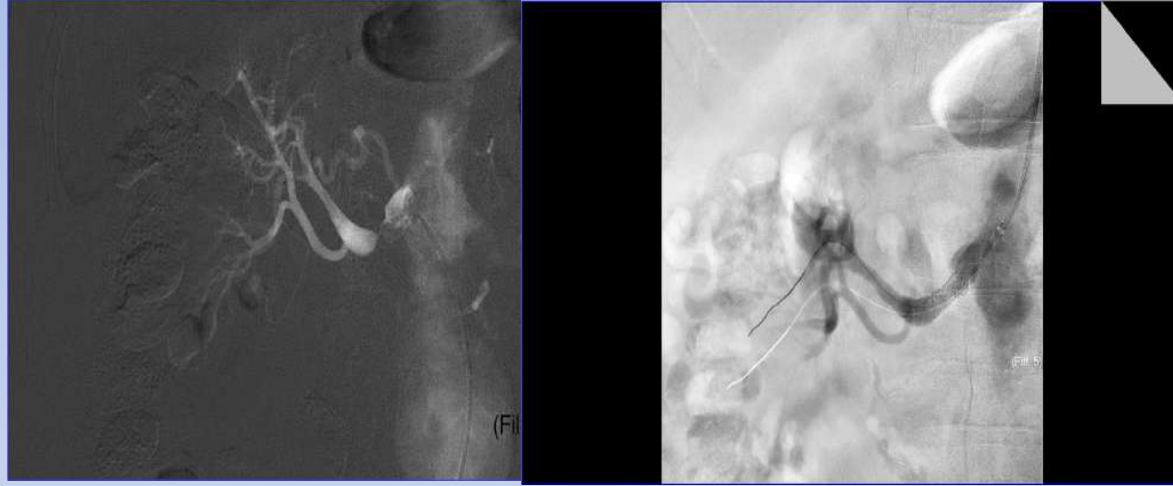


KOMORBİDİTE

- PAH olan diyabetik popülasyonun yaklaşık **% 27** si progresif hastalığa sahip olacak ve **% 4** ü de **major amputasyona** gidecektir. Bu hastaların yine yaklaşık **% 20** si **miyokardial enfarkt** ya da **inme** gibi kardiyovasküler bir hadiseyle yüzleşecektir
- PAH olan diyabetik hastalarda eşlik eden **iskemik kalp hastalığı** riski yaklaşık **% 50** olup, yine bu grupta non-diyabetiklere oranla sessiz veya saptanmış **myokard iskemisi** oranında anlamlı olarak daha siktir.
- PAH olan diyabetik grubun yaklaşık **% 30** unda ise eşlik eden **karotis arter hastalığı** mevcut olup, hastaların bu açıdan revaskülarizasyon öncesi değerlendirilmesi büyük önem taşır

DİYABETİK NEFROPATİ

- Daha hızlı ilerleyen PAH
- Yoğun medial kalsifikasyon
- Azalmış kollateral formasyonu



- ESRD hasta grubunda **PAH % 77** olarak bildiriliyor.
- Diyaliz, diyabetik hastalarda **ülserasyon** ve **amputasyon** için temel risk faktörlerinden biridir.
- **Diyalize girenlerde amputasyon oranı girmeyenlere göre 4.7 kez daha fazladır**
- **DİYABET, RENAL YETMEZLİK ve CLI özellikle revaskülarizasyon sonrası sonuçları KÖTÜ**

TASC II UPDATE

Special Article

An Update on Methods for Revascularization and Expansion of the TASC Lesion Classification to Include Below-the-Knee Arteries: A Supplement to the Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II) The TASC Steering Committee*

Michael R. Jaff, ¹ DO, Christopher J. White, ² MD, Gerry R. Fowkes, ³ MD, John Dormandy, ³ DSc, Manmohan Ruzavi, ⁴ MD, Jim Reekers, ⁷ MD, and Lars Norgren, ^{8a} MD, PhD


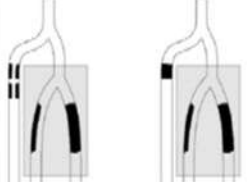
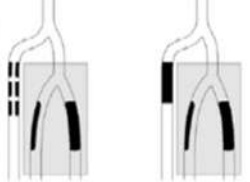

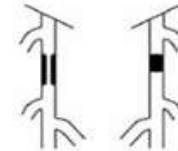
<p>TASC A lesions</p> <p>Single focal stenosis, ≤ 5 cm in length, in the target tibial artery with occlusion or stenosis of similar or worse severity in the other tibial arteries.</p>	
<p>TASC B lesions</p> <p>Multiple stenoses, each ≤ 5 cm in length, or total length ≤ 10 cm or single occlusion ≤ 3 cm in length, in the target tibial artery with occlusion or stenosis of similar or worse severity in the other tibial arteries.</p>	
<p>TASC C lesions</p> <p>Multiple stenoses in the target tibial artery and/or single occlusion with total lesion length >10 cm with occlusion or stenosis of similar or worse severity in the other tibial arteries.</p>	
<p>TASC D lesions</p> <p>Multiple occlusions involving the target tibial artery with total lesion length >10 cm or dense lesion calcification or non-visualization of collaterals. The other tibial arteries occluded or dense calcification.</p>	

Fig. 3. Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC) classification of infrapopliteal lesions. The unshaded area represents the target lesion; area inside the shaded rectangle represents typical background disease (see text for further ex-

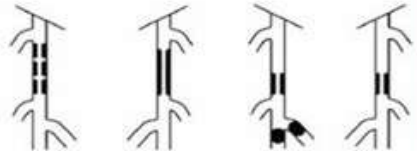
Type A Lesions

- 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 Occlusions ≤ 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



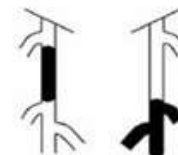
Type C Lesions

- Multiple Stenoses or Occlusions Totaling >15 cm With or Without Heavy Calcification
- Recurrent Stenoses or Occlusions That Need Treatment After 2 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



TASC II VE DİYABET

Type A Lesions

- Single Stenosis ≤ 10 cm in Length
- Single Occlusion ≤ 5 cm in Length

Type B Lesions

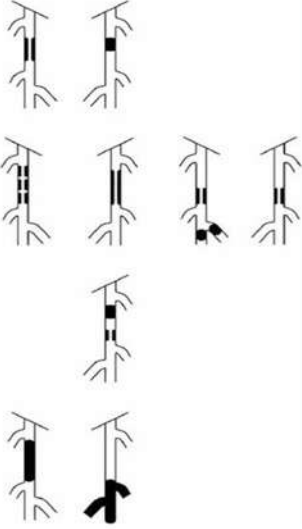
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- Single or Multiple Lesions in the Absence of continuous Tibial Vessels to Improve Inflow for a Distal Bypass
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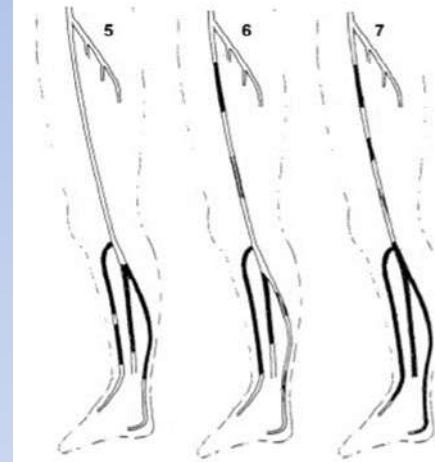
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- Chronic Total Occlusions of CFA or SFA (>20 cm, Involving the Popliteal Artery)
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Vascular Involvement in Diabetic Subjects with Ischemic Foot Ulcer: A New Morphologic Categorization of Disease Severity

L. Graziani,^{1*} A. Silvestro,¹ V. Bertone,² E. Manara,³ R. Andreini,⁴
A. Sigala,⁵ R. Mingardi⁶ and R. De Giglio⁷



TASC II yeni teknikler ve dedike medikal enstrümanları içermez. **Bugün TASC C ve D lezyonlar için bile öncelik ENDO**

Diyabet **MULTİLEVEL** bir hastalık oysa **TASC II** anatomik bölgelere göre sınıflama yapar ve her lezyon bağımsız değerlendirilir

TASC II dizaltı sınıflaması için dar kapsamlı ve **plantar ark revaskülarizasyonundan** hiç bahsetmez

WIFI

Spiliopoulos S *et al.* Minimally invasive treatment of diabetic foot

Table 1 Wound Ischemia and foot Infection score

Score	Wound	Ischemia (Toe pressure TcPO ₂)	Foot infection
0	No ulcer and no gangrene	60 mmHg	Uninfected
1	Small ulcer no gangrene	40-59 mmHg	Mild (< 2 cm cellulitis)
2	Deep ulcer and gangrene limited to toes	30-39 mmHg	Moderate (> 2 cm cellulitis/purulence)
3	Extensive ulcer or extensive gangrene	< 30 mmHg	Severe (systematic response/sepsis)

TcPO₂: Transcutaneous oxygen pressure.

SOCIETY FOR VASCULAR SURGERY® DOCUMENT

The Society for Vascular Surgery Lower Extremity Threatened Limb Classification System: Risk stratification based on Wound, Ischemia, and foot Infection (WIFI)

Joseph L. Mills, Sr, MD,^a Michael S. Conte, MD,^b David G. Armstrong, DPM, MD, PhD,^c Frank B. Pomposelli, MD,^d Andres Schanzer, MD,^d Anton N. Sidawy, MD, MPH,^e and George Andros, MD,^f on behalf of the Society for Vascular Surgery Lower Extremity Guidelines Committee, Tucson, Ariz; San Francisco and Van Nuys, Calif; Brighton and Worcester, Mass; and Washington, D.C.

Critical limb ischemia, first defined in 1982, was intended to delineate a subgroup of patients with a threatened lower extremity primarily because of chronic ischemia. It was the intent of the original authors that patients with diabetes be excluded or analyzed separately. The Fontaine and Rutherford Systems have been used to classify risk of amputation and

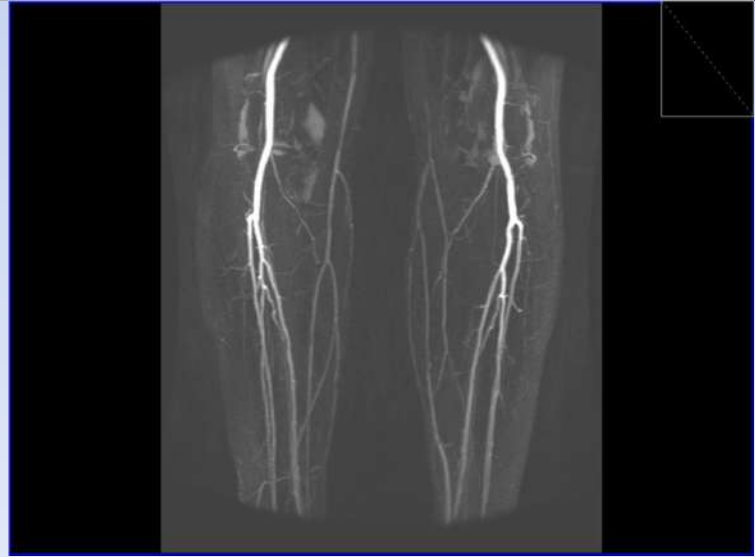
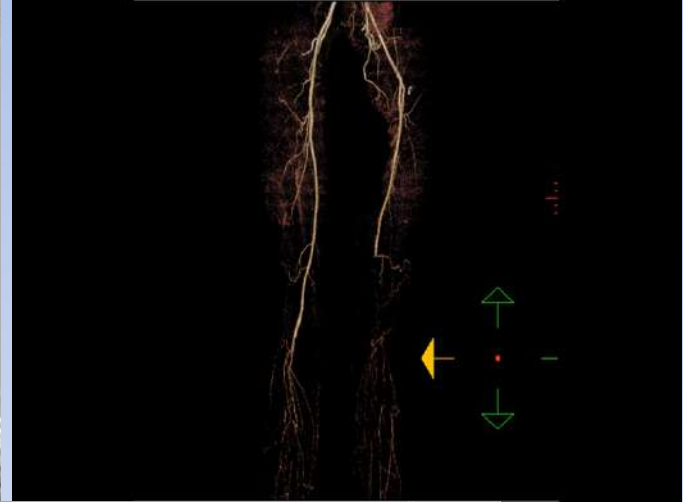
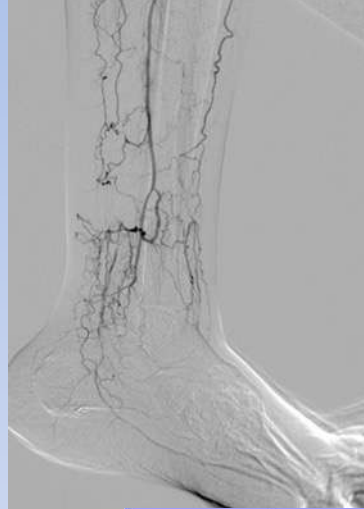
- **Klinik başarı ve amputasyon riskine göre 3 temel noktaya dayandırılır:**
- **Wound**
- **Ischemia**
- **Foot Infection**
- **Daha yüksek WIFI klinik dereceler, majör amputasyon ile yakından bağlantılıdır ve bir çalışma stage 4 Wifi da amputasyon riski % 64 e kadar yükselmektedir.**

TANI

- Primer ampütasyona giden hastaların sadece % 49 unda pre-operatif diagnostik çalışma yapılmış.

- Klinik Testler
- Görüntüleme

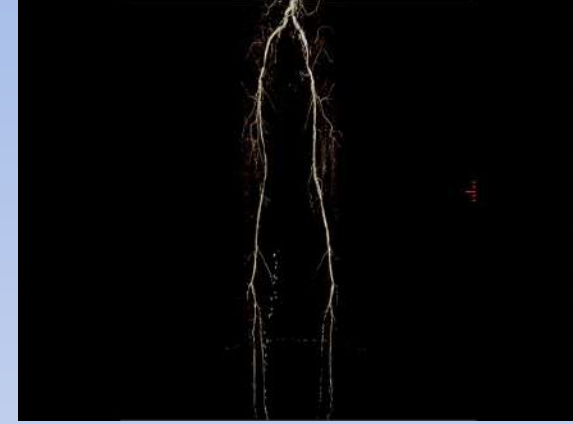
- Doppler
- BTA
- MRA
- Konvansiyonel DSA
- CO2 angiography***



VASKÜLER GÖRÜNTÜLEME-1

Table 8.2 Pros and cons of CTA, MRA, and contrast arteriography

	Pros	Cons
CTA	Noninvasive	Radiation exposure
	Fast scanning time	Contrast volume
	Good image resolution	Reactions to contrast
	Multiplanar and 3D reconstructions	
MRA	Noninvasive	Lowest image resolution
	No radiation exposure	Slow scanning time
	3D reconstructions	Nephrogenic systemic fibrosis
Contrast arteriography	Gold standard	Invasive
	Best image resolution	Radiation exposure
	Allows for diagnosis and treatment	Access site complications
		Reactions to contrast



- Özellikle selektif olduğunda hala **DSA ALTIN STANDART!!!**
- MRA ve BTA şüpheli ya da kesin olduğunda mutlaka **DSA !!!**
- **CE-MRA** ın özellikle distal pedal arterleri görüntülemeye DSA dan bile üstün olduğunu gösteren yayınlar var.
- **MRA in-stent stenozu göstermede başarısız.**
- Kalsifiye damarlarda BTA da **calcium blooming** ve **beam hardening artefaktları** nedeniyle stenoz oranını belirlemek zor

PTA of Infrapopliteal Arteries: Long-term Clinical Follow-up and Analysis of Factors Influencing Clinical Outcome

Jan H. Peregrin · Boris Kožnar · Josef Kováč ·
Jarmila Laštovičková · Jiří Novotný ·
Daniel Vedlich · Jelena Skibová

1 YILLIK EKSTREMİTE SAĞKALIMI

3 ARTER PATENT	% 83.0
2 ARTER PATENT	% 80.4
1 ARTER PATENT	% 73.1
PATENT ARTER YOK	% 56.4



PTA of the infrapopliteal arteries: long-term clinical follow-up and analysis of factors influencing clinical outcome. Peregrin JH et al. Cardiovasc Intervent Radiol 2010 Aug

Infrapopliteal PTA uzun dönem sonuçları: 1268 hasta ve 1445 işlem

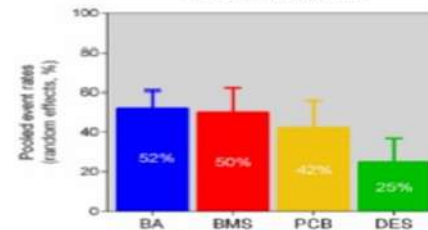
1 yıllık primer ekstremitte sağkalımı	% 76.1
1 yıllık sekonder ekstremitte sağkalımı	% 84.4
5 yıllık ekstremitte sağkalımı	% 78.8
10 yıllık ekstremitte sağkalımı	% 73.3

PTA of the infrapopliteal arteries: long-term clinical follow-up and analysis of factors influencing clinical outcome. Peregrin JH et al. Cardiovasc Intervent Radiol 2010 Aug

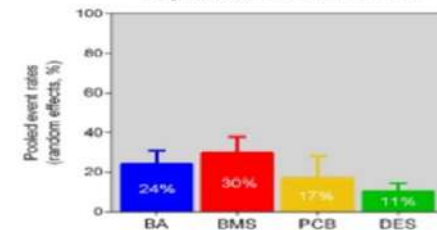
Meta-analysis

Comparative Effectiveness of Plain Balloon Angioplasty, Bare Metal Stents, Drug-Coated Balloons, and Drug-Eluting Stents for the Treatment of Infrapopliteal Artery Disease: Systematic Review and Bayesian Network Meta-analysis of Randomized Controlled Trials

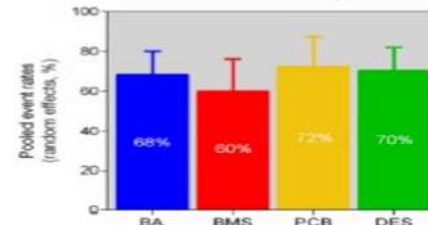
Konstantinos Katsanos, MSc, MD, PhD, EBIR¹, Panagiotis Kitrou, MD, PhD²,
Vascular restenosis



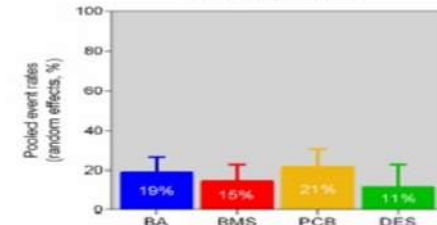
Target lesion revascularization



Wound healing



Limb amputations



DİYABET ve KONTRAST NEFROPATİ

Commentary

Carbon Dioxide Automated Angiography in Patients With a High Risk of Contrast-Induced Nephropathy Who Undergo Percutaneous Interventions for Critical Limb Ischemia

Filippo Scalise, MD, FACC, FESC¹

Keywords
angioplasty, automated carbon dioxide angiography, chronic kidney disease, contrast media, critical limb ischemia, diabetic foot, endovascular interventions, iodinated contrast, pedal arteries, transcutaneous oxygen pressure

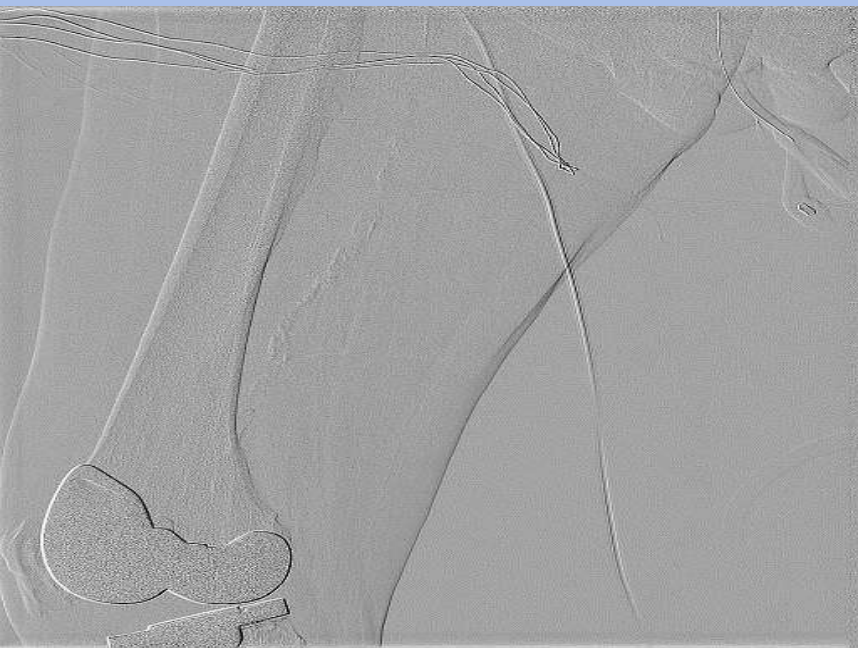
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DOI: 10.1177/1526602815620870
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SAGE

127 hastalık IC ve CLI olan bir seride hastaların yaklaşık % 45 inde **renal arter stenozu** saptandı . Bu hastalardan % 16 sı **ciddi**, % 17 orta derecede ve % 12 sinde **bilateral renal arter stenozu** mevcuttu.

PAD hastalığı olan ve **normal serum kreatinin seviyesine** sahip 76 anjiografiye giren hastada, bu hastaların % 86 sı **anormal kreatinin klirensine** sahip olup and % 65 inde ise **GFR, 60mL/min** altında saptandı.

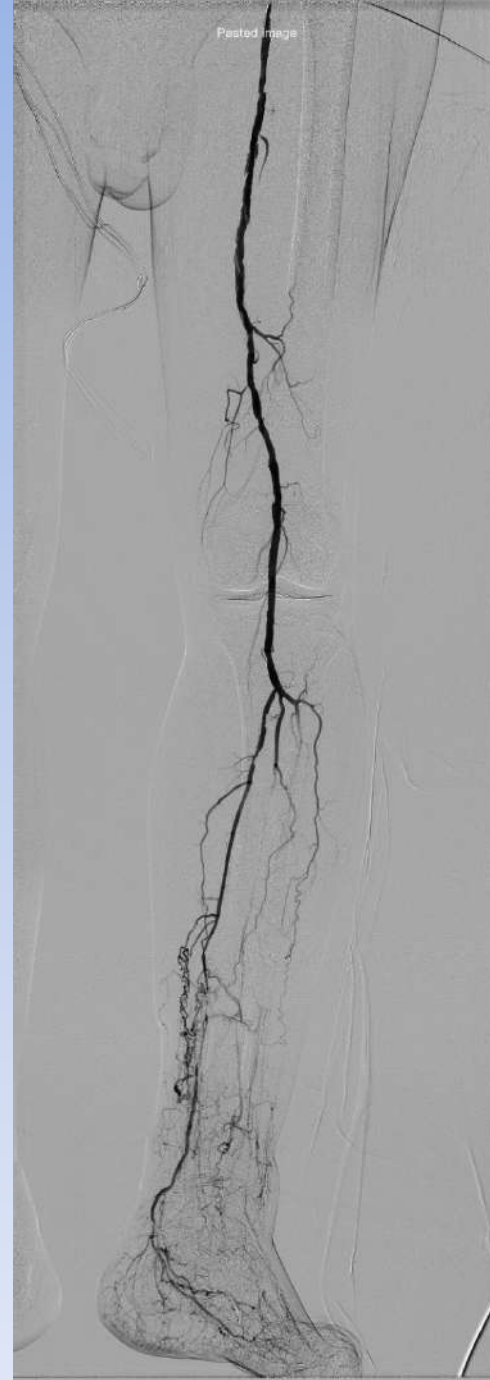
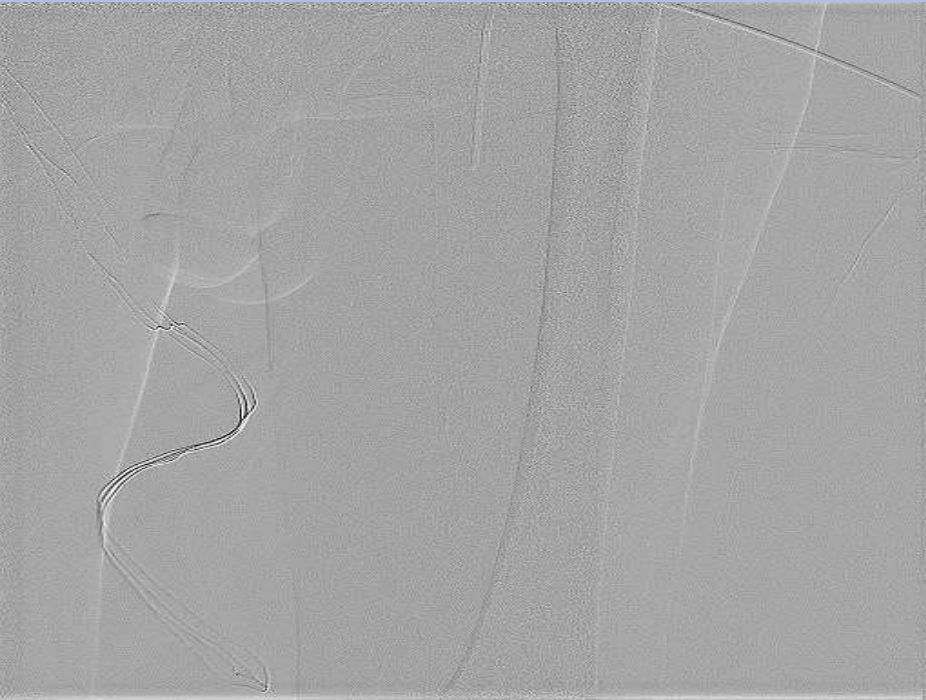
- **72 yaş erkek**
- **Her iki ayakta iyileşmeyen yara**
- **Rutherford 5**
- **DM, KAH**

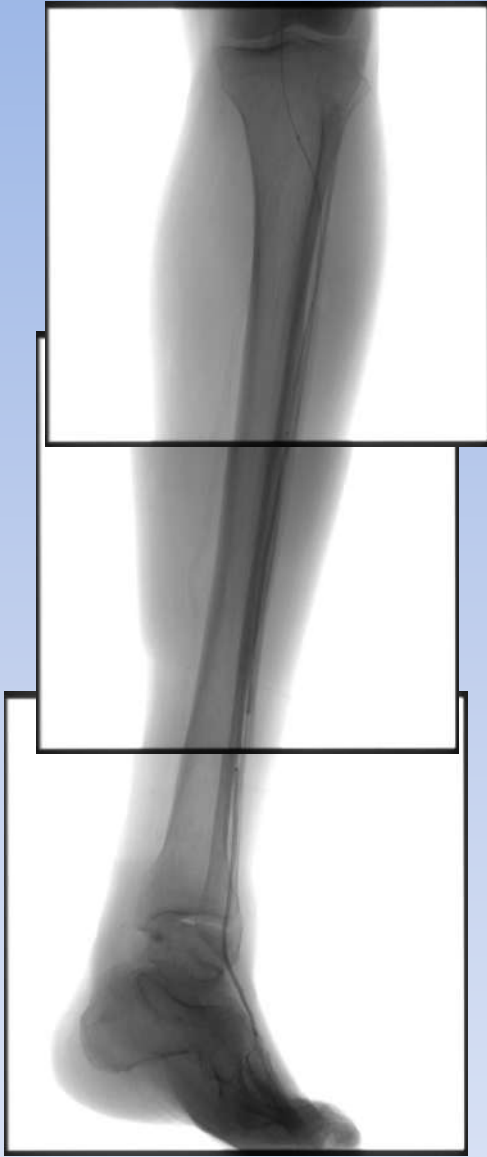


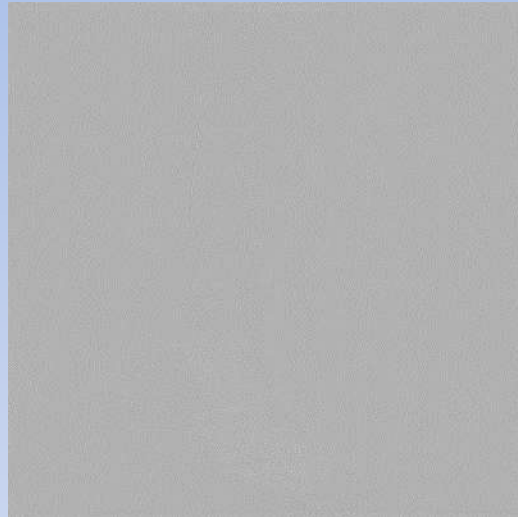
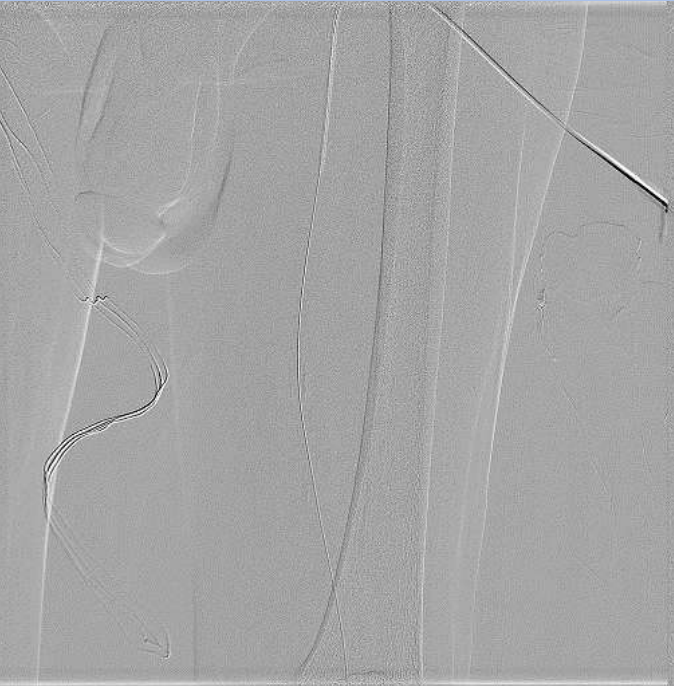




- **73 yaş hasta**
- **Sol ayakta ülsere minör yara**
- **DM,KAH,HT**
- **Rutherford 5**







CO₂ ANJİYOGRAFI

Clinical Investigation

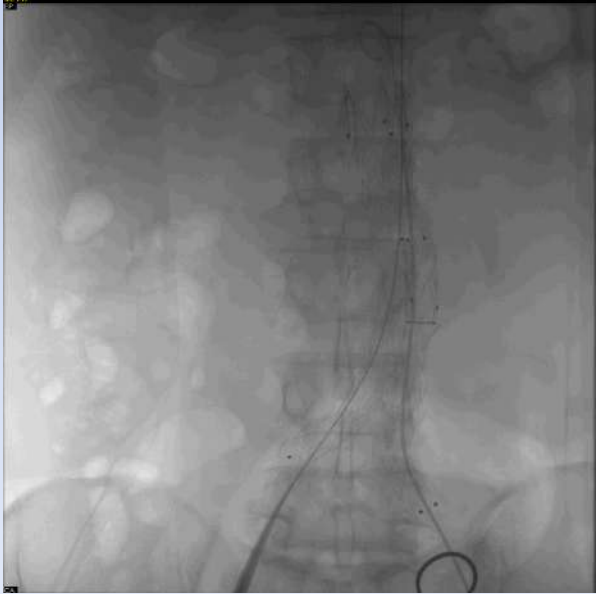
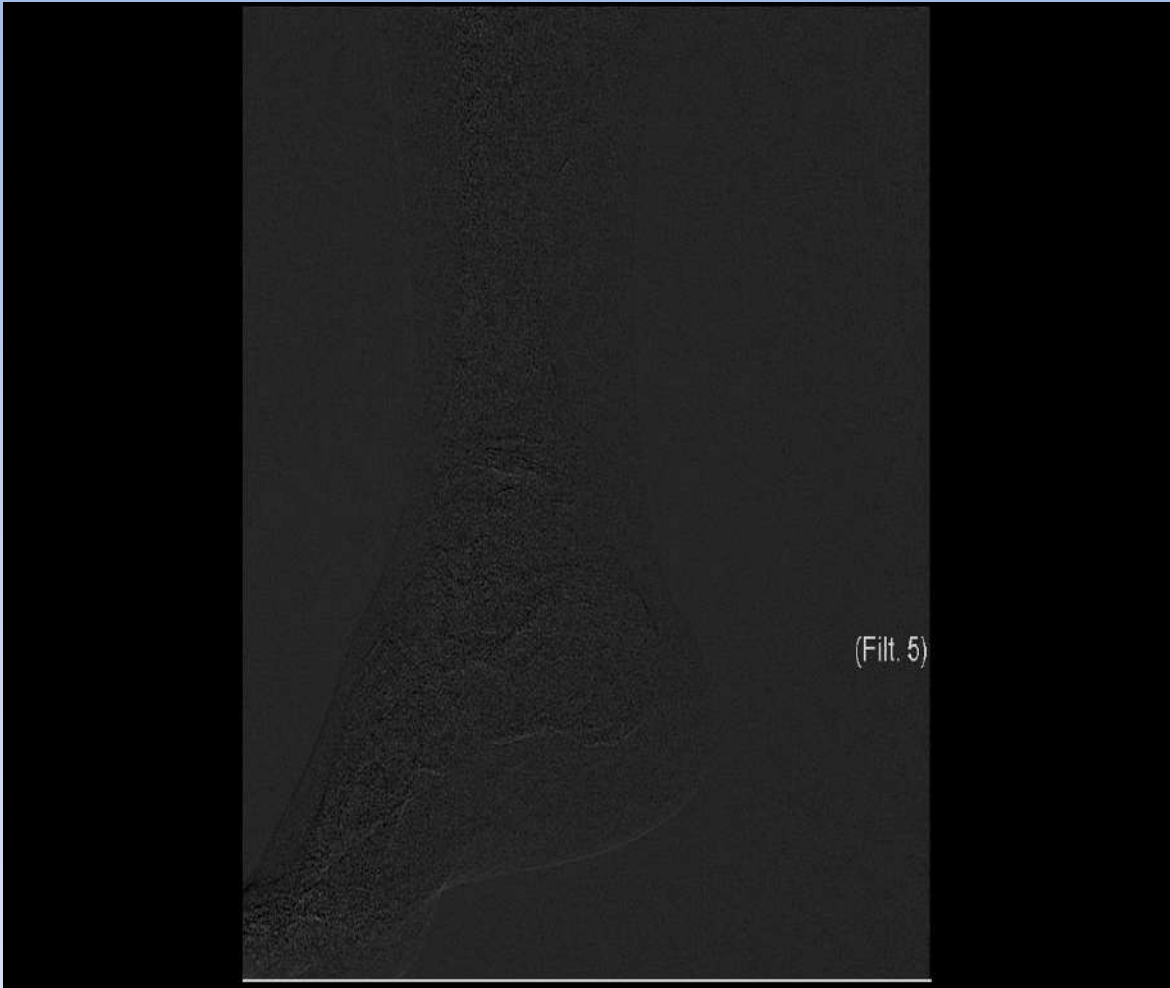
Automated Carbon Dioxide Angiography for the Evaluation and Endovascular Treatment of Diabetic Patients With Critical Limb Ischemia

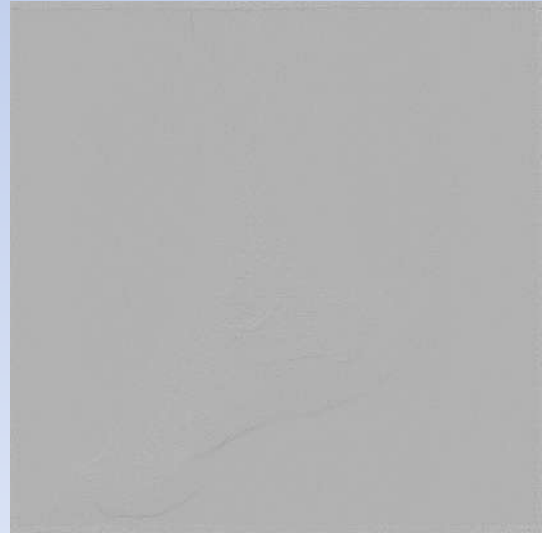
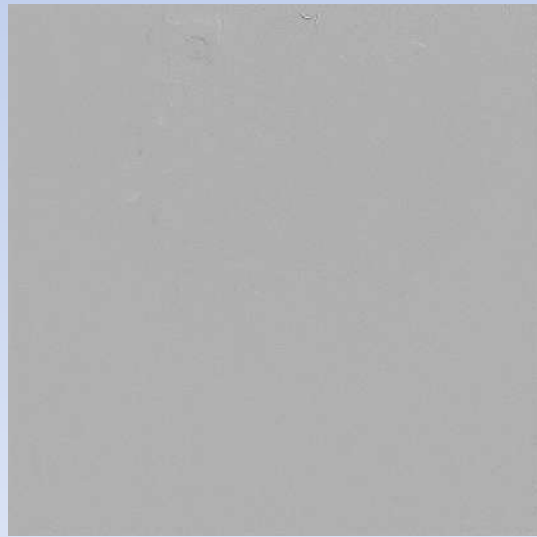
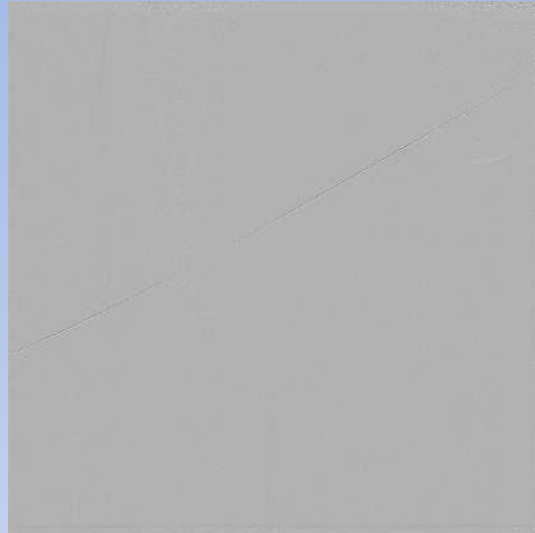
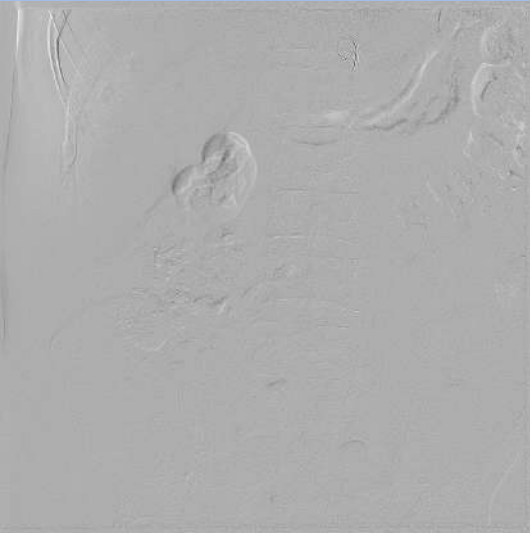
Luis Mariano Palena, MD¹, Larry J. Diaz-Sandoval, MD², Alessandro Candeo, RT¹, Cesare Brigato, DNP¹, Enrico Sultato, DNP¹, and Marco Manzi, MD¹

Abstract
Purpose: To test the safety, efficacy, and diagnostic accuracy of automated carbon dioxide (CO₂) angiography (ACDA) for the evaluation of diabetic patients with critical limb ischemia (CLI) and baseline renal insufficiency and compare ACDA with iodinated contrast medium (ICM) during endovascular treatment. **Methods:** From November 2014 to January 2015, 36 consecutive diabetic patients (mean age 74.8±5.8 years; 27 men) with stage ≥3 chronic kidney disease (CKD ≥3) and CLI underwent lower limb angiography with both CO₂ and ICM followed by balloon angioplasty in a prospective single-center study. The primary outcome measure was the safety and efficacy of ACDA as the exclusive agent to guide angioplasty in this cohort. The secondary outcomes were the safety and diagnostic accuracy of ACDA injection as compared with ICM digital subtraction angiography (DSA) for invasive evaluation of these patients. **Results:** ACDA safely and effectively guided angioplasty in all patients without complications. Transcutaneous oxygen pressure improved from 11.8±6.3 to 58.4±7.6 mm Hg (p<0.001). There were no complications related to ACDA during diagnostic imaging and no significant changes in the estimated glomerular filtration rate from baseline to 24 hours (44.7±13.3 vs 47.0±0.8 mL/min/1.73 m²; nonsignificant). The diagnostic accuracy of CO₂ was 89.8% (sensitivity 92.3%; specificity 75%; positive predictive value 95.5%; negative predictive value 63.1%). There was no statistically significant difference in the qualitative diagnostic accuracy between the media (p=0.197). **Conclusion:** ACDA is an accurate, safe, and effective technique that can be utilized to guide endovascular interventions in diabetics with CLI and baseline CKD ≥3. Larger multicenter randomized studies are needed to validate these results.

Journal of Endovascular Therapy
2016, Vol. 23(1) 40-48
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DOI: 10.1177/1526602815616924
www.jevt.org
SAGE

- 36 Diyabetik CLI hastası
- Stage 3 CKD
- Antegrade YFA akses
- Diagnostik DSA ve PTA aynı seansta
- Minor Complications:
 - Transient limb and abdominal pain, diarea
- Major Complications:
 - Non –obstructing mesenteric ischemia (Mortal)





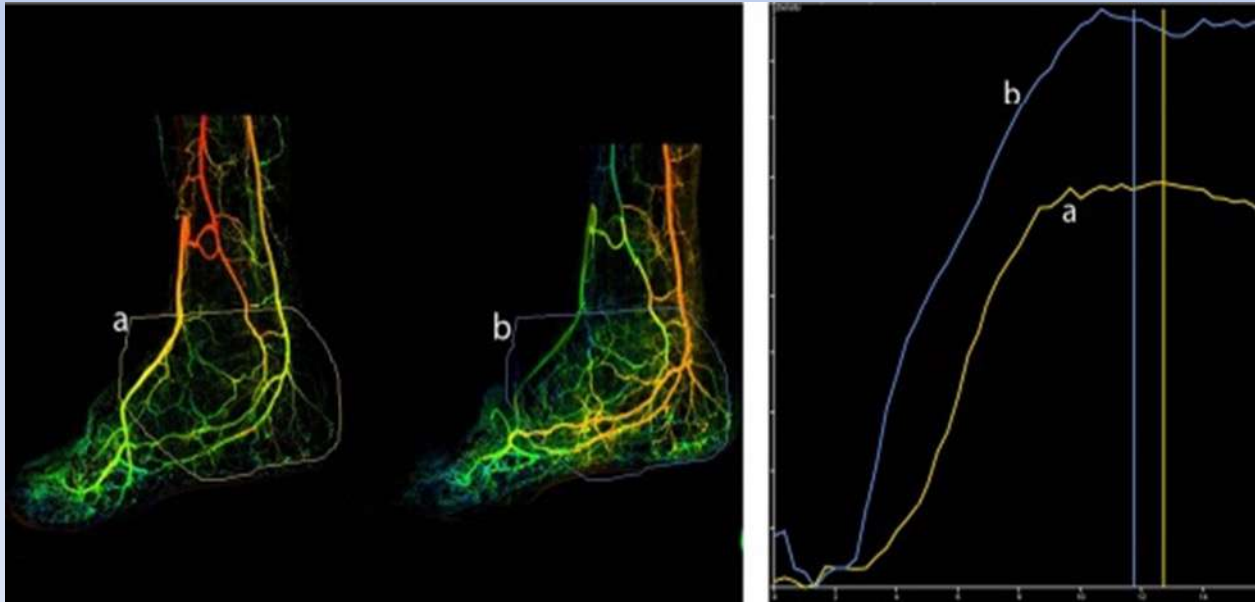
PERFÜZYON ANJİYOGRAFİ-1

Arrival time, time to peak and time-density eğrileri DSA görüntülerinden biraraya getiriliyor.

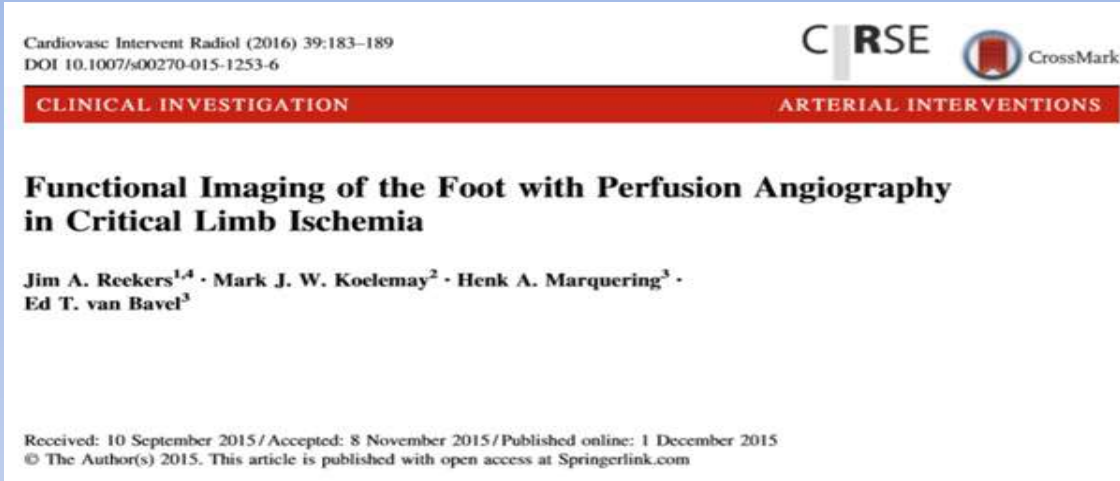
3 ana faktör önemli ;

1. Inflow
2. Ischemic Condition
3. Quality of Microcirculation

İlk iki faktör değiştirilebilir ve revaskülarizasyona cevap verebilir.



PERFÜZYON ANJİYOGRAFİ-2



PERFÜZYON ANJİYOGRAFİ, REVASKÜLARİZASYON SONRASI SONUÇLARIN ÖNGÖRÜLMESİNDE BİR PARAMETRE POTANSİYELİ TAŞIYAN BELKİ DE ELİMİZDE Kİ TEK SOMUT GÖRÜNTÜLEME MODALİTESİDİR.

Pedal sirkülasyonun %90 dan fazlası microcirculation and %10 dan daha azı macrocirculation a bağlıdır.

Perfüzyon anjiyografilerde bu nedenle makrosirkülasyona bağlılık minimal olup, klinikte her zaman inflow u artırmanın iyi bir klinik sonuçla karşılık bulmaması muhtemelen bununla ilgilidir.

ANJIOZOM-1

Long-term results of direct and indirect endovascular revascularization based on the angiosome concept in patients with critical limb ischemia presenting with isolated below-the-knee lesions

Osamu Iida, MD,^a Yoshimitsu Soga, MD,^b Keisuke Hirano, MD,^c Daizo Kawasaki, MD,^d Kenji Suzuki, MD,^e Yusuke Miyashita, MD, PhD,^f Hiroto Terashi, MD, PhD,^g and Masaaki Uematsu, MD, PhD,^a *Hyogo, Fukuoka, Kanagawa, Miyagi, and Nagano, Japan*

Angiosomes: How Do They Affect My Treatment?

Luis Mariano Palena, MD,^{*} Luis Fernando Gareia, MD,[†] Cesare Brigato, DNP,^{*} Enrico Sultato, DNP,^{*} Alessandro Candeo, RT,^{*} Tommaso Baccaglini, RT,^{*} and Marco Manzi, MD^{*}

The number of diabetic patients is actually increasing all around the world, consequently, critical limb ischemia and ischemic diabetic foot disorders related to the presence of diabetic occlusive arterial disease will represent in the next few years a challenging issue for vascular specialists. Revascularization represents one step in the treatment for the multidisciplinary team, reestablishing an adequate blood flow to the wound area, essential for healing and avoiding major amputations. The targets of revascularization can be established to obtain a "complete" revascularization, treating all tibial and foot vessels or following the angiosome and wound-related artery model, obtaining direct blood flow for the wound. In this article, we summarize our experience in endovascular treatment of diabetic critical limb ischemia, focusing on the angiosome and wound-related artery model of revascularization and the technical challenges in treating below-the-knee and below-the-ankle vessels. *Tech Vasc Intervent Radiol* 17:155-169 © 2014 Elsevier Inc. All rights reserved.

Angiosome-targeted infrapopliteal endovascular revascularization for treatment of diabetic foot ulcers

Maria Söderström, MD, PhD,^a Anders Alback, MD, PhD,^a Fausto Biancari, MD, PhD,^b Kimmo Lappalainen, MD,^c Mauri Lepäntalo, MD, PhD,^a and Maarit Venermo, MD, PhD,^a *Helsinki and Oulu, Finland*

Outcomes of angiosome and non-angiosome targeted revascularization in critical lower limb ischemia

Aadarsh Kabra, MBBS, DNB, FVCS, Kalkunte R. Suresh, MBBS, DABS, FACS, Vivekanand Vivekanand, MS, Motukuru Vishnu, MBBS, MS, FNB, Raj Sumanth, MS, and Muralikrishna Nekkanti, MBBS, MS, DNB, *Bangalore, India*

- Anjiozom konsepti sağlıklı hastalarda geliştirilen bir plastik cerrahi teorisidir.
- Özellikle pedal anatomik varyasyonların hiçbirini içermez
- Hallux genel olarak bir plantar anjiozomudur ancak DP arterinde bir anjiozomu olabilir.
- DP % 12-15 vakada yoktur veya ileri derecede hipoplaziktir ki ant tibial arter devamlılığı tarsal arter ile olabilir.
- % 12-15 vakada İNKOMPLET ARK mevcuttur.
- Topuk dual beslenmeye sahip olup peroneal ve PTA den gelen dallarla beslenir.

ANJİYOZOM-2

INVITED COMMENTARY

Commentary on “Angiosome-targeted Lower Limb Revascularization for Ischaemic Foot Wounds: Systematic Review and Meta-analysis”

R. Forsythe, R. Hinchliffe *

St George's Vascular Institute, London SW17 0RE, UK

Khori and Price *Journal of Foot and Ankle Research* (2017) 10:26
DOI 10.1186/s13047-017-0206-5

Journal of
Foot and Ankle Research

RESEARCH

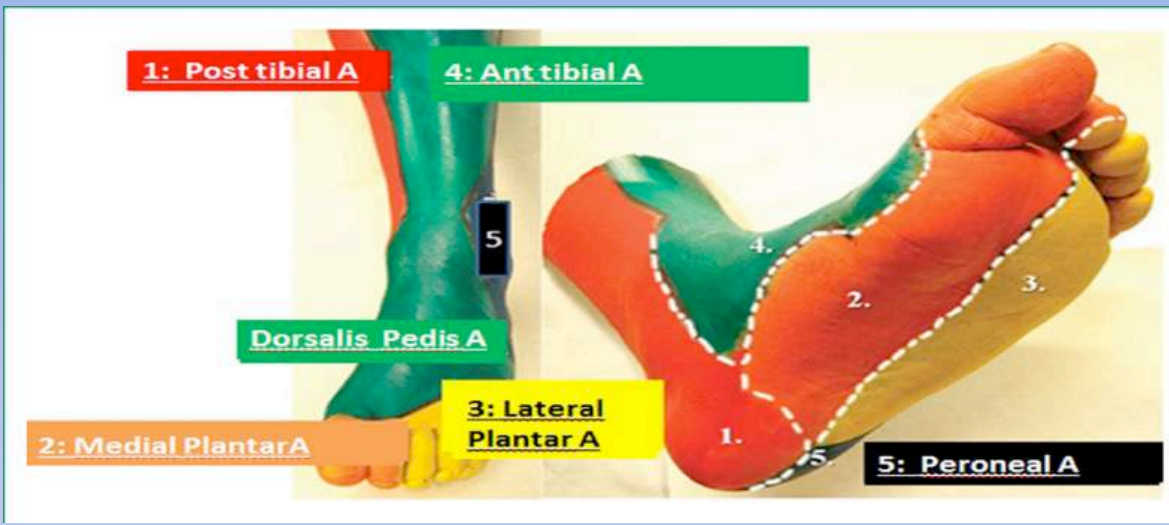
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The comparative efficacy of angiosome-directed and indirect revascularisation strategies to aid healing of chronic foot wounds in patients with co-morbid diabetes mellitus and critical limb ischaemia: a literature review

Benedictine Y. C. Khor^{1*} and Pamela Price²

- **Angiosome teorisi KAI veya diyabet hastalarında çok sağlıklı öngörülemez ve uygulanamaz.**
- **Yeni bilimsel datalar bize KAI gibi vasküler yatağın içerdiği anormallikler nedeniyle perfüzyon paterni bozulmuş subgruplarda, diyabetik hastalar gibi kollateral formasyonu bozulmuş grupta veya varolan mikrovasküler yatağın atrofiye uğradığı durumlarda anjiyozom modelinin kan akımı topografik dağılımını pek öngöremediğini göstermektedir.**
- **Bir yaranın topografik lokasyonu her zaman o anjiyozomun besleyici arteri ile korelasyon göstermez.**



- **Kişisel anatomik varyasyonları** ve % 90 dan fazlası benzerlik gösterecek ayrıntılı anatomiye anjiyo sitede belirlemek
- Her ayak için **kollateral** rezervini saptamak kritik. **Dominant ayak ark** ının tanımlanması ve **angiozom** ile bağlantılı marjinal kollaterallerin saptanması kritiktir.

TEDAVİ

Endovascular Treatment of Critical Limb Ischemia In Buerger Disease (Thromboangiitis Obliterans) With Midterm Follow-Up: A Viable Option When Bypass Surgery Is Not Feasible

Sadık Ahmet Uyanık, MD¹, Umut Öğürlü, MD¹, İbrahim Sani Aminu, MD², Birnur Yılmaz, MD¹, Halime Çevik, MD¹, Eray Atlı, MD¹, Burçak Gümüş, MD¹

Interventional Radiology · Original Research

Keywords

Buerger disease, endovascular treatment, thromboangiitis obliterans

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The authors declare that they have no disclosures relevant to the subject matter of this article.

OBJECTIVE. Thromboangiitis obliterans (TAO) is an occlusive inflammatory disease affecting small- and medium-sized vessels that causes decrease in life quality and eventually limb loss. The only proven treatment method is smoking cessation, but it may be insufficient for limb salvage in patients with critical limb ischemia. In this single-center retrospective study, the feasibility and efficiency of endovascular treatment in TAO were evaluated.

MATERIALS AND METHODS. After approval of the local institutional review board, 41 patients who underwent endovascular treatment of TAO between January 2014 and June 2019 were evaluated retrospectively. Technical success and procedure-related complications were recorded. Decrease in Rutherford classification score, relief of pain, and wound healing were evaluated to determine clinical success. Primary patency, limb salvage rate, and amputation-free survival were also evaluated.

RESULTS. A total of 45 limbs were treated during the study period. Technical success was achieved in 82.2% of procedures. Mean follow-up was 29.8 months. Clinical improvement was achieved in 35 limbs. Three patients underwent major amputation and 12 patients underwent minor amputation. Amputation-free survival and limb salvage were both 93.3% at both 1 and 2 years. Reintervention was performed in 14 patients because of occlusion and clinical relapsing of the symptoms.

CONCLUSION. Endovascular treatment of TAO is feasible, has a potential to prevent limb amputation in patients with critical limb ischemia, and has acceptable technical success and limb salvage rates. Because there is no consensus in treatment of TAO, prospective comparative studies are needed to determine the effectiveness of an endovascular approach.

- Revaskülarizasyon KAI hastalarında ilk hedef tedavidir.
- Artan tecrübe ve endovasküler teknolojinin gelişimi artık en kompleks lezyonların bile endovasküler yolla tedavisini mümkün kılmaktadır.
- **KAI tedavisi =Kompleks lezyon tedavisi**
- Multidisipliner bir çalışma modelinin başlatılması ampütasyonları **% 94** e kadar azaltabiliyor.

NEGATİF GÖSTERGELER

Ayağa düz en azından bir arter akışı olmayışı

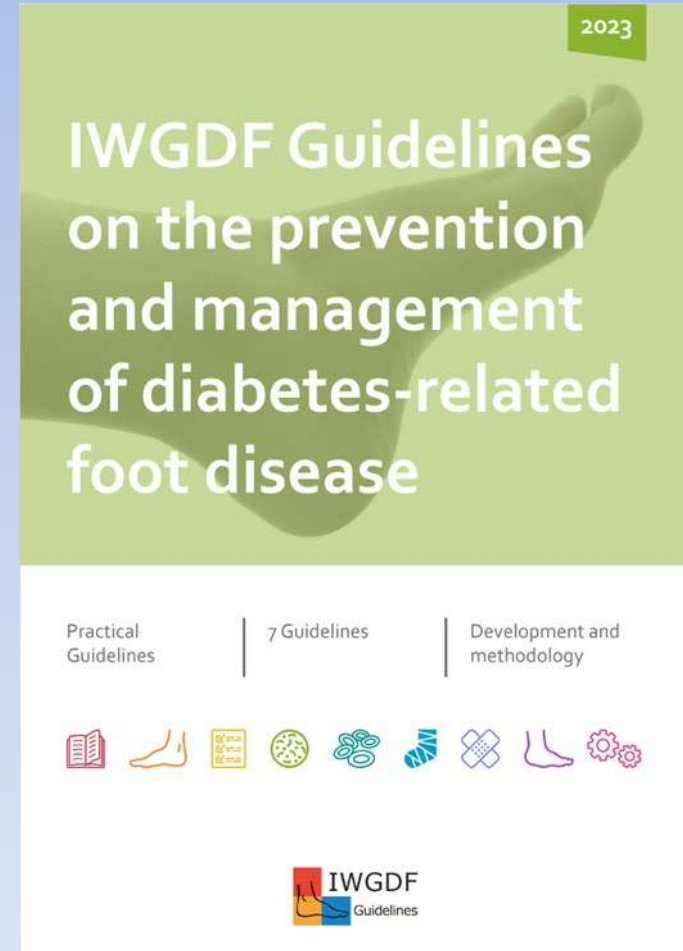
Diyabet

Böbrek yetmezliği

Rutherford 6



- Endovasküler ya da cerrahi revaskülarizasyona giden diyabetik hastalarda IWGDF tarafından 2019 da yapılan bir review de , **peri-operative** 30 günlük **mortalite** oranı **% 2** olarak bildirilmiştir.
- En yüksek risk grubu **son dönem böbrek yetmezliği** olan gruptur ve bu grup, **% 5 peri-operative mortalite** oranına, **%40** 1 yıllık **mortalite** oranına ve **% 70** civarında 1 yıllık **ekstremitte sağkalımına** sahiptirler.



REVASKÜLARİZASYON STRATEJİSİ

Akses

İpsi, kontralateral, antegrad ve retrograd

Teknik

Intraluminal, subintimal

Lezyonun özellikleri

Lezyonun uzunluğu

Kalsifikasyon varlığı

Proksimal ve distal güdük özellikleri

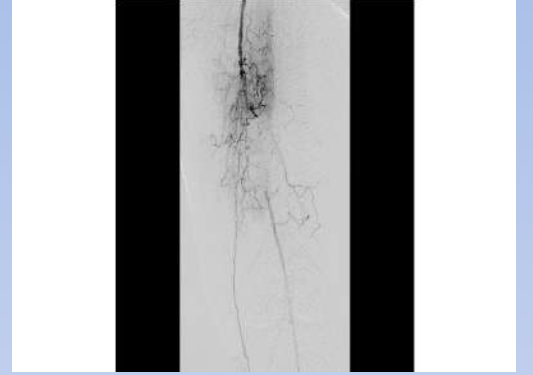
Ekipman

PTA: POBA vs DEB

PTA + Stent

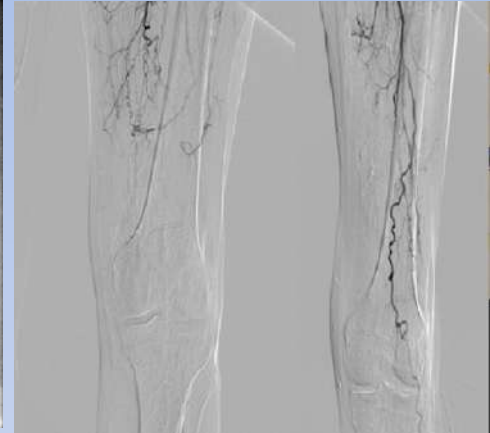
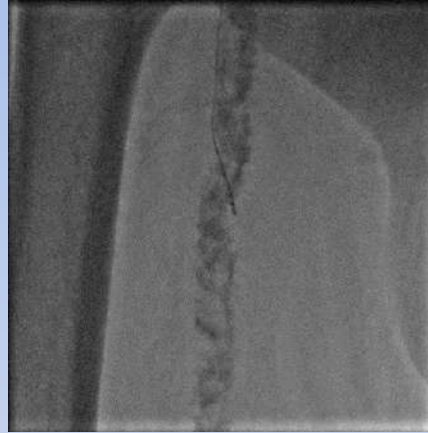
Stent : BME vs DES

Diğerleri: Cryo, Cutting, Atherectomy, Laser, Shockwave



ENDOVASKÜLER GİRİŞİM KARAKTERİSTİKLERİ VE ZORLUKLARI

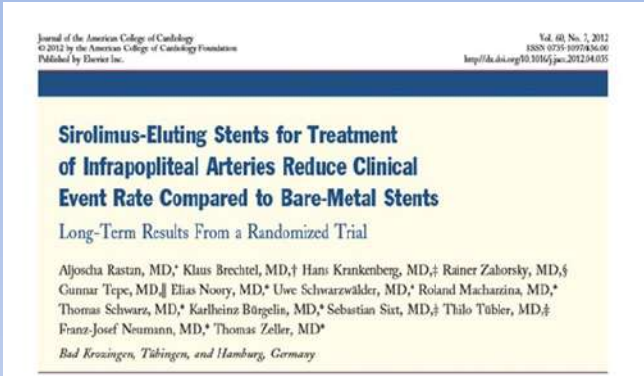
- Küçük damar çapı
- Ağır kalsifikasyon
- Yoğun plak yükü
- Uzun segment oklüzyon
- Kronik total oklüzyon
- Elastik rekoil
- Mikroembolizasyon
- Desert foot
- **Yüksek restenoz oranı**



“Trans-Collateral” Angioplasty for a Challenging Chronic Total Occlusion of the Tibial Vessels: A Novel Approach to Percutaneous Revascularization in Critical Lower Limb Ischemia

Massimiliano Fusaro,^{1*} MD, Pierfrancesco Agostoni,² MD, and Giuseppe Biondi-Zoccai,³ MD

İLAÇ SALINIMLI STENTLER



• YUKON-BTX

- 161 hasta
- CLI ve IC
- DES ve BMS
- % 53.8 Diabetes
- DES mean length 31+- 9 mm
- DES ler, Long –term event free survival, amputasyon oranı and klinik iyileşmede (Rutherford classification parameters) daha üstünler
- Takip 36 ay



• ACHILLES

- 200 hasta
- CLI ve IC
- DES ve PTA
- % 64.5 Diabetes
- DES mean length 26.9 +- 20.9 mm
- Infrapopliteal DES, PTA ile kıyaslandığında; hem yara iyileşmesinde hem QoL da daha üstün
- Takip 12 ay

İLAÇ SALINIMLI STENTLER



PADI TRIAL

Multicenter, RCT
DES İLE PTA/ bail out stentleme (Stentler Paclitaxel yüklü Taxus)

Major Amputation
DES % 19.3, PTA-BMS % 34

Amputation free survival
DES % 31.8 PTA-BMS % 20.4

Event free survival
DES %26.2 PTA-BMS % 15.3

60 AYLIK TAKİP MEVCUT

DESTINY

En belirgin özelliği sadece CLI hastalarını içermesi ki bu özelliği ile YUKON-BTX ve ACHILLES çalışmalarından ayrılır

DES ve BMS

PP DES %85 ve BMS % 54

Takip 12 ay

Current evidence of drug-elution therapy for infrapopliteal arterial disease

Stavros Spiliopoulos, Nikiforos Vasiniotis Kamarinos, Elias Brountzos

HEDEF DİZALTI

Bir yıllık takipte, diğer kontrol tedavilerine göre **infrapopliteal DES** kullanımı, daha yüksek **PP**, **Rutherford sınıflamasında** iyileşme, daha iyi **yara iyileşmesi** ve yine olaydan bağımsız **sağkalımda** daha üstündür.

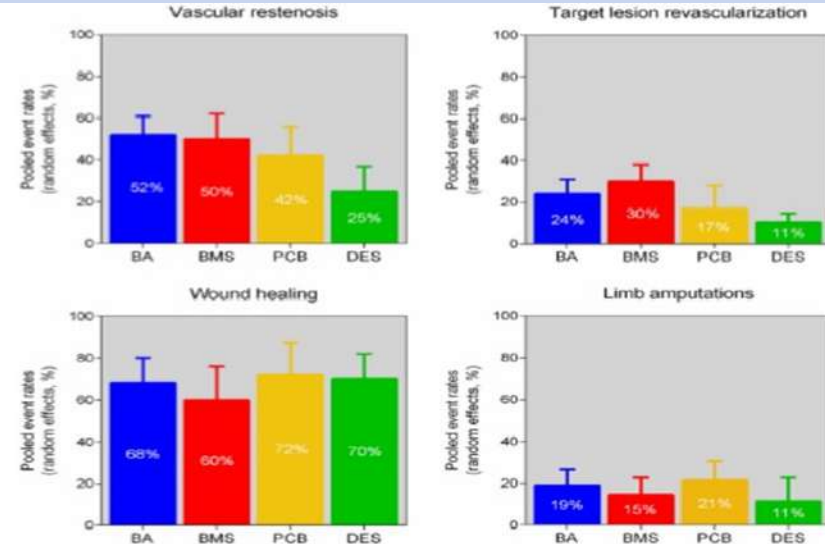
Elimizde, fokal BTK lezyonlarının tedavisinde, **DES** lerin primer kullanımı için artık yeterli Level I bilimsel kanıt mevcuttur. Infrapopliteal **DES** ler, anlamlı olarak vasküler restenozu durdurmakta ve böylece, patensiyi artırmakta, tekrar girişim ihtiyacını azaltmakta, hadise-bağımsız sağkalımı uzatmakta ve yara iyileşmesini hızlandırmaktadırlar.

Meta-analysis

Comparative Effectiveness of Plain Balloon Angioplasty, Bare Metal Stents, Drug-Coated Balloons, and Drug-Eluting Stents for the Treatment of Infrapopliteal Artery Disease: Systematic Review and Bayesian Network Meta-analysis of Randomized Controlled Trials

Konstantinos Katsanos, MSc, MD, PhD, EBIR¹, Panagiotis Kitrou, MD, PhD², Stavros Spiliopoulos, MD, PhD, EBIR¹, Athanasios Diamantopoulos, MD, PhD¹, and Dimitris Karnabatidis, MD, PhD, EBIR¹

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**ENDOVASCULAR
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Journal of Endovascular Therapy
2016, Vol. 23(6), 651-663
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DOI: 10.1177/1526733516662746
SAGE



- **70 yař erkek hasta**
- **KAH, KBY, DM**
- **35 paket yıl sigara**
- **Parmakta minör yara**

(Filt. 5)

(Filt. 5)

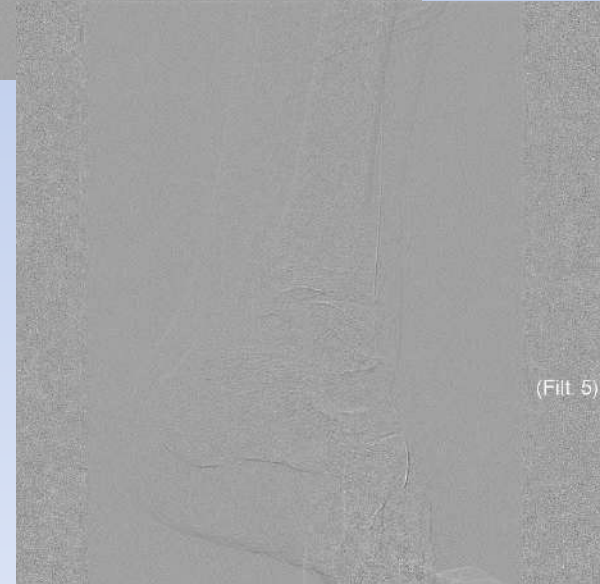
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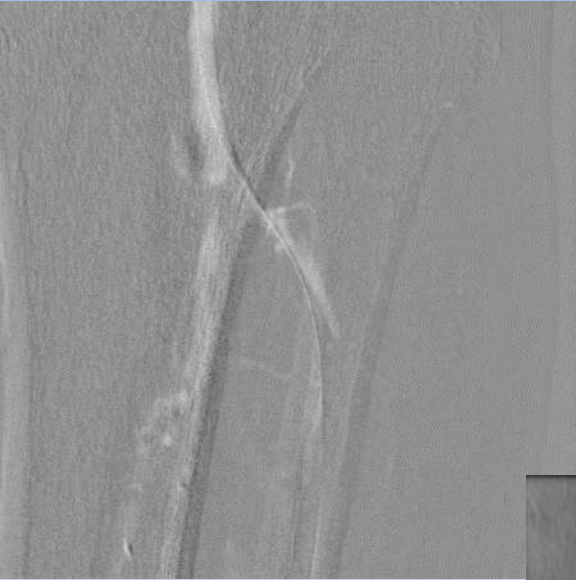
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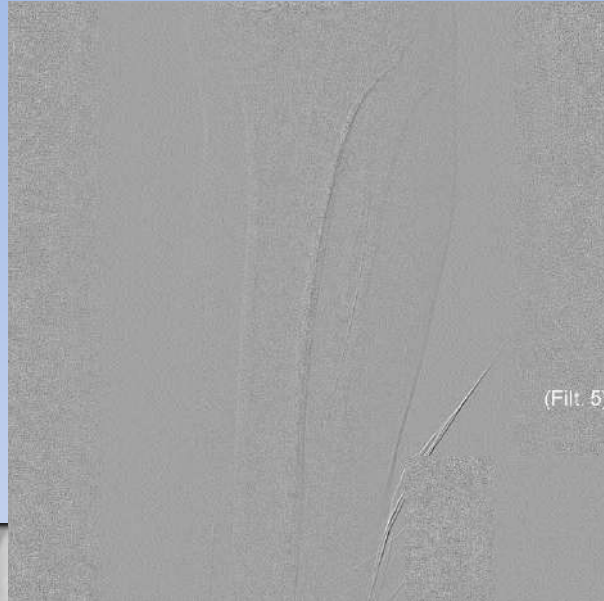
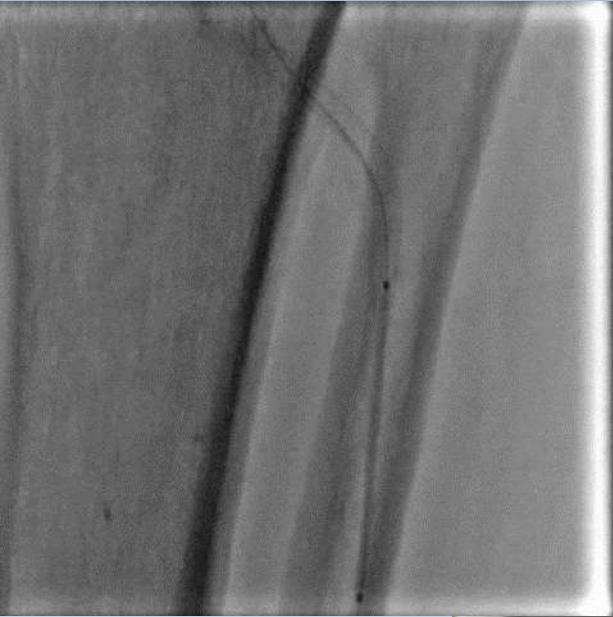


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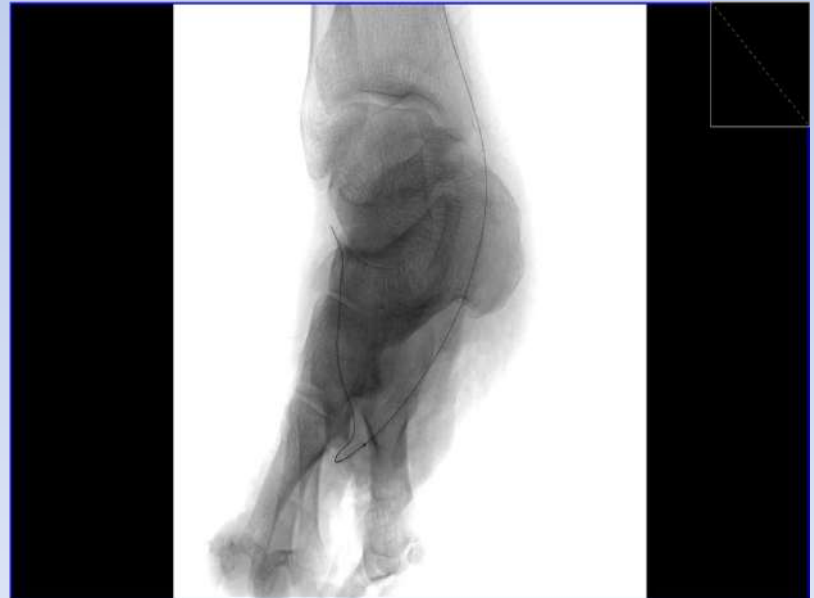
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ALTERNATİF YAKLAŞIMLAR

- Konvansiyonel antegrad yaklaşım vakaların çoğunda yeterli
- Fakat ,vakaların % 10-40 ında teknik başarısızlık bildiriliyor...
- Alternatif teknikler, başarı oranlarını arttırmak ve teknik başarısızlığın üstesinden gelerek ekstremitte sağkalımını artırmak amacıyla kullanılabilirler.



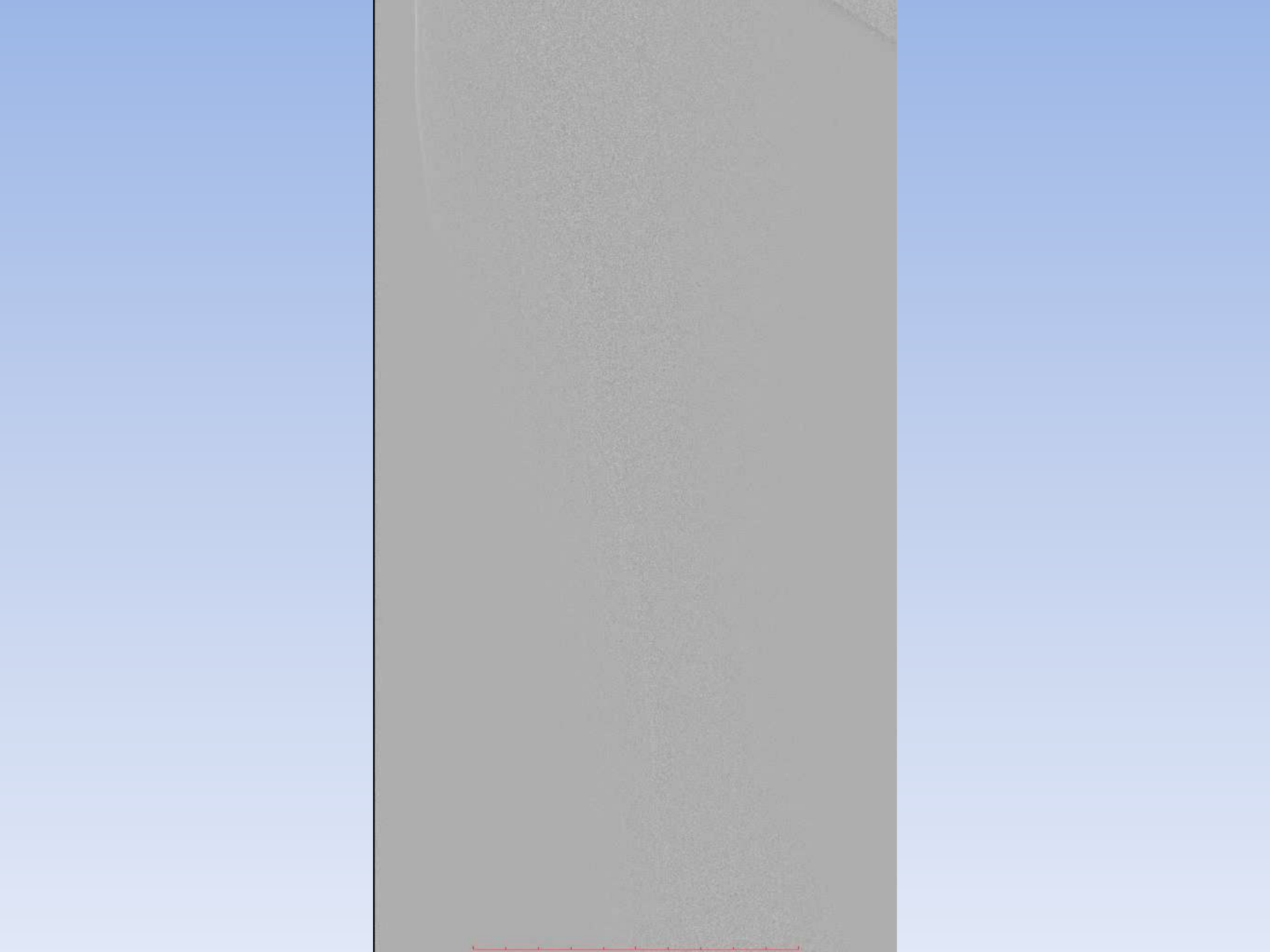
Alternative Teknikler

- Pedal-plantar Loop
- Trans-kollateral angioplasti
- Combined antegrade-retrograde Technique (CART)
- Crossing devices
- Deep vein arterialization





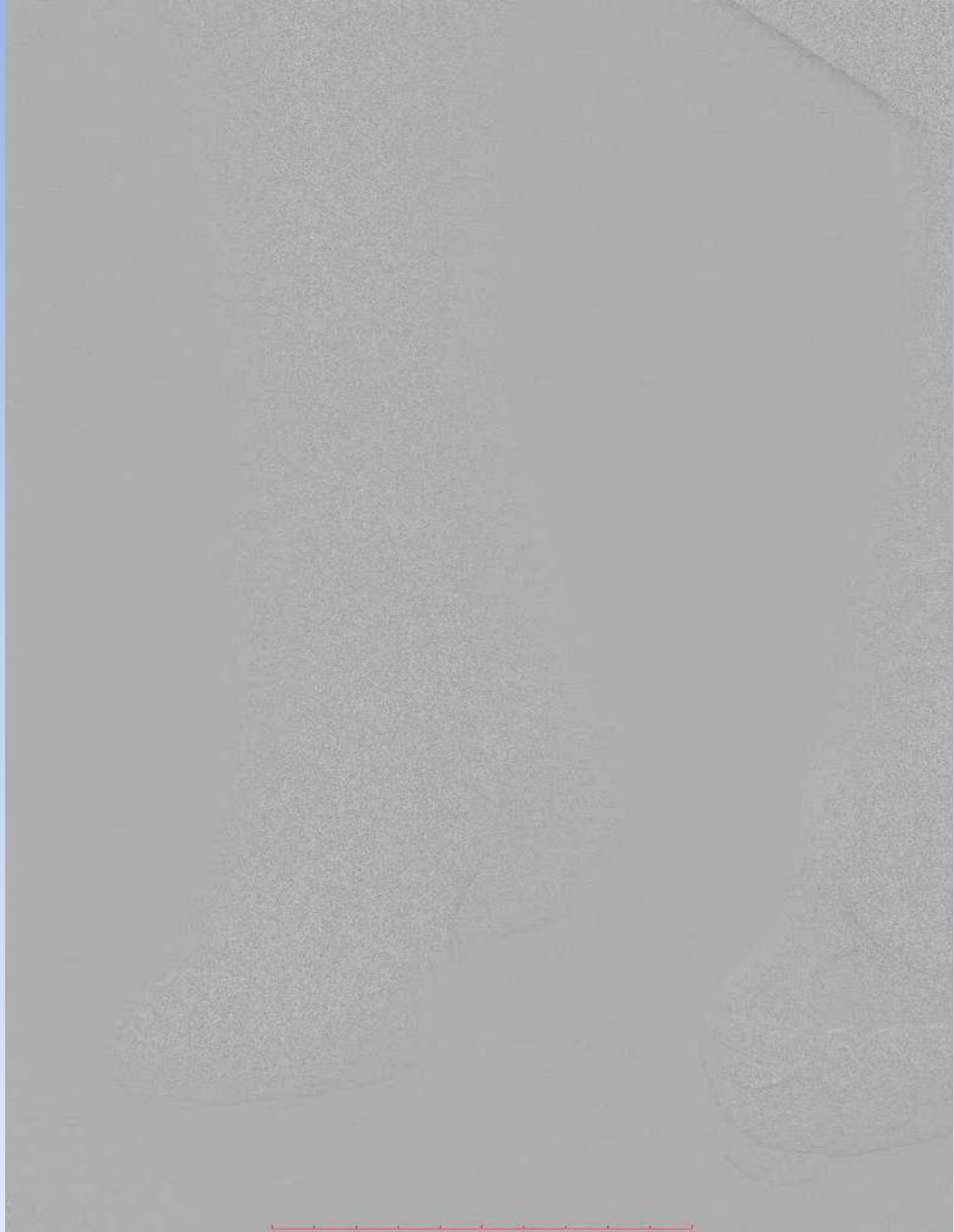
- 48 yaşında bayan
- DM,CRF
- Kalkaneal alan ve topukta iyileşmeyen geniş yara
- Rutherford 5













69 y.o kadın

DM,HT,HL

Lateral kalkaneal ülserasyon

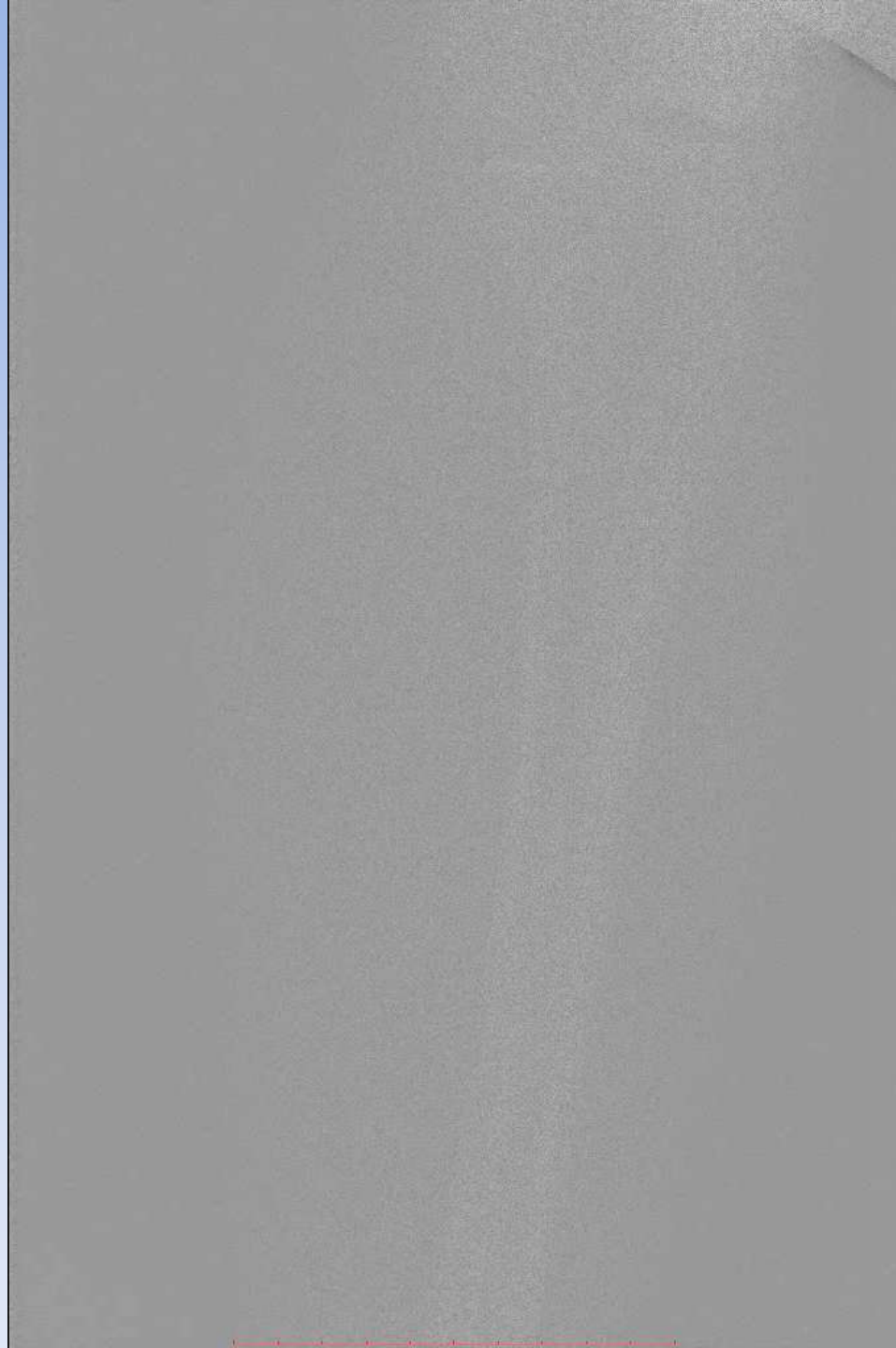
Rutherford 5















67 y.o erkek

DM,HT,CAD

Rutherford 6

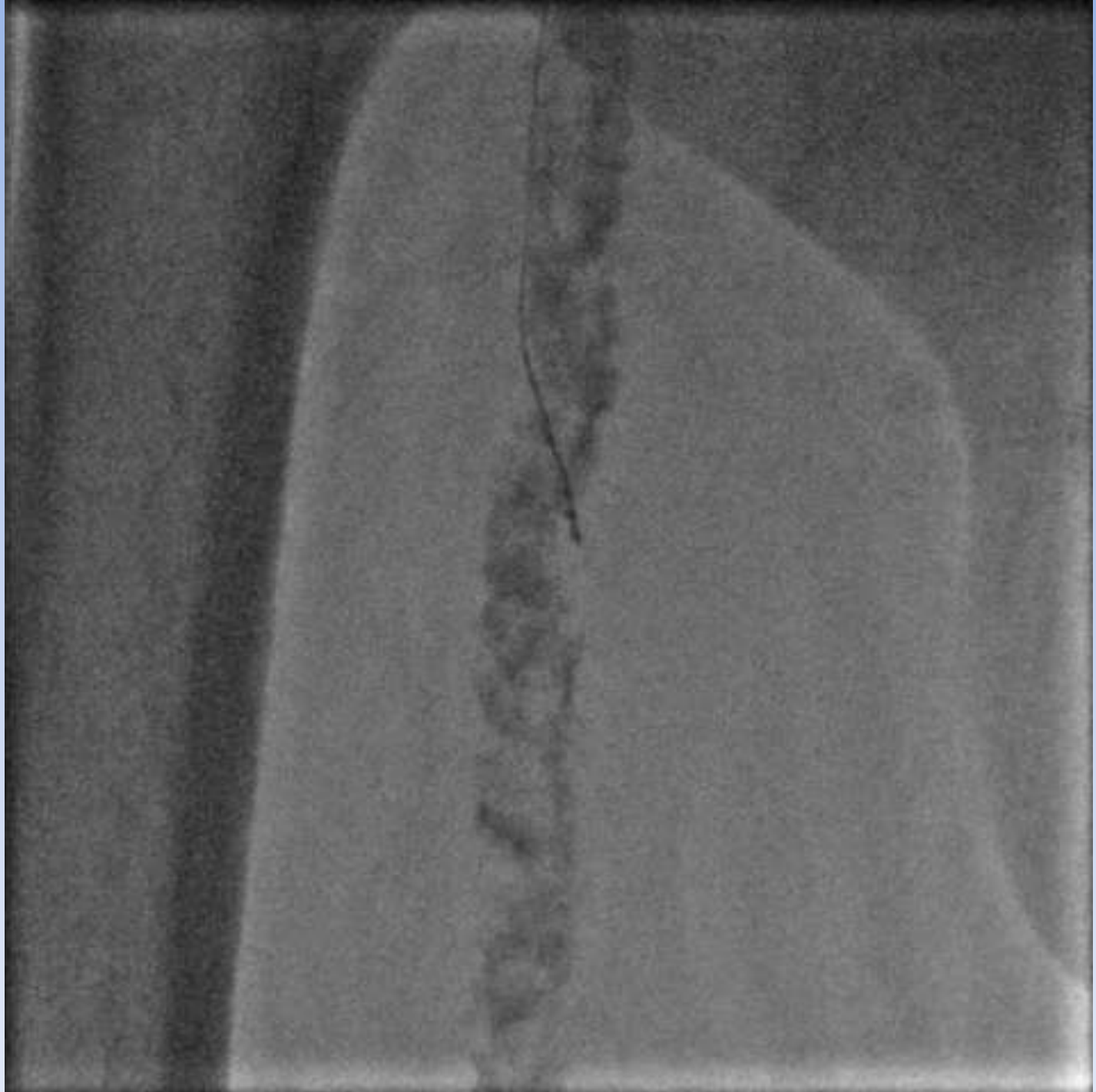
İstirahat ağrısı

**Daha önceki endovasküler denemeler
başarısız**

Amputasyon güdüğünde iyileşmeyen yara

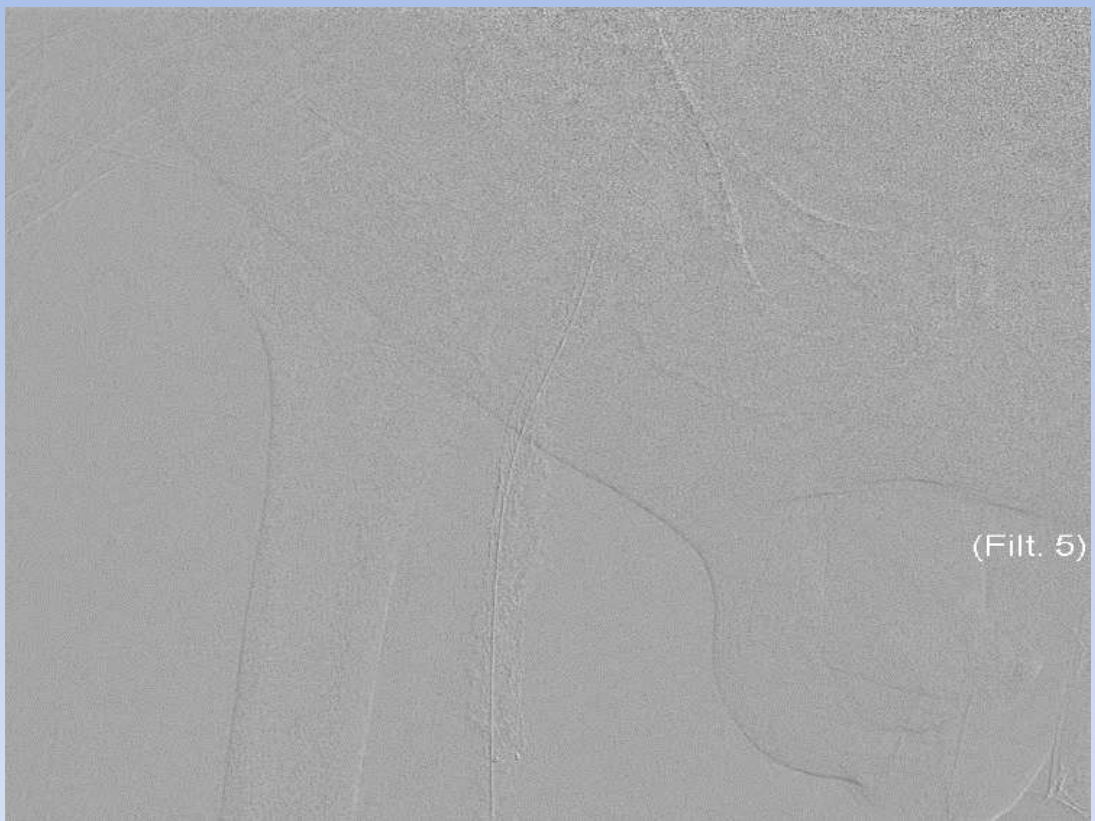
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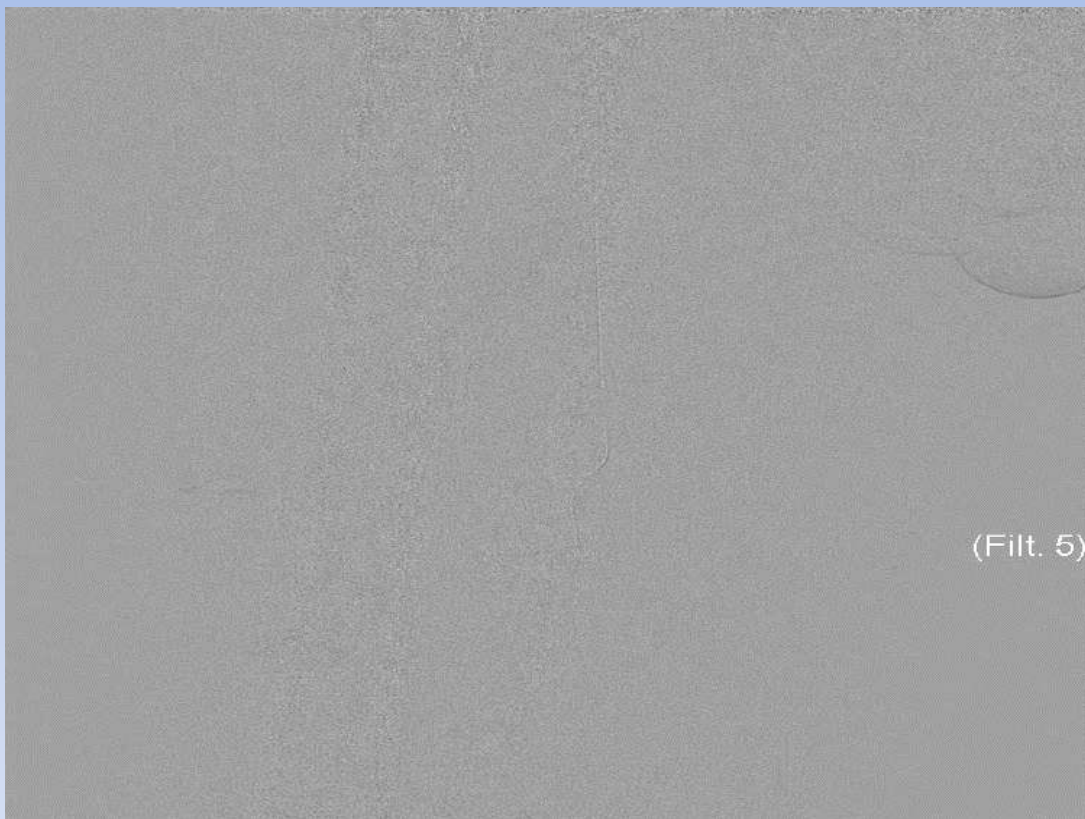








(Filt. 5)



(Filt. 5)



(Filt. 5)

- **64 y.o E**
 - **İstirahat ağrısı**
 - **Uzun segment ileri derecede kalsifiye SFA CTO**
 - **Rutherford 4**
-
- **Double ballon technique**

(Filt. 5)

(Filt. 5)

(Filt. 5)



(Filt. 5)









(Filt. 5)



(Filt. 5)(FLT:e1)

Retrograd Pedal Akses

CLINICAL STUDY



Retrograde Pedal Access via Occluded Arteries in Endovascular Treatment of Critical Limb Ischemia

Sadık Ahmet Uyanık, MD, Umut Öğüşlü, MD, Birnur Yılmaz, MD, Halime Çevik, MD, Eray Atılı, MD, and Burçak Gümüş, MD

ABSTRACT

Purpose: To evaluate the feasibility and technical outcomes of retrograde access via occluded pedal arteries in endovascular treatment of critical limb ischemia (CLI) when the conventional antegrade approach fails.

Materials and Methods: One hundred fifty-one patients with CLI (age 69 ± 10.5 ; 116 men) who were not surgical candidates and were treated via retrograde pedal access between January 2016 and January 2018 were evaluated retrospectively. Seventy patients in whom retrograde access was performed through occluded arteries constituted the occluded group, and 81 patients who were treated via retrograde access from patent arteries constituted the nonoccluded group. Pedal access success, lesion crossing success, angiographic success, overall technical success, and procedure-related complications were evaluated and compared between groups.

Results: Pedal access success (74 of 78 vs 83 of 87 attempts; $P = .873$) and lesion crossing success (64 of 78 vs 77 of 87 lesions; $P = .340$) were comparable between subgroups. Angiographic success (54 of 78 vs 77 of 87 lesions; $P = .012$) and overall technical success (48 of 70 vs 72 of 81 patients; $P = .004$) rates were lower in the occluded group. Procedure-related complications were similar between groups ($P = .096$).

Conclusions: Retrograde pedal access from occluded pedal arteries is a feasible option when an antegrade approach fails in endovascular treatment of CLI. Although it has lower technical success, its use enables angiosome-directed therapy and has the potential to improve the outcomes of the procedure.

- Antegrad yaklaşımda teknik başarısızlık durumunda
- CTO nun distal güdüğü daha az fibrotiktir
- Daha fazla mekanik destek ve itebilme gücü
- Kombine antegrade ve retrograde yaklaşım lümeneye tekrar giriş şansını artırabiliyor
- SAFARI veya double balloon teknikleri kullanılabilir

- **56 y.o K**
- **DM, CRF**
- **İstirahat ağrısı, major doku kaybı ve gecikmiş yara iyileşmesi**
- **Rutherford 6**
- **Daha önce başarısız endovasküler girişim**



(Filt. 5)



(Filt. 5)

Diagnostic angiography showed patent SFA and popliteal artery



(Fil



(Filt. 5)

Long segmental CTO of PTA and plantary arteries



After failed attempt of antegrade recanalization, puncture of the occluded PTA was performed.



- Combined antegrade-retrograde approach



(Filt. 5)

(Filt. 5)

Combined antegrade-retrograde approach was used but re-entry in the lateral plantar artery was failed and guidewire ended in subintimal space



Puncture of lateral plantar artery at sole of the foot



Angiography after retrograde angioplasty

- **65 yaşında erkek**
- **Rutherford 5**
- **DM, Sigara kullanımı**
- **2 kez femoropopliteal by-pass**
- **Daha önce SFA ya endovasküler girişimle uzun segment stentleme**

CLINICAL STUDY

Endovascular Recanalization of the Chronically Occluded Native Superficial Artery After Failed Bypass Graft: Midterm Results

Umut Oguslu, MD, Sadık Ahmet Uyanık, MD, Halime Çevik Cenkeri, MD, Eray Atli, MD, Birmur Yılmaz, MD, and Burçak Gümüş, MD





3D
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Se:2
Volume Rendering No cut
DFOV 138.6 cm
STND/+E/AR70 No Filter

Nb Views: 20
Rotation: 18.0 deg.

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MEDICANA INTERNATIONAL HOSPITAL
M 60 32404952302
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Ex: Aug 07 2023

Calc. incl.

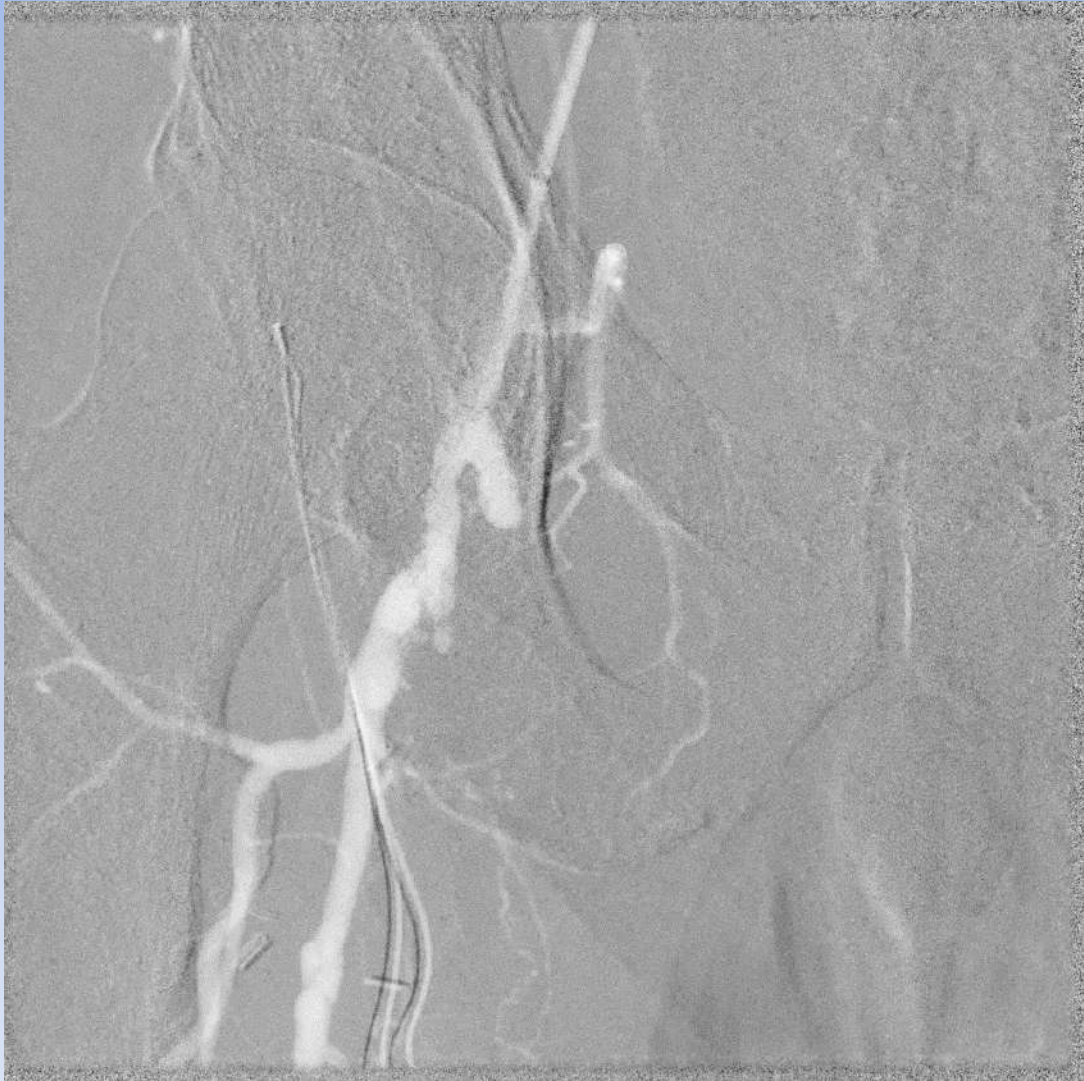
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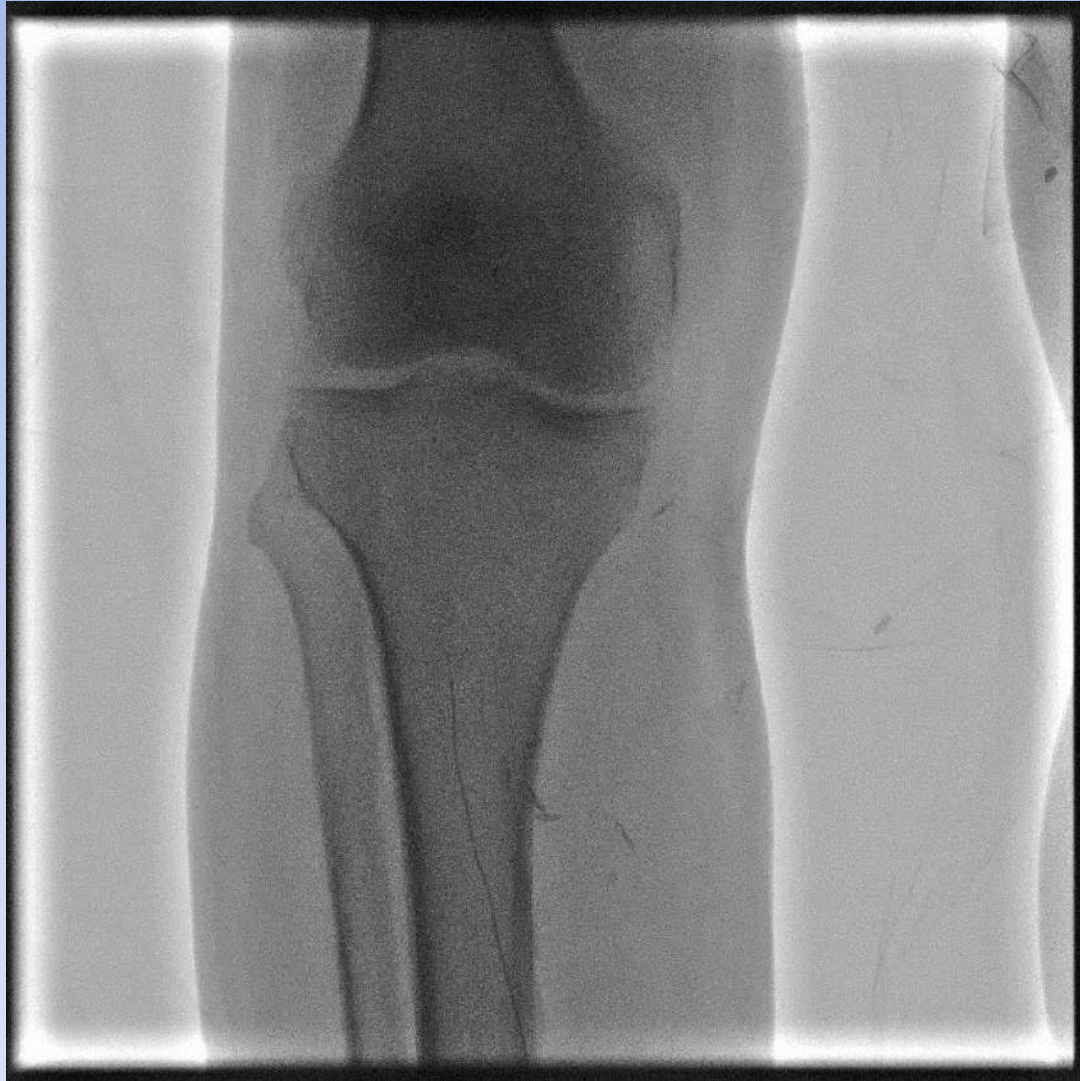
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A 3D volume rendering of the chest vasculature, showing the heart, lungs, and a network of blood vessels. The rendering is in a golden-brown color. The image is displayed on a black background with various technical parameters and patient information overlaid.



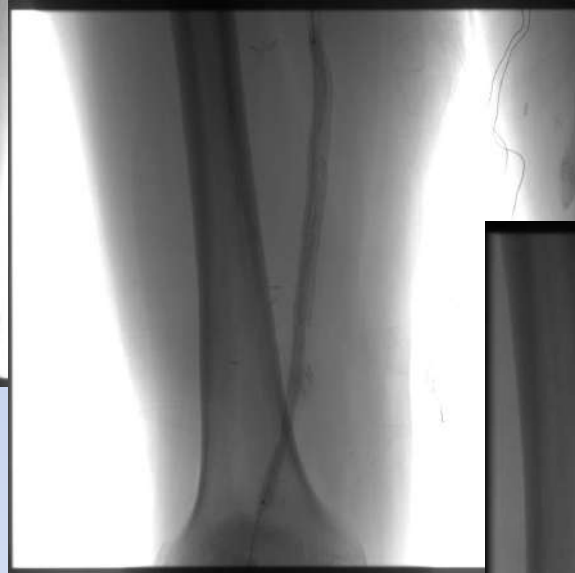
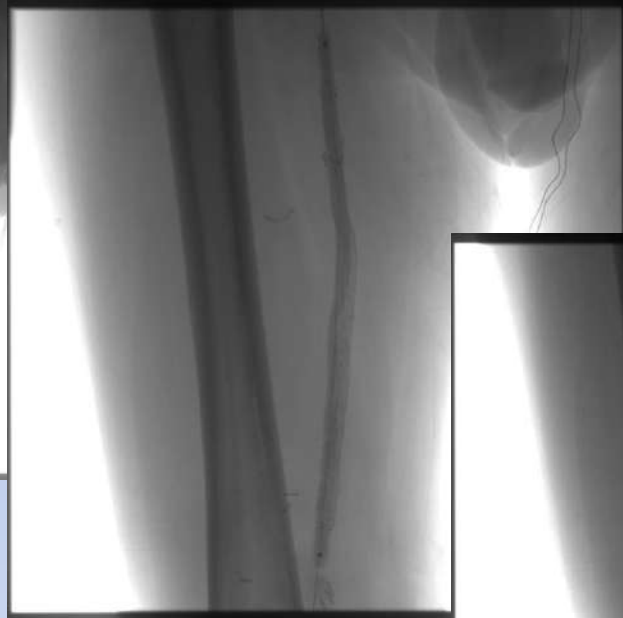


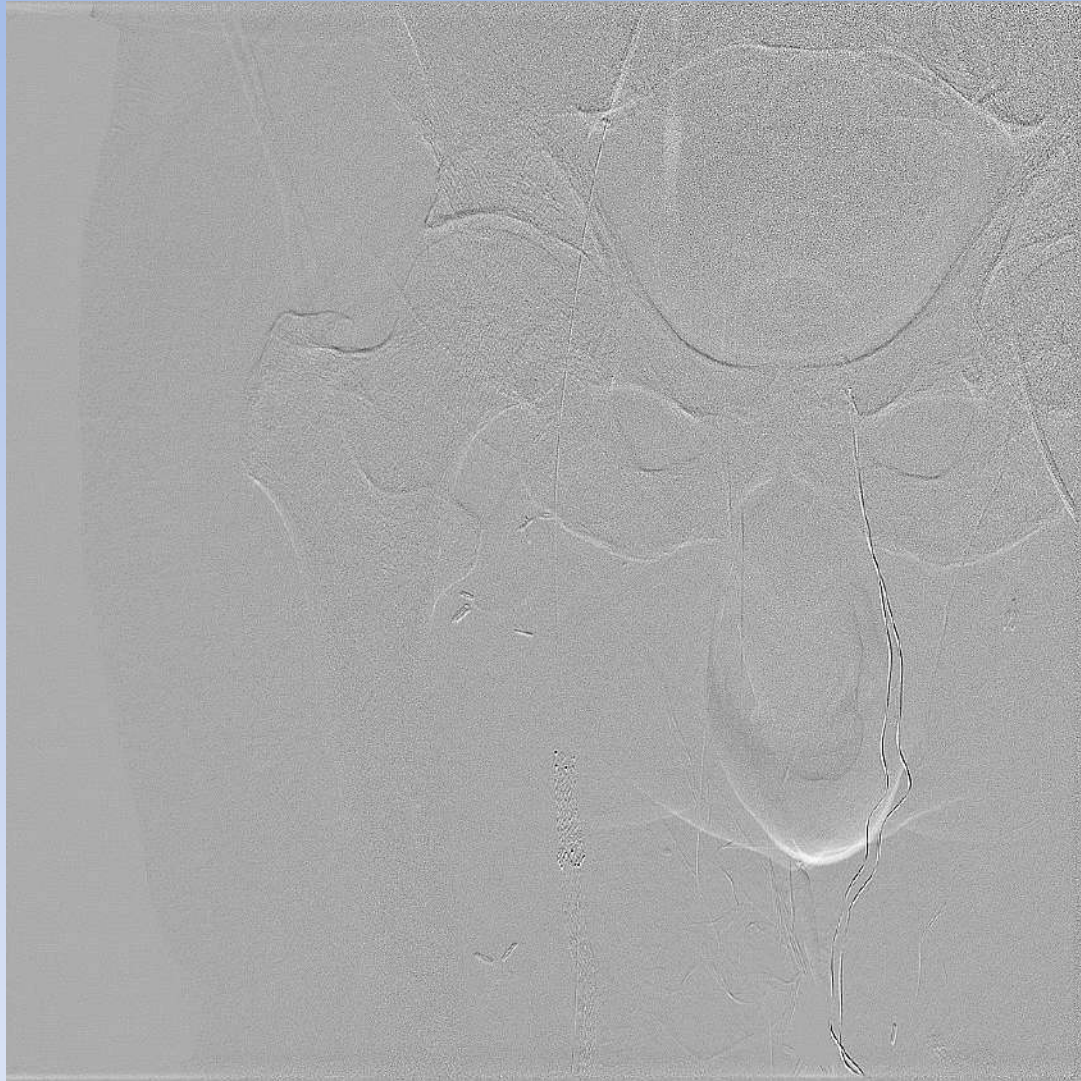




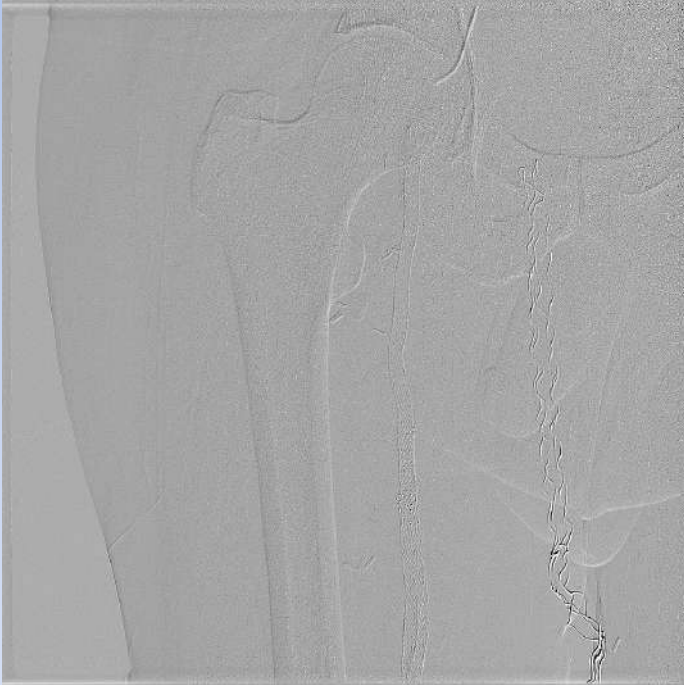


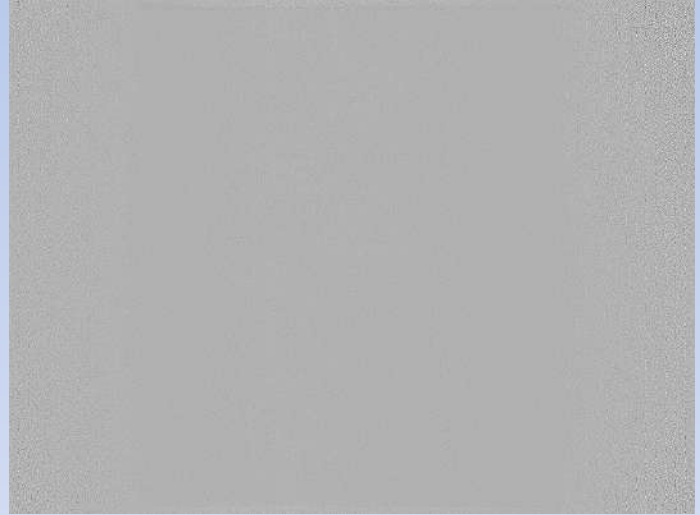
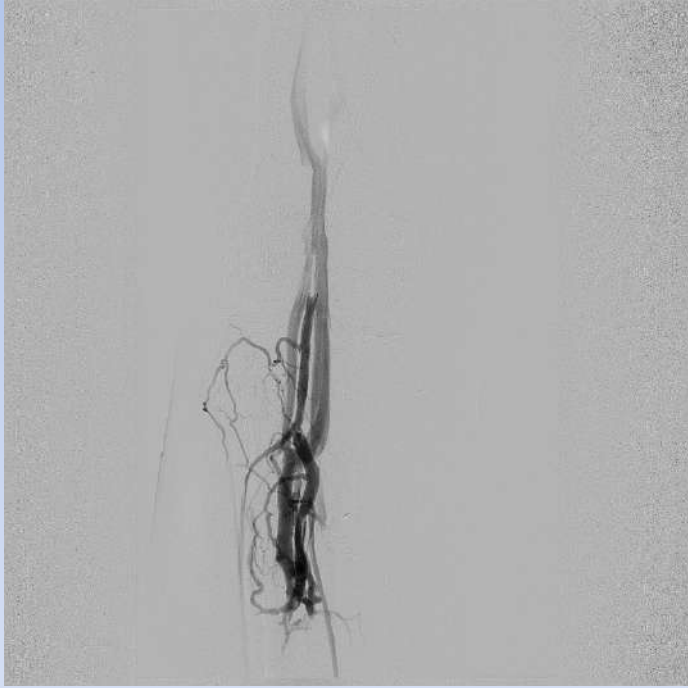


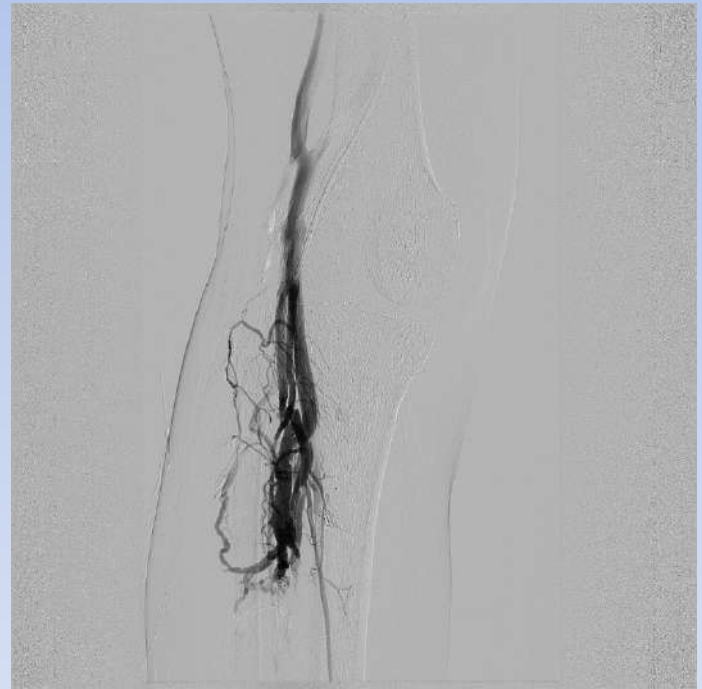
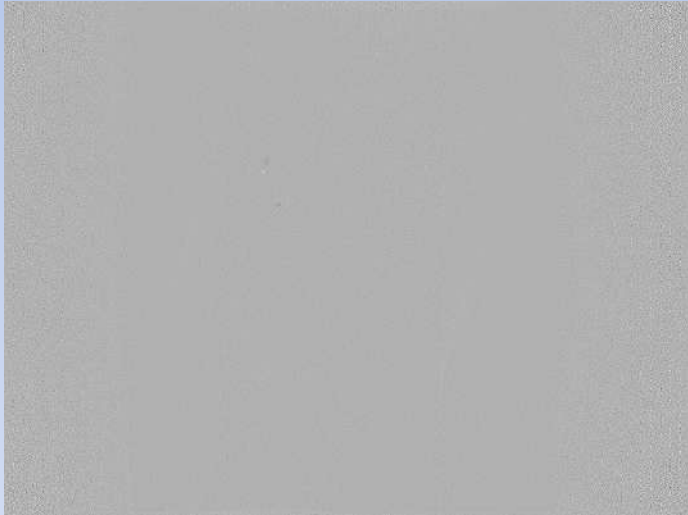


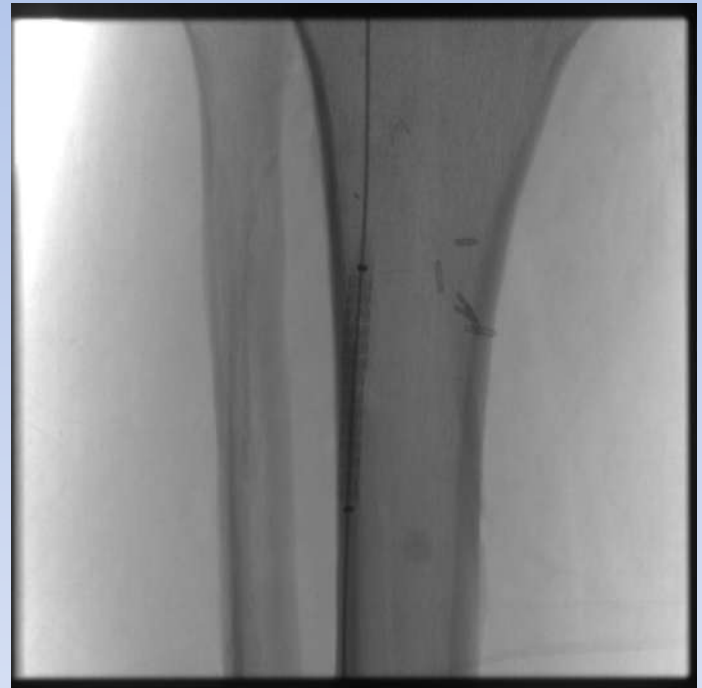
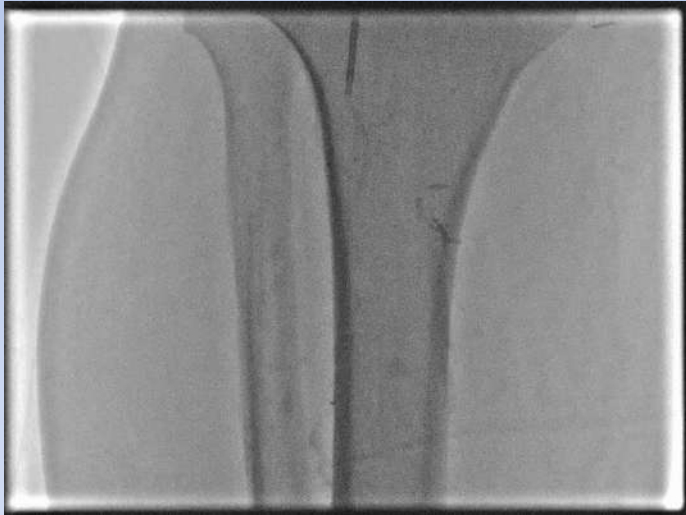


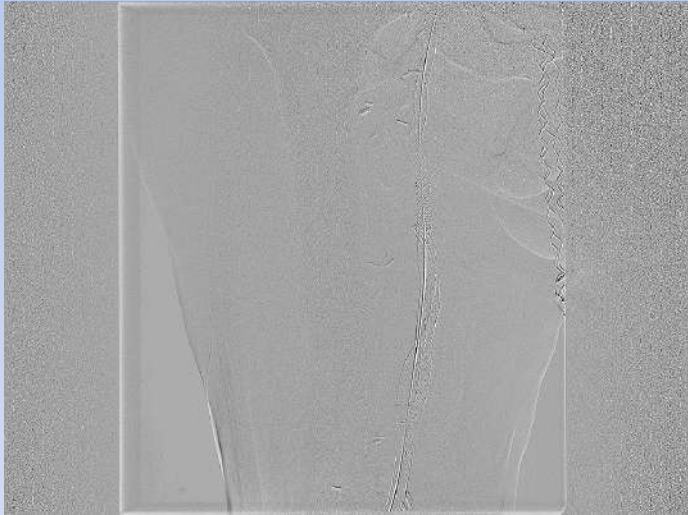
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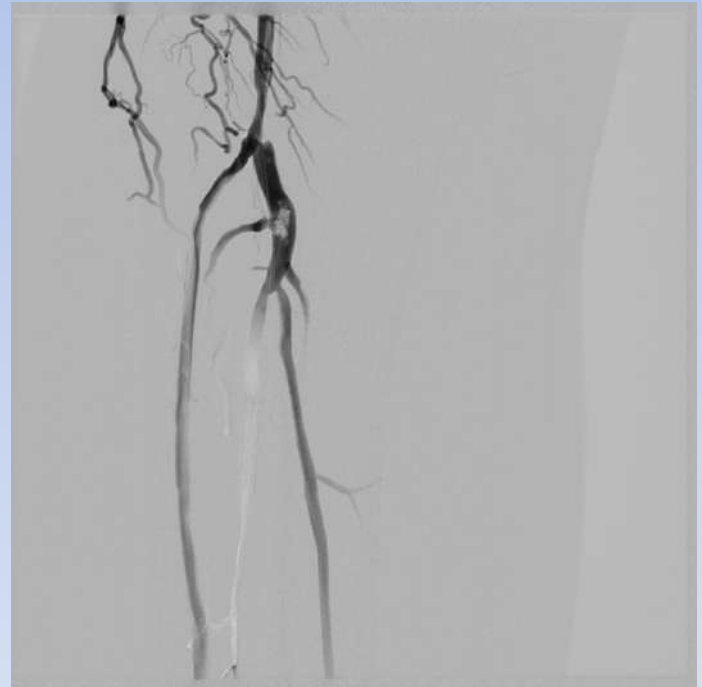


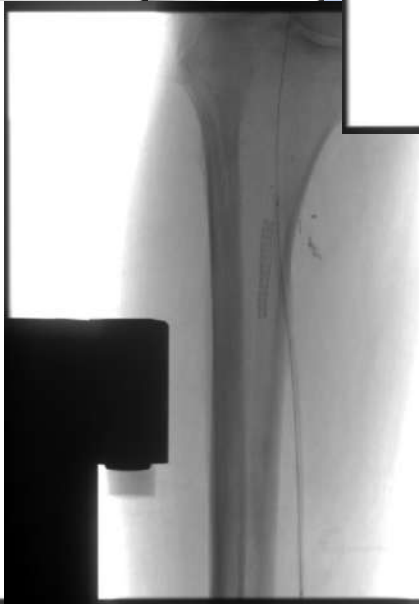


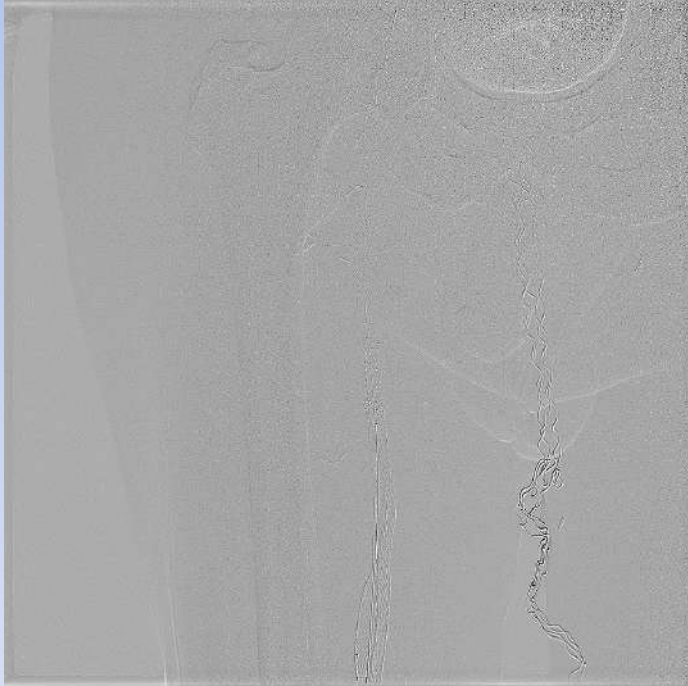




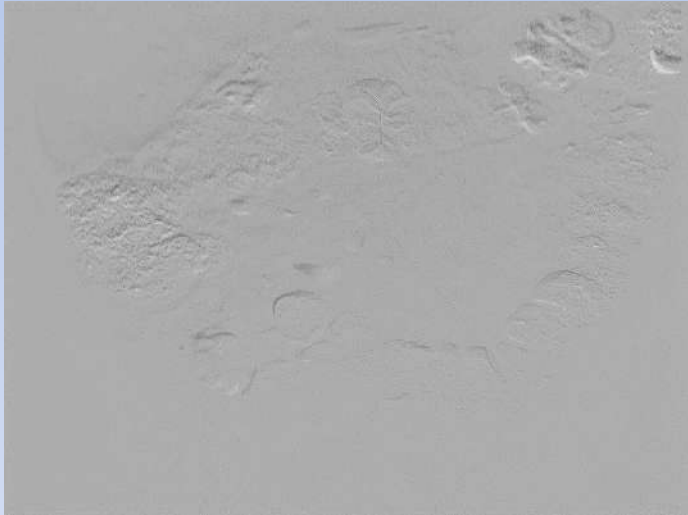


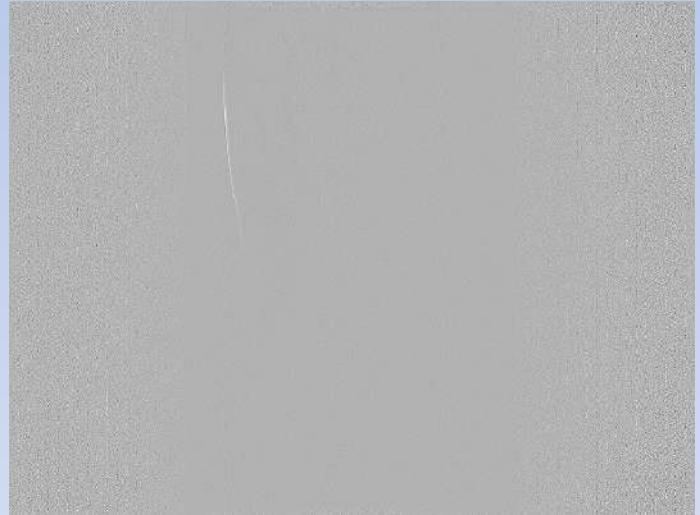
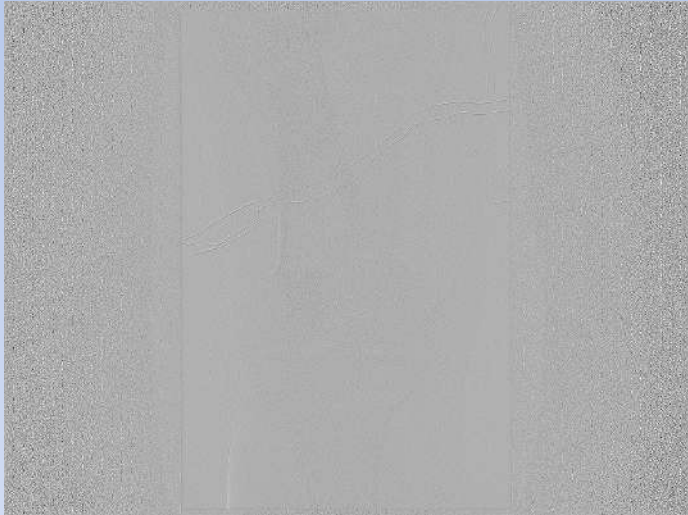


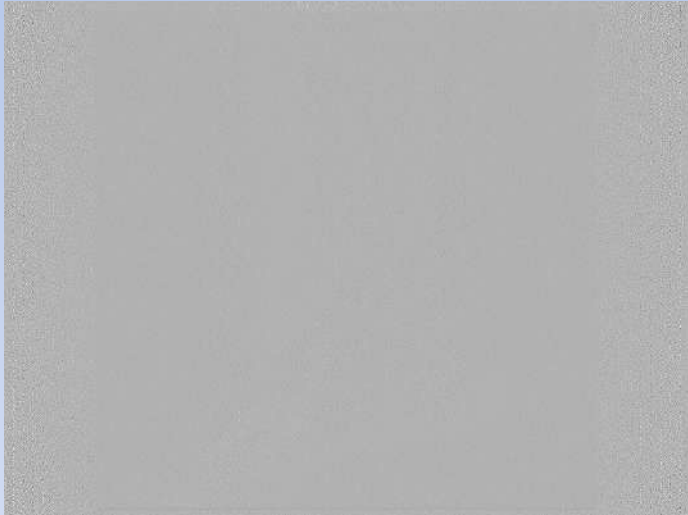




- **2024.1.4**
- **İlk seans**
- **Ayak yarasında hızla kötüleşme**

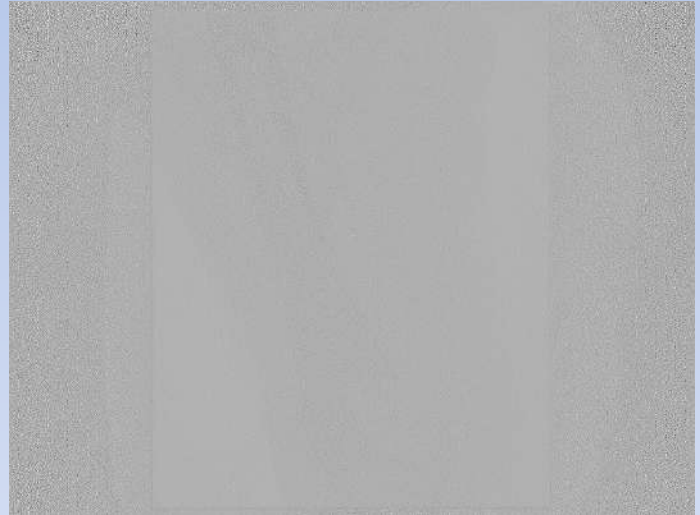


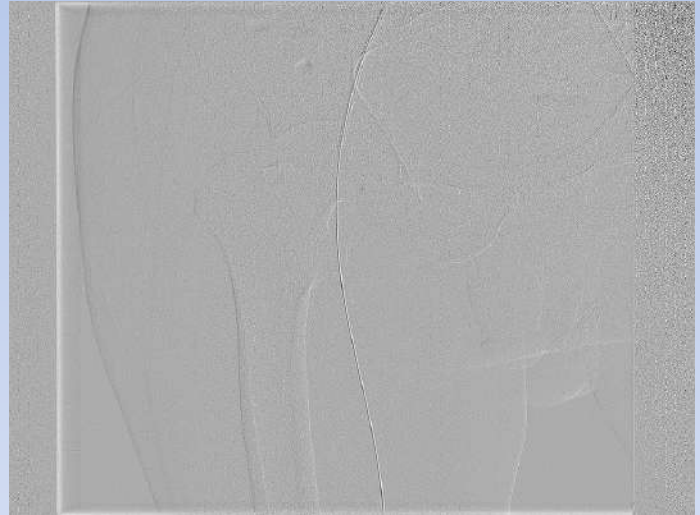
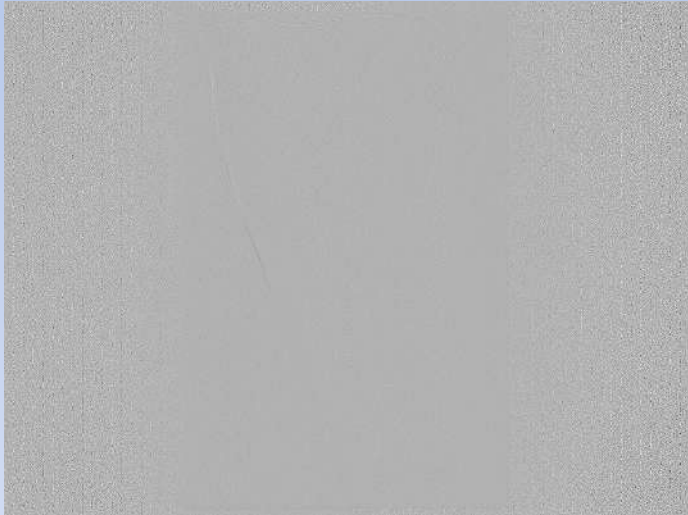




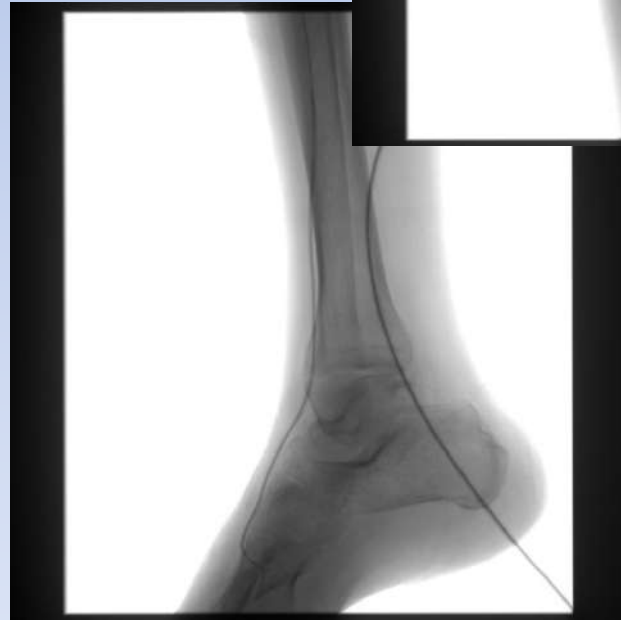


- **2024.1.5**

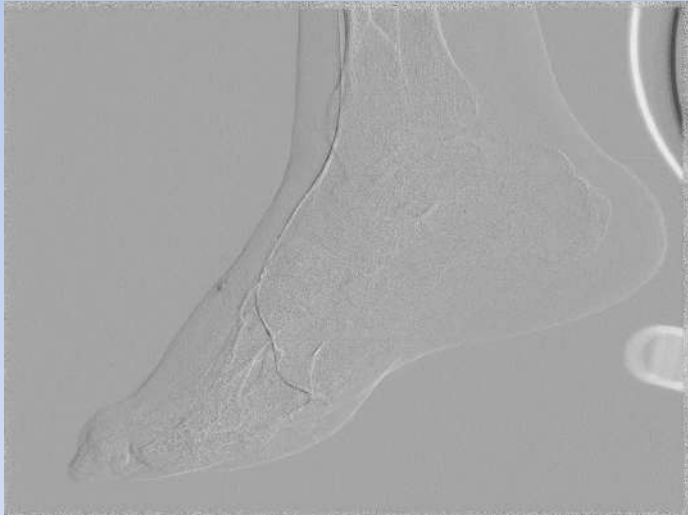




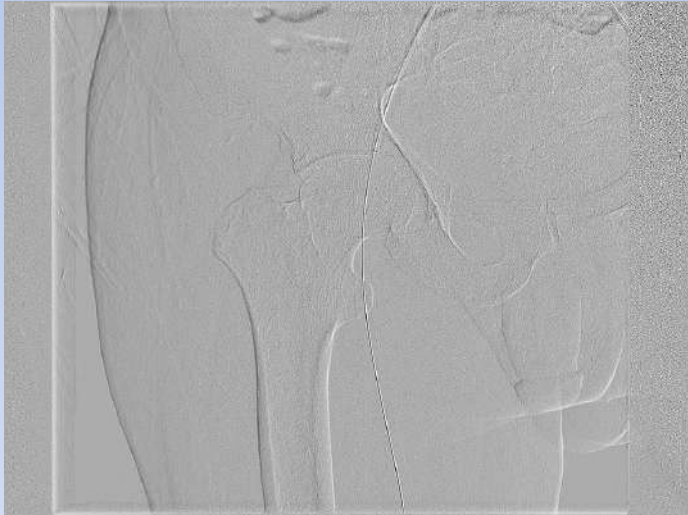












SON SÖZLER

- **Endovasküler first stratejisi** giderek standart klinik yaklaşım haline geliyor.
- **CLTI** olan hastaların yaklaşık **% 40** ı zaten düşük yaşam beklentisi ve eşlik eden ciddi komorbiditeler nedeniyle cerrahi için aday değil.
- Endovasküler tedavide **infrapopliteal** girişimlerde hala elimizde ki en büyük silah **POBA**
- Endovasküler tedavinin en büyük handikapı **RESTENOZ** ve teknolojinin temel hedefide her zaman buna alternatif tedaviler geliştirmek.