



Manuscript ID ZUMJ-2403-3235

DOI 10.21608/ZUMJ.2024.275238.3235

Original Article

## Evaluation of Surgical Management of Infected Femoral Artery Pseudoaneurysm in Intravenous Drug Abusers

Eslam Mohamed Mahmoud Romih\*, Abdelrahman Mohamed Gamil, Mohamed Ahmed Effat, Mahmoud Ahmed Elsabbagh

Vascular Surgery Department, Faculty of Medicine, Zagazig university ,Egypt

### ABSTRACT

**Corresponding author\*:**  
Eslam Mohamed Mahmoud  
Romih

**Email:**  
islamromih@gmail.com

**Submit Date** 07-03-2024  
**Revise Date** 20-03-2024  
**Accept Date** 23-03-2024

**Background:** Pseudoaneurysm (PSA), or false aneurysm, is a local dilation or rupture of a blood vessel caused by a breach in the arterial wall not contained by layers of the normal arterial wall. Arterial ligation is a reliable and efficient technique, with a limited number of individuals requiring significant amputations. The present work aims to improve outcomes of surgical management of patients with infected femoral artery PSA. **Subjects and methods:** This is a prospective clinical trial investigation which was conducted on intravenous drug addict patients with femoral artery PSA admitted to the emergency unit of the Vascular Surgery department in Zagazig University Hospital. During the study period (6 months), 3 cases per month, 18 cases were included. All cases were subjected to complete history taking, and full general and local examination of the lower limb regarding bleeding, oedema, state of skin and soft tissue, distal pulsations and other signs of ischemia. All cases received intravenous broad-spectrum antibiotics before surgery, which lasted throughout the period after surgery with antibiotics indicated by culture findings. **Results:** There was a highly substantial reduction in O<sub>2</sub> Saturation in ligated limbs among amputated cases compared to none. There was a remarkable elevation in the frequency of pain, coldness, cyanosis, delayed or absent capillary refilling, and affected or loss of motor power and sensation among amputated cases compared to none. **Conclusion:** PSA excision, arterial ligation, and debridement of contaminated tissue are all successful first-line treatments with extremely low major adverse limb events. We advise against vascular repair because of the increased risk of infection.

**Keywords:** Surgical Management Infected Femoral Artery, Pseudoaneurysm, Intravenous Drug Abusers.

### INTRODUCTION

Intravenous (IV) drug addiction has reached an epidemic level, with an estimated over 13 million cases of injecting drug users globally in 2020. In addition to the recognition that IV drug addiction is an important health concern on a global scale, this type of lifestyle unavoidably results in severe and occasionally fatal outcomes, including drug overdose, local and systemic infections, cerebrovascular and cardiovascular adverse events, and infected pseudoaneurysm (PSA) [1].

Because of its ease of access, the femoral triangle is the most commonly used injection location. Multiple injections to the femoral region under septic conditions result in the creation of an infected femoral artery pseudoaneurysm (IFAP), which is a prevalent vascular consequence among heroin abusers [2].

Repeated futile efforts to inject heroin into a major lower leg deep vein are likely to result in arterial or venous damage. A PSA is a pulsing encapsulated

hematoma that communicates with a ruptured artery lumen [3].

Infected femoral artery PSA in IV drug users provides a challenge to the vascular surgeon. Infection makes the arterial wall difficult to reconstruct, and arterial ligation is frequently the only possible treatment. After ligation, whether immediate revascularization is judged essential or not is still disputed [4].

Primary revascularization increases the risk of infection and secondary bleeding. On the other hand, postponing revascularization reduces limb function and increases the danger of limb loss. In the lack of reliable predictors that may direct decisions, there is no global consensus about the optimal treatment [5].

We aimed to improve outcomes of surgical management of patients with infected femoral pseudoaneurysm.

## METHODS

### Patients:

This prospective cohort study was conducted on IV drug addict cases with femoral pseudoaneurysm admitted in the emergency unit of the Vascular Surgery Department at Zagazig University Hospital. During the study period between January 2023 and January 2024, 24 cases (limbs) (18 cases were mentioned in the abstract?!) were included. Written informed consent was obtained from all participants; the research ethical committee of the Faculty of Medicine, Zagazig University, approved the study. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. This study was carried out after the approval of the Institutional Review Board (IRB#10618).

IV drug addicts with ruptured or impending rupture femoral artery pseudoaneurysm with general manifestations of infection were included in this study.

Cases with the following characteristics were excluded: cases with signs of peripheral vascular disease or vasculitis, patients submitted to previous lower limb vascular intervention, patients with only femoral vein pseudoaneurysm, and patients with unsalvageable limbs.

### Methods:

All cases were subjected to complete history taking and full general and local examination of the lower limb regarding bleeding, oedema, state of skin and soft tissue, distal pulsations and other signs of ischemia.

### Technique: -

Each case's data included demographic data, blood tests, microbiologic findings, diagnostic technique, operational data, operative outcome, postoperative complications, and follow-up.

All cases were managed in the emergency unit by local compression to control bleeding if present. 2 wide pore cannulas were inserted with blood sampling for urgent complete blood count (CBC) and blood cross-matching. The urinary catheter was placed. IV fluids for resuscitation and blood transfusion if hemodynamically compromised. Duplex ultrasound is used to confirm the relation to blood vessels and the presence of DVT if hemodynamically stable. Routine laboratory tests include CBC, a coagulation profile, kidney and liver function tests, and viral markers.

### Surgical intervention

All cases received preoperative IV broad-spectrum antibiotics, which were continued postoperatively with antibiotics based on microbiological culture findings.

Surgery was conducted as an emergency, and our local protocol is to ligate the affected vessel. Using a retroperitoneal incision or an uninfected field, the surgical approach initially exposed the distal external iliac artery for proximal control. This was done just above the inguinal ligament. An unaffected distal region was also accessed to control the superficial femoral artery (SFA). The groin area was then incised and drained, and back bleeding was managed with digital pressure until the affected femoral arteries were ligated with polyglycolic acid suture 2/0 and an under-running suture of polypropylene 3/0.

The level of arterial ligation was determined by the infective load and tried at the most distant available area. Any necrotic tissue was excised, and the incision was irrigated with povidone-iodine, H<sub>2</sub>O<sub>2</sub>, and normal saline. After inserting the suction drain, the retroperitoneal incision was closed. The groin

incision was either left to drain and heal by secondary intention or approximated with wide sutures.

Patients were followed up clinically by evaluation of symptoms and signs of ischemia (pain, coldness, cyanosis, capillary refilling, motor and sensory powers), O2 saturation, ABPI postoperatively to evaluate limb vascularity, wound infection and groin state, general condition and sepsis.

**Statistical Analysis:**

Statistical analysis was done using SPSS version 28 (IBM Co., Armonk, NY, USA). Quantitative parametric data are presented as mean, SD, and range. Categorical variables are presented as frequency and percentage (%). Pearson Chi-square test is used to compare categorical data while independent t-test is used to compare numerical data. P-value less than 0.05 is considered statistically significant.

**RESULTS**

The age of the cases ranged from 22 to 51 years, with a mean of 35 years. All cases were male. Regarding marital status, 70.8% were married. All the studied cases were smokers and drug addicts. More than half of them had drug addiction more than 24 months ago. Regarding virology status, 16.7% of the cases had HIV, 16.7% had HCV, 25% had both, and 8.3% had HIV, HCV & HBV (Table 1).

Table (2) showed that 70.8% of the cases had the site of pseudoaneurysm below the inguinal ligament. Sepsis is found in 45.8% of the cases. Also, wound infection with sinus discharging pus was found in 45.8% of the cases. The most frequent organisms found in the culture of infected wounds were Staph aureus (54.5%), followed by Pseudomonas (18.2%).

**Table (1):** Demographic and special habits and history of the studied groups

Variable		(n=24)	
		Mean±SD (Range)	
Age (years)		35.33±8.87 (22-51)	
Variable		No	%
<b>Sex:</b>	Male	24	100
	Female	0	0
<b>Marital:</b>	Single	7	29.2
	Married	17	70.8
<b>Smoking:</b>	No	0	0

Regarding ligation data, 70.8% of the cases had a ligation site in the external iliac artery above inguinal ligament, while 29.2% had it retroperitoneal. Needing for retroperitoneal extension was reported in 29.2% of the cases. O2 saturation on the ligated side ranged from 46 to 89 with a mean of 72% (Table 3).

Postoperatively, pain was reported in 41.7% of the cases, coldness in 66.7%, and cyanosis in 33.3%. Capillary re-filling was delayed in 20.8% of the cases and absent in 12.5%. Finally, motor power and sensation were affected in 16.7% and lost in 16.7% of the cases. 33.3% of the cases had amputation. 81.2% of the non-amputated cases had signs of ischemia. These signs were mild in 31.2%, moderate in 18.8% and severe in 31.2% of the non-amputated cases (Table 4).

Age and past history had no statistically significant effect on the outcome (Table 5). Also, pseudoaneurysm site, groin state, skin integrity and general condition had no statistically significant effect on limb outcome. On the other hand, a statistically significant decrease in O2 saturation was found in ligated limbs necessitating amputation (Table 6).

Table (7) showed that pain, cyanosis, delayed or absent capillary re-filling, and affected or lost motor power and sensation are statistically significantly associated with amputation.

There is statistically significant relation between amputation and percent decrease in ankle brachial index after intervention as compared to baseline level (percent decrease was significantly higher among patients underwent amputation) (Supplementary Table 1).

	Yes	24	100
<b>Drug addiction:</b>	No	0	0
	Yes	24	100
<b>Duration of addiction:</b>	<12 months	4	16.7
	12-24 months	6	25
	> 24 months	14	58.3
<b>Past history:</b>	Free	8	33.3
	HIV	4	16.7
	HCV	4	16.7
	Both	6	25
	HIV, HCV & HBV	2	8.3

**Table (2): Examination findings among the studied cases**

Variable		(n=24)	
		No	%
<b>site of pseudoaneurysm</b>	Above inguinal ligament	7	29.2
	Below inguinal ligament	17	70.8
<b>General condition and Lab evident sepsis</b>	No sepsis	13	54.2
	Sepsis	11	45.8
<b>Groin state and skin integrity:</b>	Inflamed without sinus discharging pus	13	54.2
	Infected with sinus discharging pus	11	45.8
<b>Wound culture in infected cases:</b>		(n=11)	
	Staph aureus	6	54.5
	Pseudomonas	2	18.2
	Klebsiella	1	7.1
	Proteus	1	7.1
	Strept pyogenus	1	7.1

**Table (3): Ligation data among the studied cases**

Variable		(n=24)	
		No	%
<b>Site of External iliac artery ligation</b>	Above inguinal ligament	17	70.8
	Retroperitoneal	7	29.2
<b>Need for retroperitoneal extension</b>	No	17	70.8
	Yes	7	29.2
<b>O<sub>2</sub> saturation in ligated side</b>	Mean ± SD	72.13±14.82	
	Range	46-89	

**Table (4): Sign of ischemia and outcome among the studied cases and Signs of ischemia (claudication) among non-amputated patient**

Variable		(n=24)	
		No	%
Signs of ischemia among all cases			
<b>Pain</b>	No	14	58.3
	Yes	10	41.7
<b>Coldness</b>	No	8	33.3
	Yes	16	66.7
<b>Cyanosis</b>	No	16	66.7

	Yes	8	33.3
<b>Capillary refilling</b>	Normal	16	66.7
	Delayed	5	20.8
	Absent	3	12.5
<b>Motor &amp; sensory loss</b>	Preserved	16	66.7
	Affected	4	16.7
	Loss	4	16.7
Outcome among all cases			
<b>Amputation</b>	No	16	66.7
	Yes	8	33.3
<b>Signs of ischemia (claudication) among non-amputated patient</b>			
<b>Signs:</b>	No	3	18.8
	Mild	5	31.2
	Moderate	3	18.8
	Sever	5	31.2

**Table (5):** Relation between amputation and age and past history among the studied cases

Variable		No amputation (n=16)		Amputation (n=8)		t	P
<b>Age</b>	Mean ± Sd	35.38±9.1		35.25±9		0.03	0.98
	Range	22-51		24-46			
Variable		No	%	No	%	χ <sup>2</sup>	P
<b>Duration of addiction:</b>	<12 months	2	50	2	50	1.29	0.53
	12-24 months	5	83.3	1	16.7		
	> 24 months	9	64.3	5	35.7		
<b>Past history:</b>	Free	4	50	4	50	4.88	0.30
	HIV	4	100	0	0		
	HCV	3	75	1	25		
	Both	3	50	3	50		
	HIV, HCV & HBV	2	100	0	0		

SD: Standard deviation t: Independent t test χ<sup>2</sup>:Chi square test NS: Non significant (P>0.05)

**Table (6):** Relation between amputation, examination, and ligation data among the studied cases

Variable		No amputation (n=16)		Amputation (n=8)		χ <sup>2</sup>	P
		No	%	No	%		
<b>Site of pseudoaneurysm</b>	Above inguinal lig.	3	42.9	4	57.1	2.52	0.11
	Below inguinal lig.	13	76.5	4	23.5		
<b>Groin state and skin integrity:</b>	Inflamed without pus	6	54.5	5	45.5	1.34	0.25
	Infected with pus	10	76.9	3	23.1		
<b>General condition &amp; sepsis</b>	No sepsis	10	76.9	3	23.1	1.34	0.25
	Sepsis	6	54.5	5	45.5		
<b>Site of External iliac artery ligation</b>	Above inguinal lig.	13	76.5	4	23.5	2.52	0.11
	Retroperitoneal	3	42.9	4	57.1		
<b>Retroperitoneal extension</b>	No	13	76.5	4	23.5	2.52	0.11
	Yes	3	42.9	4	57.1		
<b>O<sub>2</sub> Saturation in ligated side:</b>	Mean ± Sd	81.88 ±	52.63 ±	<b>14.38</b>			<b>&lt;0.001</b>
	Range	4.83	4.41				
		77-89	46-63				

χ<sup>2</sup>:Chi square test NS: Non significant (P>0.05)

**Table (7):** Relation between amputation and sign of ischemia among the studied cases

Variable		No amputation (n=16)		Amputation (n=8)		$\chi^2$	P
		No	%	No	%		
<b>Pain</b>	No	14	100	0	0	<b>16.8</b>	<b>&lt;0.001</b> **
	Yes	2	20	8	80		
<b>Coldness</b>	No	8	100	0	0	<b>6</b>	<b>0.01*</b>
	Yes	8	50	8	50		
<b>Cyanosis</b>	No	16	100	0	0	<b>24</b>	<b>&lt;0.001</b> **
	Yes	0	0	8	100		
<b>Capillary refilling</b>	Normal	16	100	0	0	<b>24</b>	<b>&lt;0.001</b> **
	Delayed	0	0	5	100		
	Absent	0	0	3	100		
<b>Motor &amp; sensory loss</b>	Preserved	16	100	0	0	<b>24</b>	<b>&lt;0.001</b> **
	Affected	0	0	4	100		
	Loss	0	0	4	100		

$\chi^2$ : Chi square test    \*\*: Highly significant (P<0.001)

### DISCUSSION

Vascular consequences from IV drug misuse remain to be a significant problem for vascular surgeons. The most typical manifestations of an infected femoral artery PSA are painful swelling, infection, thrombosis, and life-threatening bleeding [6].

This serious situation can result in systemic infection, limb amputation, life-threatening bleeding, and even death. Therapy in these instances is complicated, and there is no unanimity on the best surgical method. The literature discussed many techniques, including ligation alone, rapid revascularization, and delayed revascularization. Over the past few years, there have been some reports of endovascular therapy of infected femoral PAs; nevertheless, these are simply case series, so additional studies have to be conducted before any strong conclusions can be formed about its safety and efficacy [7].

The contaminated surgical field and the scarcity of accessible venous conduits are the primary issues with revascularization. Even when synthetic grafts are inserted deeply and far from the affected area, there is still a chance that they catch infection. Some researchers have recommended using deep femoral veins because superficial autologous veins are typically not suitable for this patient cohort. Also, these veins are frequently reported to be of low quality with either acute or chronic thrombosis [8].

In addition, when thinking about a bypass treatment, it's crucial to remember that many of these cases

will resume elicit drugs injection. For similar reasons, anticoagulation for deep vein thrombosis in these cases may be dangerous [9].

Consequently, artery ligation alone has many benefits, such as avoiding the conduit problem and shortening the surgical time for cases with septicemia [9].

Furthermore, blood-borne infections are common in cases that arrive with these problems, posing a risk to medical personnel. This challenging situation will grow more prevalent as drug users increase in number, and there is no significant agreement on the most effective ways to treat them [10].

Risks associated with artery ligation alone include severe claudication or amputation as a result of limb-threatening ischemia. When the distal external iliac artery is ligated, the available research indicates that it is a reliable and effective surgery with a comparatively small number of cases needing significant amputations [11].

Twenty-four patients were included in this study; their ages ranged from 22 to 51 years, with a mean of 35 ± 8 years. All cases were male. Most of the cases were married (70.8%).

These variables were consistent with Shakarchi et al study, where the mean age of cases was 39.7 ± 8.2 years (range: 22 to 57 years), 80% were males, and 20% were females [11].

In another study by Quiroga et al. where, 58 cases with recent use of heroin, included 60 infected femoral artery pseudoaneurysms (IFAPs) cases

were treated. 68.4% of cases were males with a median age of 36.6 years [12].

In our study, all cases were smokers and drug addicts with blood-borne infections; 4 cases (16.7%) had HIV, 4 cases (16.7%) had HCV, 6 cases (25%) had both, 2 cases (8.3%) had combined HIV, HCV & HBV and 8 cases (33.3%) were free from any blood-borne infection.

Shakarchi et al. identified hepatitis C in just 10 cases, and HIV in one case [11]. Li et al. revealed that 89%, 49%, and 3% of patients had hepatitis C, hepatitis B, and HIV infections, respectively [13].

In the current study, all the studied cases were drug addicts. More than half (58.3%) of them had drug addiction for more than 24 months. Six cases (25%) were addicted for less than two years, and the rest of the cases (16.7%) were addicted for less than one year.

In Shakarchi et al.'s [11] study, all cases had thigh or leg swelling along with groin pain. But in our research, 17 cases (70.8%) had the pseudo-aneurysm below the inguinal ligament, and 7 cases (29.2%) had swelling above the inguinal ligament as a presenting symptom, and no case had leg swelling.

In our study, wound infection with sinus discharging pus and general sepsis presented in 45.8% of the cases. But in Quiroga et al. review, 50% of cases had positive blood cultures at the time of the first visit [12].

In the present work, *Staphylococcus aureus* is most frequently the cause of bacteremia (54.5%), followed by *Pseudomonas* (18.2%). Other organisms as *Klebsiella*, *Proteus*, and *Strept.* *Pyrogens* were also found in wound culture (7.1% each).

Shakarchi revealed that 9 out of 27 patients had a positive wound culture for *S. aureus*, 4 cases had Type B *Haemophilus influenzae* group A, and 4 cases had mixed anaerobic infection. About 11 out of the 27 cases included in their study had septic shock at the time of presentation [11].

Like many other hospitals, we conducted emergency surgery, and our local protocol is ligating the afflicted vessel. The surgical approach involved making a retroperitoneal incision to expose the distal external iliac artery for proximal

control, which was necessary in only seven individuals (29.2%). But most cases (70.8%) needed proximal arterial control through an incision made just above the inguinal ligament, needless for the retroperitoneal extension wound.

Similarly, a sterile area is used to control the SFA. Following groin incision and drainage, digital pressure is used to manage the back bleeding until the femoral arteries are tied. The level of arterial ligation is determined by the infective load and tried at the most distant location. All necrotic tissue is removed, and the incision is irrigated with saline. The groin wound is either permitted to drain and seal with secondary intention or broadly approximated by stitches.

In Quiroga et al., their approach was arterial ligation, excision of the PSA, and debridement of the contaminated tissue without immediate revascularization, which was demonstrated to be a successful first-line treatment for IFAP caused by injectable drug use. Gaining endovascular control is especially beneficial in cases with identified retained needle parts, as the needle fragments can be small (2-3 mm in length) and pose a hazard to the surgical team if bleeding occurs during debridement and digital compression is attempted for bleeding management. Employing this method proved a high success rate with minimal major adverse limb events (MALE) [12].

Postoperatively, we found that O<sub>2</sub> saturation on the ligated side ranged from 46 to 89 with a mean of 72±15. Pain was reported in 10 cases (41.7%), coldness in two-thirds (66.7%) of the cases, and cyanosis in 8 cases (33.3%). Capillary refilling was delayed in 5 cases (20.8%) and absent in 3 cases (12.5%). Finally, motor and sensory powers were affected in 4 cases (16.7%), lost in another 4 cases (16.7%), and preserved in 16 patients (66.7%).

Amputation was the net result in about 8 out of the total 24 patients included in the study (33.3%). This has no significant relationship with any of the demographic data, history of blood-borne infection, duration of addiction, site of swelling, level of arterial ligation, or presence of disease or sepsis.

However, there was a highly statistically significant decrease in O<sub>2</sub> Saturation in ligated limbs among amputated cases compared to non. It ranged from 77 to 89 (mean 81.88 ± 4.83) in non-amputated

instances compared to 46-63 (mean  $52.63 \pm 4.41$ ) in the ligated side of amputated cases.

Also, all eight amputated cases had pain, coldness and cyanosis on the ligated side. Delayed capillary refilling was found in 5 amputated cases and absent in 3 amputated cases. Affected motor and sensory function was evident in 4 cases and lost in 4 others among amputated cases. So, there was a substantial elevation in the frequency of these parameters among amputated cases compared to non.

Shakarchi J et al. suggested that despite ligating the distal external iliac artery, only a small percentage of patients required major amputations [11]. They were the earliest to demonstrate a pattern towards a greater risk of amputation with a greater level of ligation in that cohort of cases. However, their findings were not remarkable. Thus, they recommended avoiding external iliac artery ligation, even at the most distal part, just under the ligament, leaving the circumflex iliac vessel in the circuit. Hence, an extra-anatomical bypass must be regarded if distal external iliac artery ligation is necessary owing to the infection load.

We also found that 13 patients (81.2%) of the non-amputated cases had signs of ischemia (claudication). These signs were mild in 5 cases (31.2%), moderate in 3 cases (18.8%) and severe in 5 cases (31.2%). Eight patients (50%) had coldness, and only two (20%) had pain in the non-amputated group. They all had no colour changes, normal capillary refill, or preserved motor and sensory functions on the ligated side.

Salimi et al. noticed that 77% of the individuals who underwent IFAP ligation maintained regular daily activities without arterial bypass [14]. However, ABIs were not assessed, and they did not disclose the assessment method utilized to evaluate recovery to their previous activity level in their research.

Qiu et al. also reported favorable outcomes with ligation. Claudication at three months was observed in just 12% of cases requiring no amputation [15]. Quiroga et al. study group had a significant death rate for such young cases [12]. Compared to our study, 16 out of 24 patients had near-normal lifestyles even with symptoms such as coldness on the ligated side.

## CONCLUSION

PSA caused by intravenous drug misuse continues to present substantial hurdles to surgeons around the world, ranging from accurate diagnosis to surgical options. Even though, each surgical technique has its own set of restrictions, the goals of surgery must be effective debridement and infection and bleeding control. Increased awareness must be promoted to recognize any connected issues early and administer suitable therapy.

We found that artery ligation, PSA excision, and debridement of diseased tissue are successful first-line treatments with very low MALEs. We recommend against performing early vascular repair because of the increased risk of infection. Furthermore, we encourage larger-scale trials with long-term follow-up to determine the best treatment approach for IFAP cases.

No potential conflict of interest was reported by the authors.

## References

1. Ilic A, Stevanovic K, Pejkić S, Marković M, Dimić A, Sladojević M, et al. Vascular injuries in intravenous drug addicts—A single-center experience. *Ann Vasc Surg.* 2020; 67:185–91.
2. Siddique S, Anwar MH, Khan TM, Zia N. Optimal management of infected femoral pseudoaneurysm in drug addicts presenting to Benazir Bhutto Hospital, Rawalpindi. *Professional Med. J.* 2022;29:1625–9.
3. Hemdan MAA, Ewida AM, Metwally YHH. Surgical management of the infected femoral pseudoaneurysms in intravenous drug addicts. *Egypt. J. Hosp. Med.* 2018;72:4539–42.
4. Elahwal M, Gaweesh AS, Elemam A, Moustafa S. Predictors of limb outcome following arterial ligation of infected femoral pseudoaneurysms in drug abusers. *Ann Vasc Surg.* 2020;65:130–6.
5. Tresson P, Huvelle U, Bordet M. Femoral artery ligation for treatment of infected groin pseudoaneurysm in injected drug abusers. *Clin Anat.* 2022;35:1138–41.
6. Gulland A. Drug deaths hit a record high in England and Wales, figures show. *BMJ.* 2016;354:i4921.



7. D’Oria M, Sgorlon G, Calvagna C, Zamolo F, Chiarandini S, Adovasio R, et al. Endovascular Management of Infected Femoral Artery Pseudoaneurysms in High-Risk Patients: A Case Series. *Cardiovasc Intervent Radiol.* 2017;40:616–20.

8. Moulakakis KG, Alexiou VG, Sfyroeras GS, Kakisis J, Lazaris A, Vasdekis SN, et al. Endovascular management of infected iliofemoral pseudoaneurysms - a systematic review. *Vasa.* 2017;46:5–9.

9. Hu Z-J, Wang S-M, Li X-X, Li S, Huang X-L. Tolerable hemodynamic changes after femoral artery ligation for the treatment of infected femoral artery pseudoaneurysm. *Ann Vasc Surg.* 2010;24:212–8.

10. Stevenson RP, Semple C, Hussey K, McGovern J, Stuart WP, Kingsmore DB. Changes in the demographics of intravenous drug users with mycotic common femoral artery pseudoaneurysm as a consequence of self-injection does not influence outcome following emergency ligation. *Vascular.* 2017;25:520–4.

11. Al Shakarchi J, Wall M, Garnham A, Hobbs S, Newman J. Artery Ligation for Infected Femoral Pseudoaneurysms Does Carry a High Risk of Major Amputation. *Ann Vasc Surg.* 2019;58:326–30.

12. Quiroga E, Shalhub S, Tran NT, Starnes BW, Singh N. Outcomes of femoral artery ligation for treatment of infected femoral pseudoaneurysms due to drug injection. *J Vasc Surg.* 2021;73:635–40.

13. Li Q, Shu C, Jiang X, Li M, Li X, He H. Surgical management of infected pseudoaneurysms of femoral artery caused by narcotics injection. *Zhong Nan Da Xue Xue Bao Yi Xue Ban.* 2009;34:476–80.

14. Salimi J, Shojaeefar A, Khashayar P. Management of infected femoral pseudoaneurysms in intravenous drug abusers: a review of 57 cases. *Arch Med Res.* 2008;39:120–4.

15. Qiu J, Zhou W, Zhou W, Tang X, Yuan Q, Zhu X, et al. The Treatment of Infected Femoral Artery Pseudoaneurysms Secondary to Drug Abuse: 11 Years of Experience at a Single Institution. *Ann Vasc Surg.* 2016;36:35–43.

**Supplementary Table (1):** Relation between amputation and ankle brachial index pre and post

ABI	No amputation	Amputation	t	p
	Mean ± SD	Mean ± SD		
Pre	0.9 ± 0.103	0.9 ± 0.151	0	>0.999
Post	0.669 ± 0.087	0.35 ± 0.076	8.788	<0.001**
p <sup>§</sup>	<0.001**	<0.001**		
	Median (IQR)	Median (IQR)	Z	p
% decrease	25(20.56 – 30%)	61.25(52.5 – 68.13%)	-3.942	<0.001**

§Paired sample t test    t independent sample t test    IQR interquartile range    \*\*p≤0.001 is statistically highly significant

**Citation**

Romih, E., Gamil, A., Effat, M., Elsabbagh, M. Evaluation of Surgical Management of Infected Femoral Artery Pseudoaneurysm in Intravenous Drug Abusers. *Zagazig University Medical Journal*, 2024; (4878-4886): -. doi: 10.21608/zumj.2024.275238.3235