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Iatrogenic Lower Extremity Endovascular Complications: A Retrospective Analysis

By
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Disclosure

I do not have any relevant financial relationship(s) with any commercial interest that pertains to the content of my presentation

INTRODUCTION

Endovascular intervention has been widely used with increasing frequency over the past decade for the management of peripheral arterial occlusive disease (PAOD)

Chronic limb threatening ischemia represents the most advanced form of PAOD. A 10% of patients affected with PAOD progress to threatening ischemic limb within 5 years

With time the development of endovascular technique has been progressed, including the creation of new devices, innovative approaches, recanalization of chronic total occlusion, angiosome-guided intervention, and distal pedal arch revascularization

Incidental complications have been expected when carrying out any peripheral endovascular procedure. However, the complication rate should not exceed an acceptable level

Aim of the Work

The primary end-point of the current study was to report the prevalence, types, and management of iatrogenic peripheral endovascular-related complications and the possible preventive measures

Patients & Methods

- This is a 4-year retrospective analysis that took place during the period between January 2018 to January 2022 for patients who underwent lower extremity balloon angioplasty with or without stenting

- Primary patency was estimated by the Kaplan-meier survival analysis. Paired samples *t*-test was used for comparison between pre- and post-ankle/brachial pressure index (ABI).
- Follow up 24 months

Pre-operative Evaluation

1. Careful history taking
2. Clinical examination including vascular Examination of the limbs
3. Routine laboratory investigations

Non-invasive Evaluation

- Bedside clinical test with measurement of
  - ☞ Ankle/Brachial Pressure Index (ABI).
- Color Doppler Ultrasound Scanning

It is mainly used selectively to characterize specific lesions in regard to their suitability for endovascular treatment

Invasive Evaluation

Preoperative CTA/DSA was done to all patients to classify the inflow obstruction according to:

- Location
- Type
- Severity
- Extent
- Number
- Distal runoff status

Risk Factors for Lower Extremity Arterial obstruction

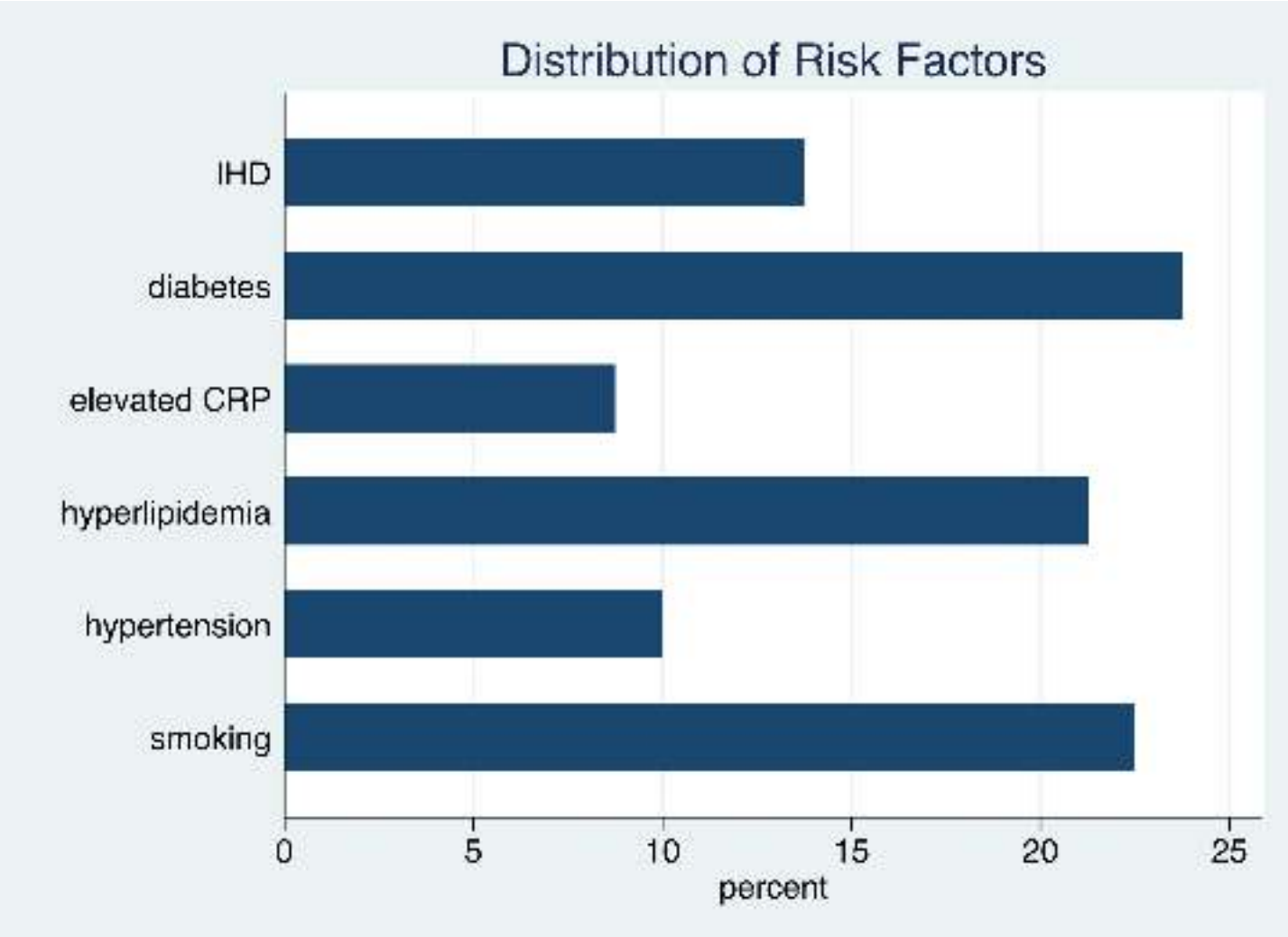
Distribution of Risk Factors
IHD
diabetes
elevated CRP
hyperlipidemia
hypertension
smoking
0
5
10
15
20
25
percent

Table 1: Patients' Clinical Presentation

Presentation	Freq.	%	Cum.
2nd toe gangrene and rest pain	2	2.50	2.50
3rd toe gangrene	1	1.25	3.75
Rest pain	21	26.00	30.00
Severe disabling claudication	20	25.00	55.00
Resistant ischemic ulcer	26	32.50	87.50
Big toe gangrene	2	2.50	90.00
Forefoot gangrene	1	1.25	91.25
Infected diabetic foot wound	5	6.25	97.50
Neuropathic ulcer	2	2.50	100
Total	80	100	

Table 2: Types of Treated Peripheral Arterial

Arterial lesion	Freq.	Percent	Cum.
PA	9	11.25	11.25
PA+ATA	2	2.50	13.75
PA+PTA	8	10.00	23.75
PTA	8	10.00	33.75
SFA (distal)	6	7.50	41.25
CIA (bilateral)	11	13.75	55.00
EIA and SFA (mid)	3	3.75	58.75
SFA (mid)	20	25.00	83.75
SFA (mid + distal)	3	3.75	87.50
SFA (proximal)	8	10.00	97.50
CIA + SFA (proximal)	1	1.25	98.75
SFA (proximal + mid)	1	1.25	100.00
Total	80	100	

Complications of Endovascular Procedures

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OPERATIVE COMPLICATIONS

- Flow-limiting arterial dissection (3.75%)
- Distal embolization (2.5%)
- Arterial rupture (1.25%)
- Wire perforation (2.5%)

EARLY POSTOPERATIVE COMPLICATIONS

Access Site Complications

- Groin hematoma (2.5%)
- False aneurysm (3.75%)
- Arteriovenous fistula (2.5%)
- Retroperitoneal hematoma (1.25%)

Results

Table 3: Patients' gender and different age group

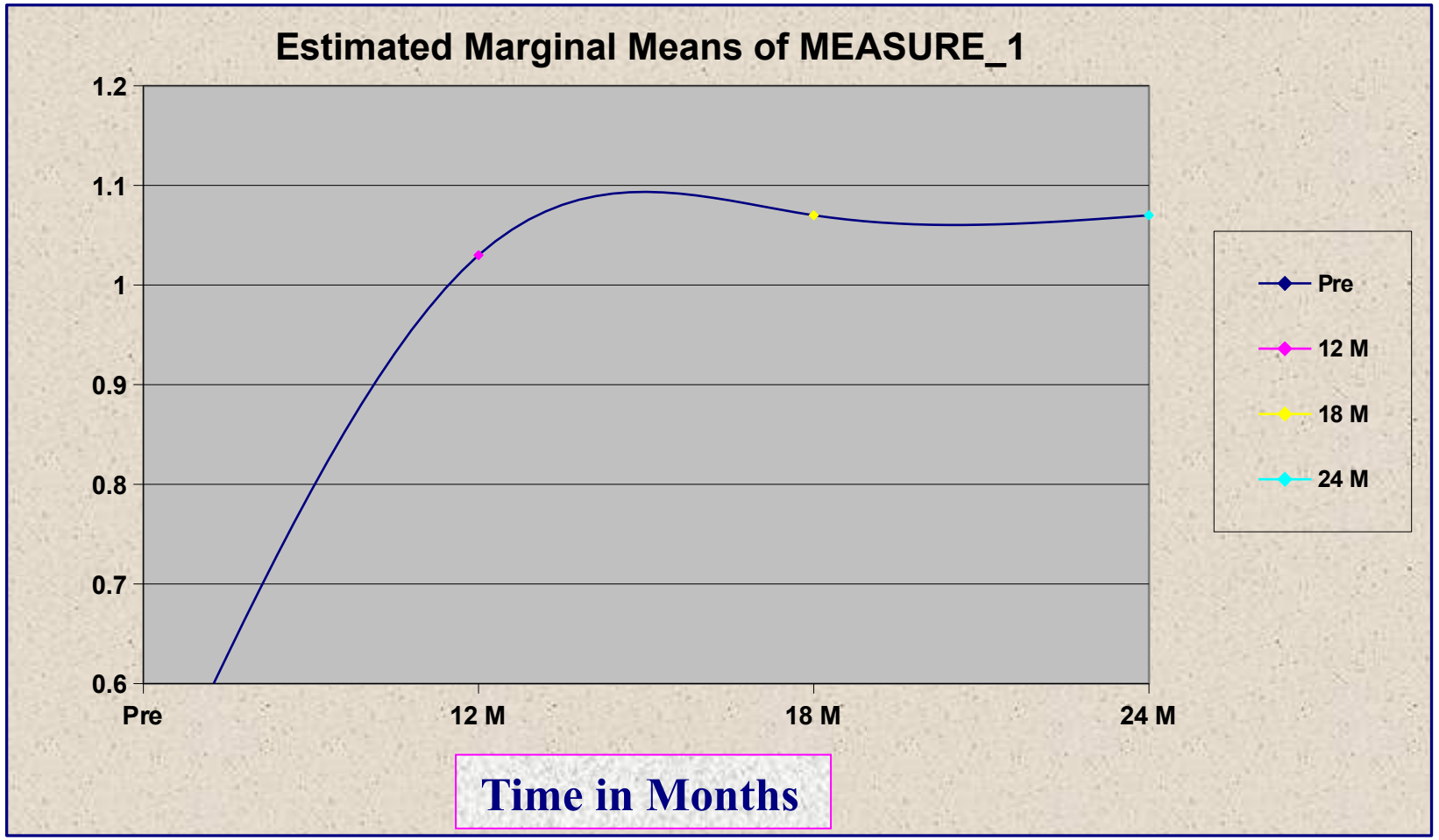
distribution		Mean	p	Min	Max
Age		47.56±9.5	50	30	70
Age groups			Freq.	Percent	Cum.
40 years and below			25	31.25	31.25
41-50 years			19	23.75	55.00
51-60 years			34	42.50	97.50
61 years and over			2	02.50	100.00
Total			80	100.00	
Sex	Females		17	21.25	21.25
	Males		63	78.75	100.00
Total			80	100.00	

Table 4: Pre- and Post- Procedural ABI using Paired

Variable	Observed	Mean	SE	SD	95% Conf. Interval	
Preoperative	80	.48	.0098083	.087728	.4604771	.4995229
Postoperative	80	.75625	.013646	.1220539	.7290882	.7834118
diff	80	- .27625	.0114245	.1021834	- .2989898	- .2535102
mean (diff) = mean (Preoperative ABI – Postoperative ABI)					t = -24.1806	
Ho: mean (diff) = 0				degree of freedom = 79		
Ha: mean (diff) < 0		Ha: mean (diff) ! = 0		Ha: mean (diff) > 0		
Pr (T < t) = 0.0000		Pr (|T| > |t|) = 0.0000		Pr (T > t) = 1.0000		

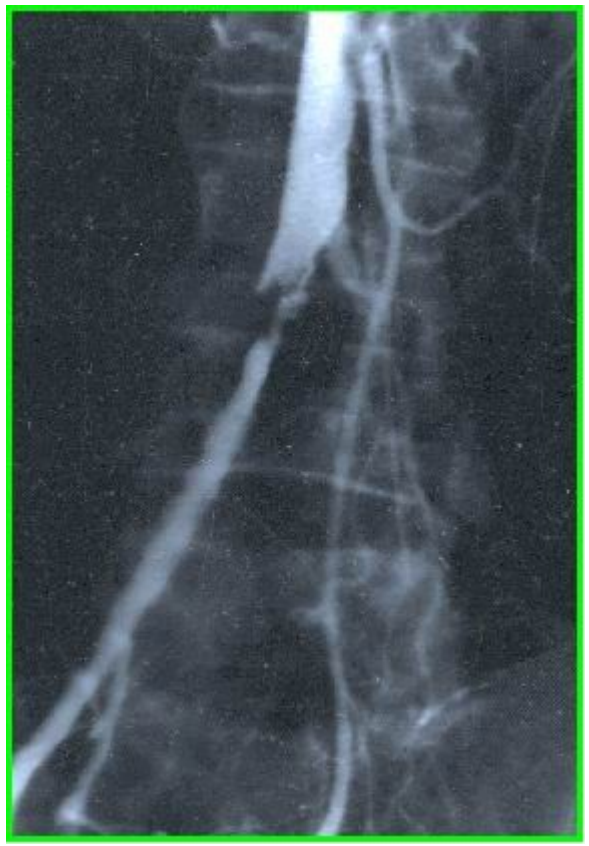
There is a significant statistical difference between the pre- and the post-ABI values ($p < 0.0001$)

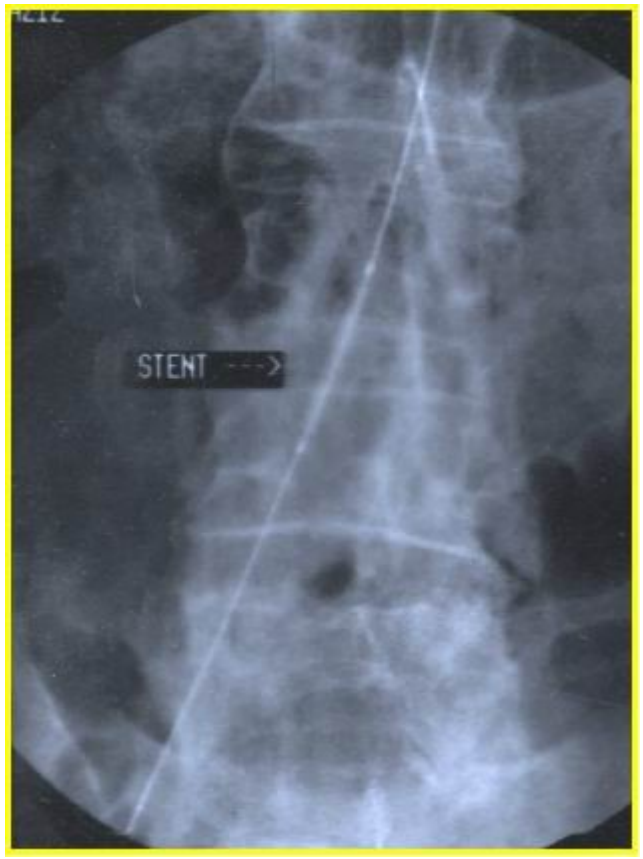
Profile Plots:

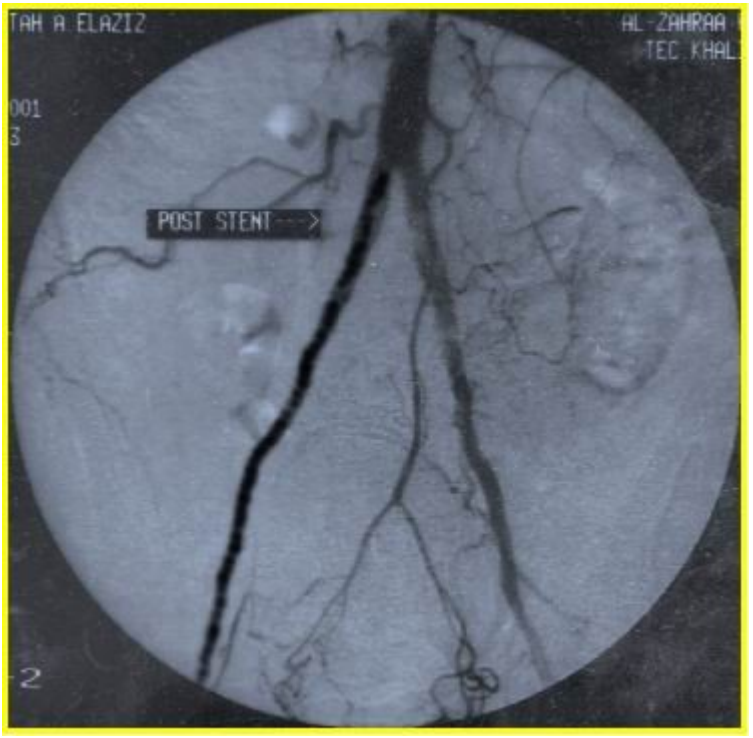


1. Flow-limiting Arterial Dissection

Those patients were treated with the immediate deployment of a self-expandable peripheral arterial stenting




STENT


POST STENT

2. Distal Embolization

- local intra-arterial infusion of (tissue plasminogen activator (t-PA) in a dosage of 20 mg over 10-20 minutes.
- The process is repeated for each filling defect detected by angiography

3. Wire perforation and Arterial rupture

- **Immediate balloon tamponade along with the quick reversal of anticoagulants and antiplatelet medications**
- **The use of covered stents may be a beneficial treatment**

4. Bleeding and Hematoma

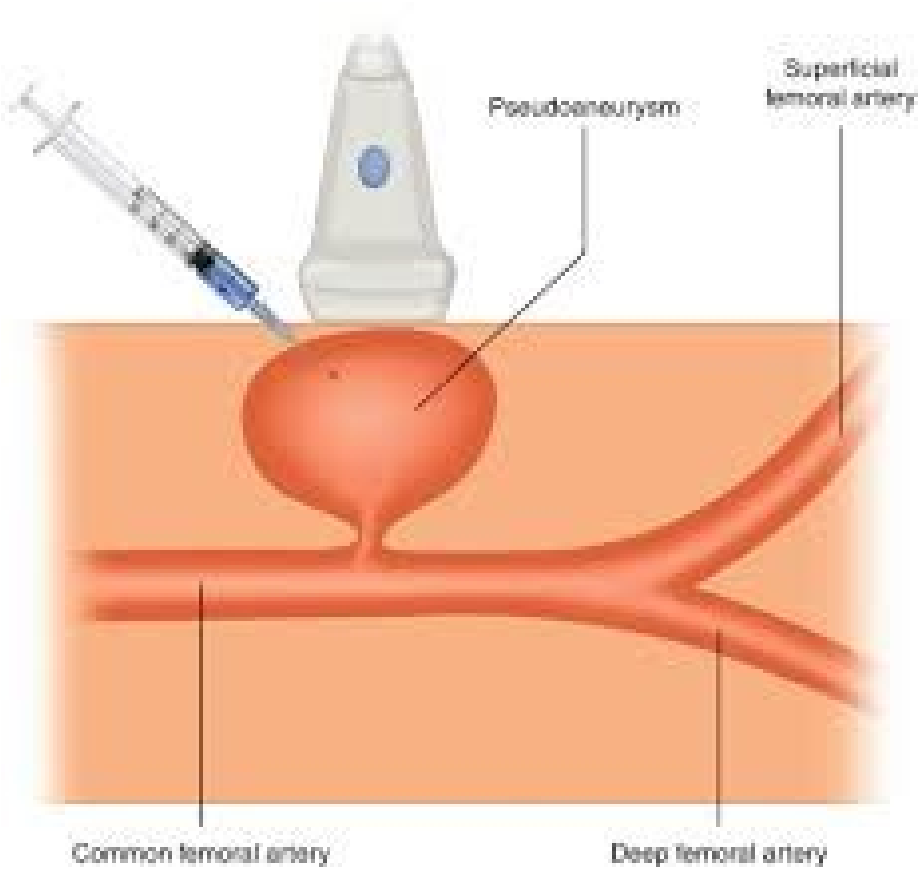
- **Femoral access site complications include:**

1. Clinically significant bleeding,
2. painful hematomas, and
3. Pseudoaneurysm formation

Patients complicated with bleeding and hematoma were treated with manual compression combined with noninvasive hemostasis pads

It is an accepted and cost-effective method for achieving hemostasis at the groin puncture site after endovascular procedures

Femoral Pseudoaneurysm



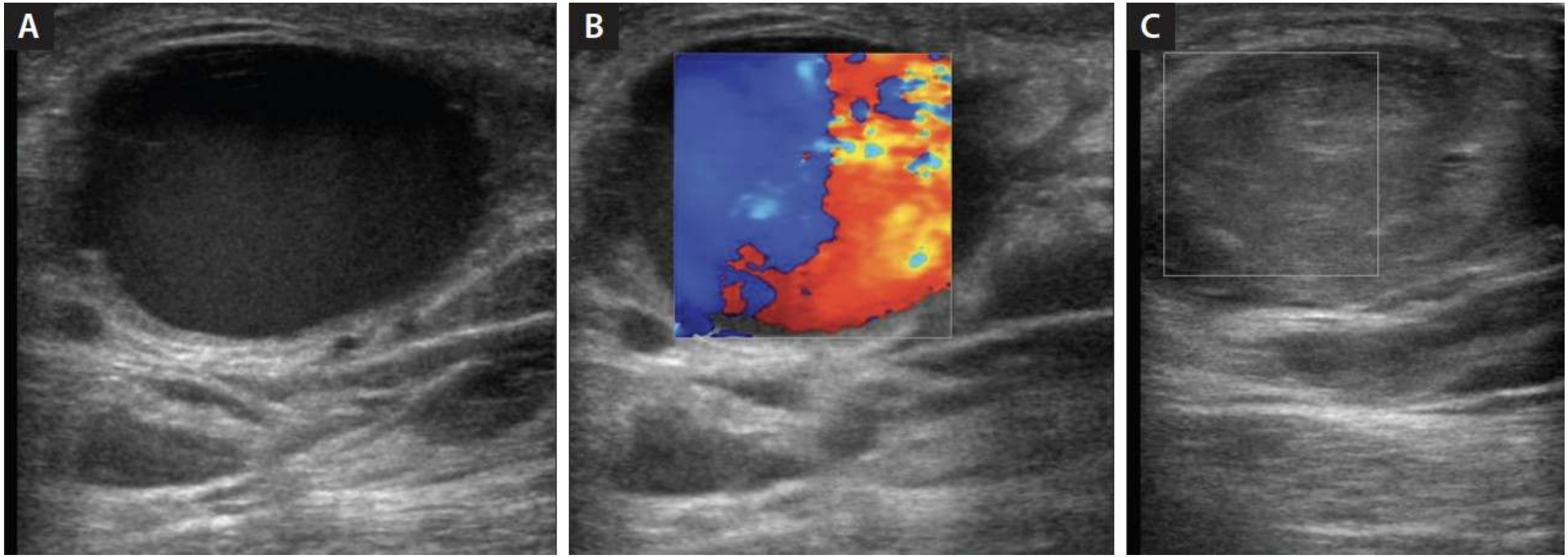
- **False aneurysm**

1. ULTRASOUND-GUIDED COMPRESSION

2. ULTRASOUND-GUIDED THROMBIN INJECTION

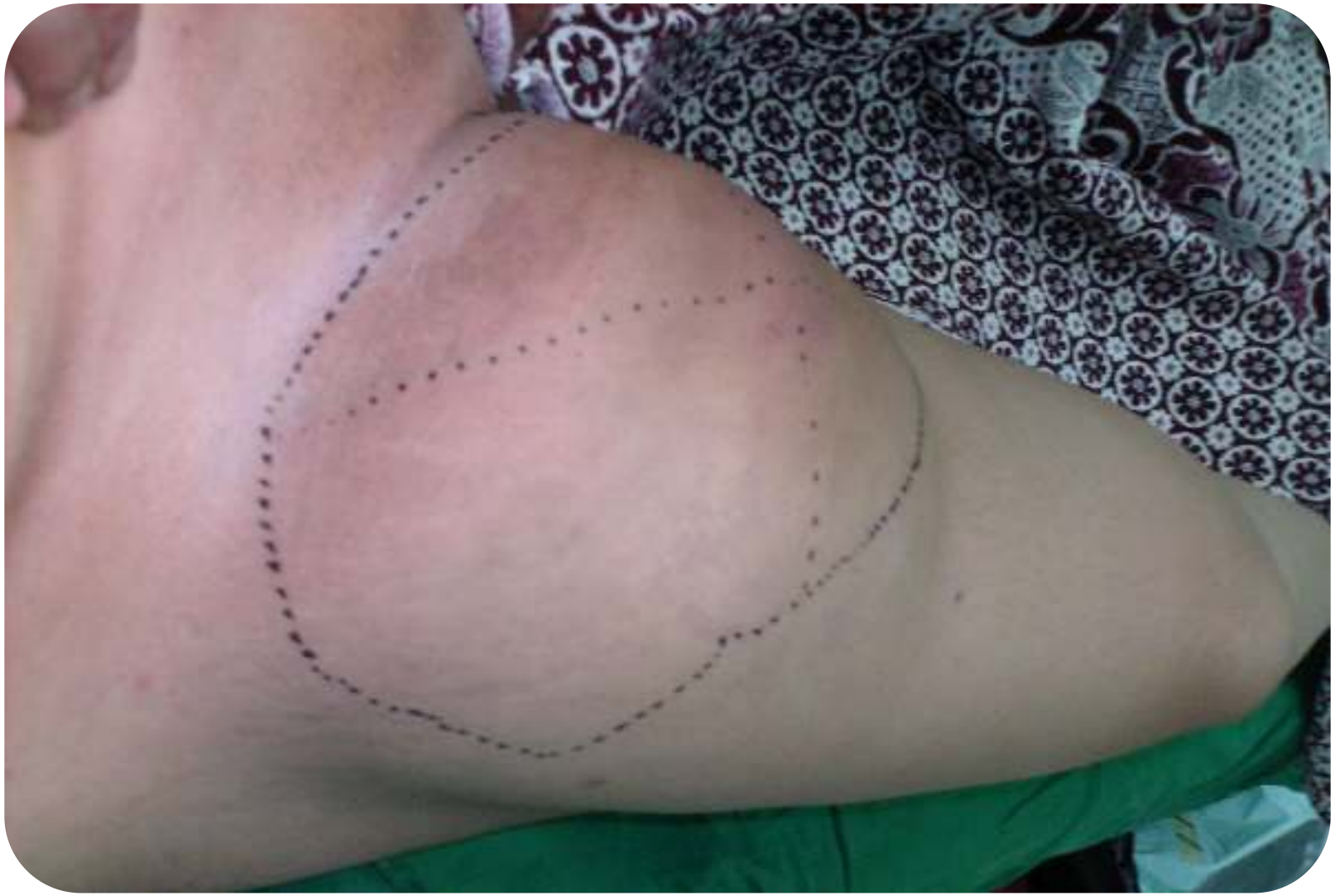
- Suitable for pseudoaneurysms 1.5 to 6.5 cm in diameter and with neck widths < 1 cm
- The standard thrombin concentration is 1,000 U/mL

A. Ultrasound-guided thrombin injection. B-mode imaging of the pseudoaneurysm sac
B. Color duplex imaging of the pseudoaneurysm sac demonstrating turbulent flow
C. Complete thrombosis of the pseudoaneurysm sac after successful thrombin injection



3. SURGICAL REPAIR

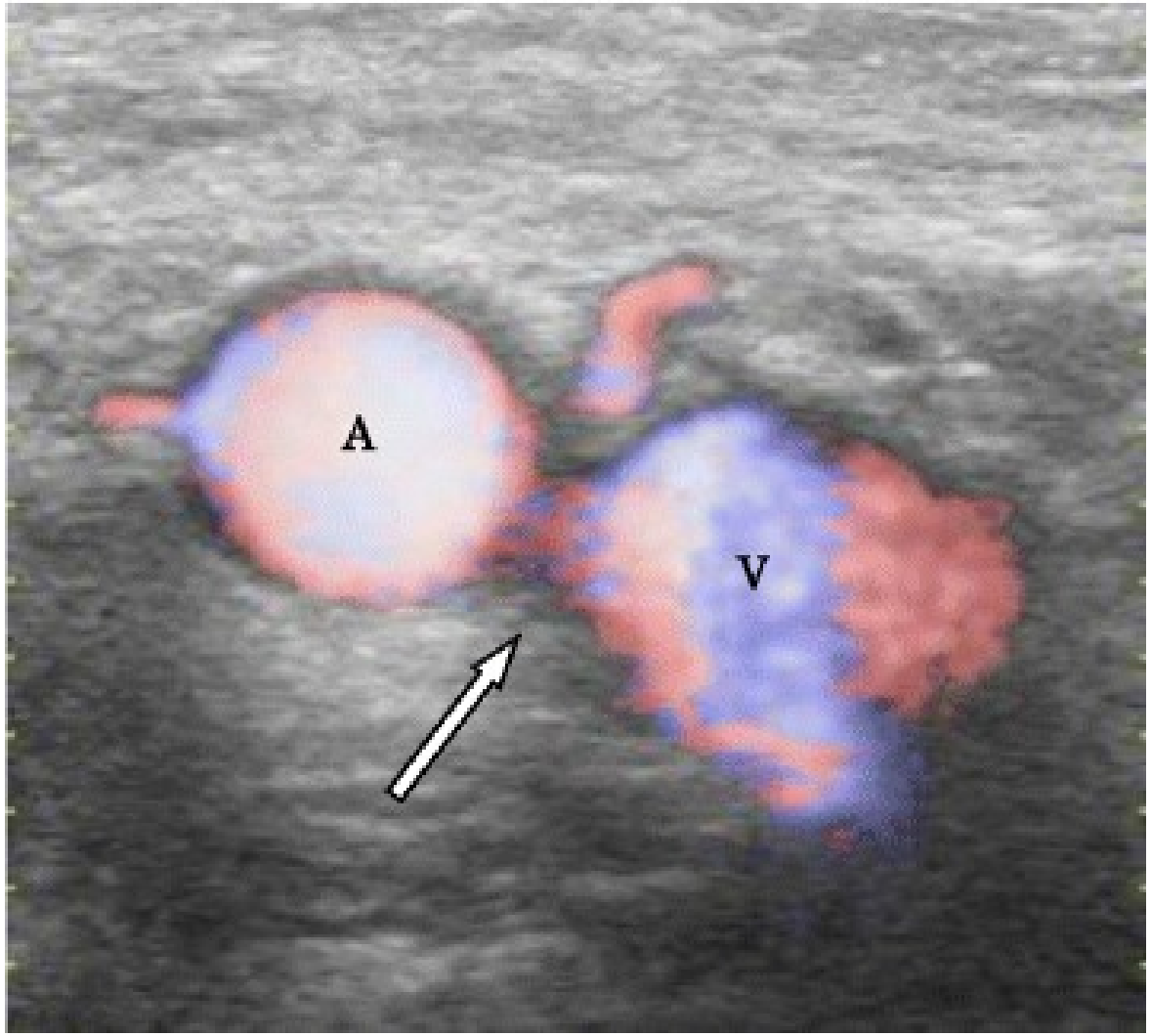
- Surgical repair has traditionally been the gold standard for treatment of femoral pseudoaneurysms
- However, with the advancement of less invasive techniques, surgical repair is not currently used



4. ENDOVASCULAR REPAIR

- **Covered Stent**
- **Coil Embolization**

5. Arteriovenous Fistula



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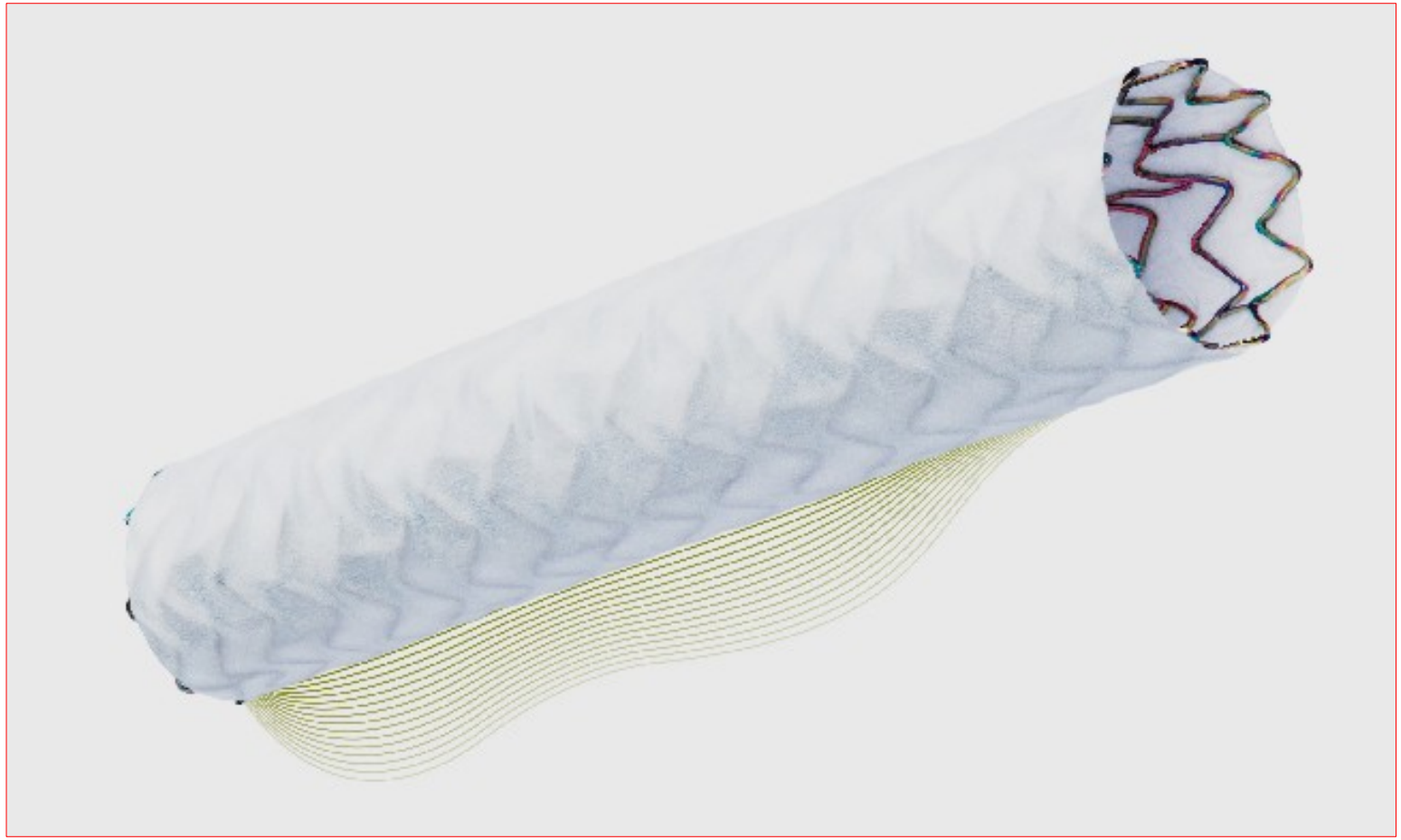

Covered Stent for Arteriovenous Fistula

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6. Retroperitoneal Bleeding

Discussion

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- With the number of endovascular procedures being performed increasing rapidly, complications of procedures are being encountered with increasing frequency

- In the current study, a four-year retrospective analysis took place on 80 patients, who underwent PTA either alone or combined with the deployment of arterial stenting

- Moreover, many risk factors may contribute mainly to the development of peripheral endovascular complications.
- These factors include the use of a larger arterial sheath, aggressive anticoagulants and antiplatelet agents, lower femoral puncture, advanced age, and female gender.

- **Regional endovascular complications included but are not limited to**
- **Arterial dissections,**
- **Vessel occlusions, perforations,**
- **Bleeding complications, and distal Embolization**

- **The incidence of these complications, while low in general, is higher in patients undergoing recanalization of chronic total occlusions than for stenotic lesions**

Conclusion

- This retrospective cohort study analyzed the many different but not all endovascular interventional-related complications that may affect lower extremity arteries susceptible and exposed to iatrogenic/unintended endovascular-related complications[al]

Nevertheless, patient-specific factors have been associated with endovascular complications (e.g. female gender and body mass index [BMA], etc...). However, it's highly important to recognize the hazards/risks that may predispose to these complications

- **Early and rapid recognition of these events, in addition to appropriate diagnosis and proper management may reduce their development and progression**

- We may conclude that the increased utilization of percutaneous endovascular peripheral interventional procedures in recent years has led to the increased frequency of their associated complications

Thank You