

## INCIDENCE AND DETERMINANTS OF LOWER LIMB SALVAGE FOLLOWING ARTERIAL LIGATION IN INFECTED PSEUDOANEURYSM IN INTRAVENOUS DRUG ABUSERS

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### ABSTRACT:

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**Background:** *Infected femoral artery pseudoaneurysms (IFAPs) in Intravenous drug abusers (IVDAs) are very common nowadays with increasing incidence and controversial management strategy with little data about correlation between IFAPs criteria and limb outcome.*

**Aim of the work:** *to estimate incidence and determinants of limb salvage post arterial ligation in patients with infected pseudoaneurysms.*

**Patients and Methods:** *Prospective cohort with 18 months follow up of 40 IVDA patients presented with groin pseudoaneurysms to estimate incidence and determinants of Lower Limb salvage following Arterial Ligation.*

**Results:** *Duration of Intravenous (IV) addiction ranged from half a year to 30 years and affected groin use ranged from half a year to 10 years and duration of symptoms ranged from 1 to 6 weeks. Symptoms ranged between swelling in 13 cases (32.5%), pulsating mass in 12 cases (30%) and hemorrhage in 15 cases (37.5%). DVT found in 31 cases (77.5%). Incidence of limb salvage post arterial ligation is 75% (N 30), threatened limbs found in 25% of cases (N 10). Amputation required in 15% (N 6) and bypass in 12.5% (N 5) bypass followed by amputation in one patient. Primary patency of all constructed bypasses is 6 months for 80% (N 4) and 3 months for 20% (N 1). Viral markers showed 33 patients were HCV +ve (82.5%), 8 patients HBV +ve (20%), 9 patients HIV +ve (22.5%). There was statistically significant difference between both groups as regard duration of affected groin use, duration of symptoms, nature of presenting symptom, Pre and immediate post-operative ABI and percent of reduction between both and Level of ligation are determinants of limb salvage*

**Conclusion:** *Ligation and debridement with selective revascularization strategy is a safe option in IFAPs management. Incidence of limb salvage following arterial ligation is 75%. Duration of affected groin use, duration of symptoms, nature of presenting symptom, Pre and immediate post-operative ABI and percent of reduction between both and Level of ligation are determinants of limb salvage.*

**Keywords:** *drug abusers, infected femoral pseudoaneurysms, limb salvage, ligation of groin vessels, IVDAs: intra venous drug abusers.*

### INTRODUCTION:

Infected femoral pseudoaneurysms are a common presentation in intravenous drug

abusers (IVDA) with little consensus as to the optimum management of these patients. Whilst emergency revascularisation options are available, excision and ligation of the

femoral artery remains the most common operative intervention but risks leaving the patient with critical ischaemia or intermittent claudication.<sup>(1)</sup>

Pseudoaneurysm in IVDA is mostly mycotic that occurs as a consequence of infection after direct arterial injury. They represent a fulminant infectious process, which, if untreated, may result in systemic sepsis, rupture and exsanguination. Historically, mycotic pseudoaneurysms were classified pathophysiologically based on the mode of arterial infection: direct arterial infection from an area of suppuration (primary), septic embolus with arterial occlusion (secondary) – frequently in the context of infective bacterial endocarditis, and finally, as a consequence of adherence of viable pathogens in the arterial wall in patients with systemic sepsis.<sup>(2)</sup>

Some surgeons advocate artery ligation and local debridement alone, with acceptable results. However, there is no level I evidence to support these procedures and the quality of results is questionable as they are based on a small clinical series with poor follow-up. Moreover, up to now, there has been no report to investigate which characteristic infected femoral artery pseudoaneurysm can be treated by artery ligation and local debridement alone without any fear of ischemic complications.<sup>(3)</sup>

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## **PATIENTS AND METHODS:**

This prospective cohort study was conducted by simple sampling of 40 IVDA patients N=40. Age ranged between 24 and 56 year old admitted with infected femoral pseudoaneurysm and managed by ligation and debridement as the sole management for all patients.

Patients were enrolled from Jan 2018 to Jan 2019 at Ain Shams University Hospitals. Patients' informed written consent and Local Ethical Committee approval have been obtained before patients' allocation. Patients

presented with lost limb at time of presentation were excluded from the study.

**Pre-Operative:** All patients diagnosed on clinical basis of ruptured femoral pseudoaneurysm, pulsating mass or non pulsating mass with duplex or CT angiogram confirming pseudoaneurysm if patient's condition permits. Emergency resuscitative measures and compressive dressings were applied immediately to patients presenting with ruptured pseudoaneurysms with external bleeding. Demographic data and relevant history were recorded (Age, Sex, duration of IV addiction, duration of affected groin use and duration of symptoms). Careful clinical examination conducted and recorded (presenting symptom, leg status, preoperative Ankle brachial Index ABI). Complete blood count, renal functions, PT, PTT, INR and viral markers (HCV, HBV, HIV) were performed for all cases. Imaging in the form of arterial duplex done in 13 cases presented with non-pulsating masses and duplex confirmed presence of pseudoaneurysm. CT angiogram done in 4 cases and confirmed presence of pseudoaneurysm. Imaging not done in cases presented with frank hemorrhage.

**Operative procedure:** All cases were managed by retroperitoneal exposure of iliac vessels to ensure proximal control and to assess extension of infection. Distal Superficial Femoral Artery (SFA) control was done to decrease bleeding from pseudoaneurysm exposure as much as we can. Then cases were managed by exploration of pseudoaneurysm and ligation of affected vessel and local debridement of infected tissues with ligation as low as safe for iliac vessels and as high as safe for femoral vessels to maintain collateral circulation. Level of proximal ligation was recorded, iliac exposure and SFA exposure wounds were closed primarily but pseudoaneurysm wounds were left for healing by secondary intention in all cases. Presence or absence of DVT was recorded either from duplex scan or assessment of

vein during exposure. Immediate post operative ABI were recorded at the end of procedure.

**Post-operative:** follow up was done immediately after ligation and hourly close monitoring for 6 hours then every 6 hours for 48 hours to assess leg perfusion by capillary refilling, Doppler signals, coldness, motor power and patient’s general condition “ blood pressure, conscious level, inotropic support, ABG and creatine kinase level “ to decide between no further intervention, above knee amputation or bypass construction if the patient requires further intervention. Decision was taken on individual basis. Patients were allocated after ligation into 2 groups: group1 of non-threatened limbs post ligation and Group 2 with threatened limbs post ligation “required secondary intervention in the form of bypass or amputation through study time”. In patients with threatened limbs but were not amenable for revascularization due to extensive tissue loss following debridement, lack of safe bypass construction planes or bad general condition, above knee amputation was performed. Criteria of a non-salvageable limb included tender and tense calf muscles, total loss of motor power, profound fixed cyanosis, fixed mottling of the limb, sever acidosis and hyperkalemia related to ischemic leg. In patients with threatened limbs and the general condition permits and in presence of safe planes, construction of ilio-femoral

bypass was done through obturator foramen if safe medial planes “done in one case only” or through lateral subcutaneous approach “done in 4 cases “all bypasses were constructed by synthetic ringed 8 mm graft.

Further follow up done via outpatient clinic visits and phone calls at 6, 12 and 18 months to assess leg viability via capillary refilling and ABI, wound status and photographs were taken after consent, construction of bypass if signs of critical ischemia develops, assessment of constructed bypasses and assessment of amputation wounds.

**Chosen determinants:** Preoperative ABI, Level of ligation, duration of intravenous drug abuse, Extent of infection (above or below inguinal ligament), Presence or absence of DVT, duration of symptoms and duration of affected groin use.

**Statistical analysis:** The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (SPSS 25). Data was presented and suitable analysis was done according to the type of data obtained for each parameter.

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**RESULTS:**

Demographic data showed that age (ranged from 24 and 56) and sex (38 males 95%, 2 female 5%). (table 1)

Table (1): Demographic data of patients:

		Mean / N	SD / %	Median (IQR)	Range
Age		38.1	8.1	36.5 (33 - 42)	(24 - 56)
Sex	Male	38	95.0%		
	Female	2	5.0%		

Addiction history showed Duration of Intravenous (IV) addiction ranged from half a year to 30 years with a mean of 6.9 years and affected groin use ranged from half a

year to 10 years with a mean of 3.4 years and duration of symptoms ranged from 1 to 6 weeks with a mean of 3.2 weeks.

Table (2):Addiction history:

	Mean	SD	Median (IQR)	Range
duration of IV addiction (ys)	6.9	6.8	5 (2 - 10)	(0.5 - 30)
Duration of affected groin use (ys)	3.4	2.4	3.25 (1 - 5)	(0.5 - 10)
duration of symptoms ( weeks )	3.2	1.4	3 (2 - 4)	(1 - 6)

Viral markers showed that 33 patients HCV +ve (82.5%), 7 patients HBV +ve (17.5%), 9 patients HIV +ve (22.5%). (table 3)

Table (3): Viral markers:

		Mean / N	SD / %	Median (IQR)	Range
HCV	No	7	17.5%		
	Yes	33	82.5%		
HBV	No	33	82.5%		
	Yes	7	17.5%		
HIV	No	31	77.5%		
	Yes	9	22.5%		

Right groin was affected in 20 cases 50% and left was affected on the other 20, 50 %. Symptoms ranged between swelling in 13 cases 32.5%, pulsating mass in 12 cases 30% and hemorrhage in 15 cases 37.5 %. Infection extension above the inguinal

ligament found in 23 cases 57% and confined to below inguinal ligament area in 17 cases 42.5%. Total Leucocytic count ranged from 5.7 to 51.3. DVT found in 31 cases 77.5 % and no DVT in 9 cases 22.5%. (table 4)

Table (4): Clinical examination:

		N	%
Groin	Rt	20	50.0%
	Lt	20	50.0%
Swelling	No	27	67.5%
	Yes	13	32.5%
pulsating mass	No	28	70.0%
	Yes	12	30.0%
haemorrhage	No	25	62.5%
	Yes	15	37.5%

Intra operative findings showed Infection extension above the inguinal ligament found in 23 cases 57% and confined to below inguinal ligament area in 17 cases 42.5%. DVT found in 31 cases 77.5 % and no DVT in 9 cases 22.5%, Level of

ligation was at femoral level in 18 patients 45%, external iliac in 19 patients 47.5% and common iliac in 3 patients 7.5%. Loss of follow up of total 6 patients at different intervals of follow up time. (table 5).

Table (5): Operative and follow up Data:

	Yes	2	5.0%
Infection Level	Above inguinal ligament	20	50.0%
	Below inguinal ligament	20	50.0%
DVT	No	9	22.5%
	Yes	31	77.5%
level of ligation	Femoral	18	45.0%
	External iliac	19	47.5%
	Common Iliac	3	7.5%
Bypass	No	35	87.5%
	Yes	5	12.5%
Amputation	No	34	85.0%
	Yes	6	15.0%
Salvage	No	10	25.0%
	Yes	30	75.0%

Table (6): Bypass Group data:

		N	%
Bypass	No	35	87.5%
	Yes	5	12.5%
time of bypass in days from ligation	.0	1	20.0%
	1.0	1	20.0%
	2.0	2	40.0%
	60.0	1	20.0%
	Primary Patency of bypass (Ms)	3.0	1
	6.0	4	80.0%

Limb salvage by ligation only achieved in 30 cases 75%. Threatened limbs found in 10 cases 25% (amputation done in 6 cases and bypass constructed in 5 cases) with bypass followed by amputation in one case. Bypass constructed in one patient immediately POD0 as the patient was presented with acutely ischemic but viable limb and at 1<sup>st</sup> POD for second patient, 2<sup>nd</sup> POD for 2 cases and 60<sup>th</sup> POD for the last patient of bypass group (N 5). Primary

patency of all constructed bypasses found to be 6 months for 80% (N 4) and 3 months for 20% (N 1) with secondary intervention required in 60% patients.

#### **Comparison analysis of groups:**

Comparison analysis of both groups showed no statistically significant difference in demographic data or laboratory data between both groups as regard limb salvage.

Table 7: Relation between salvage and demographic data

		Salvage		Test of significance		
		No	Yes	Value	p-Value	Sig.
		Mean ± SD N (%)	Mean ± SD N (%)			
Age		39.3 ± 9.29	37.67 ± 7.74	<i>t</i> = 0.550	0.586 <sup>(T)</sup>	NS
Sex	Male	8 (21.05%)	30 (78.95%)		0.058 <sup>(F)</sup>	NS
	Female	2 (100%)	0 (0%)			

<sup>(T)</sup> Student t-test of significance. (*t*= student t-test value)

<sup>(F)</sup> Monte-Carlo Fisher's Exact test of significance.

Comparison analysis of addiction data showed statistically significant difference between 2 groups in duration of affected groin use and duration of symptoms.

Table 8: Relation between salvage and addiction history

	Salvage		Mann-Whitney test		
	No	Yes	<i>U</i>	p-Value	Sig.
	Median (IQR)	Median (IQR)			
duration of IV addiction (ys)	2 (1.5 - 5)	6 (3 - 10)	90	0.059	NS
Duration of affected groin use (ys)	1 (0.5 - 3)	4 (1.5 - 6)	74.5	0.017	S
duration of symptoms ( weeks )	1 (1 - 2)	4 (3 - 4)	25	<0.001	S

Comparison analysis of signs showed statistically significant difference between 2 groups in presenting symptom.

Table 9: Relation between salvage and signs.

		Salvage		Test of significance		
		No	Yes	Value	p-Value	Sig.
		N (%)	N (%)			
Groin	Rt	5 (25%)	15 (75%)	$\chi^2 = <0.001$	1.00 <sup>(C)</sup>	NS
	Lt	5 (25%)	15 (75%)			
Swelling	No	8 (29.63%)	19 (70.37%)		0.451 <sup>(F)</sup>	NS
	Yes	2 (15.38%)	11 (84.62%)			
pulsating mass	No	9 (32.14%)	19 (67.86%)		0.231 <sup>(F)</sup>	NS
	Yes	1 (8.33%)	11 (91.67%)			
haemorrhage	No	3 (12%)	22 (88%)		0.024 <sup>(F)</sup>	S
	Yes	7 (46.67%)	8 (53.33%)			

<sup>(C)</sup> Chi-Square test of significance. ( $\chi^2$ = Chi-square test value)

<sup>(F)</sup> Monte-Carlo Fisher's Exact test of significance.

Level of ligation was related statistically to immediate postoperative ABI and percent of reduction.

Table 10: Relation between level of ligation and ABI.

	level of ligation			One Way ANOVA		
	Femoral	External iliac	Common Iliac	f	p-Value	Sig.
	Mean ± SD	Mean ± SD	Mean ± SD			
Preoperative ABI	0.86 ± 0.15	0.88 ± 0.12	1 ± 0	1.380	0.265	NS
Immediate post	0.52 ± 0.19	0.29 ± 0.18	0 ± 0	14.315	<0.001*	S
Percent of reduction	39.7% ± 19.8%	64.7% ± 25.7%	100% ± 0%	12.051	<0.001*	S

Comparison analysis of signs showed statistically significant difference between 2 groups in pre-operative ABI and immediate post-operative ABI and percent of reduction between both.

Table 11: Relation between salvage and ABI follow up

	Salvage		Student t-test		
	No	Yes	t	p-Value	Sig.
	Mean ± SD	Mean ± SD			
preoperative ABI	0.98 ± 0.07	0.85 ± 0.14	3.700	0.001	S
immediate post	0.07 ± 0.07	0.47 ± 0.18	-9.731	<0.001	S
Percent of reduction	93.1% ± 7.3%	44.7% ± 21.4%	10.542	<0.001	S

Comparison analysis of signs showed statistically significant difference between 2 groups in Level of ligation and no significant relation as regard presence or absence of DVT and infection level.

Table 12: Relation between salvage and other determinants

		Salvage		Test of significance		
		No	Yes	Value	p-Value	Sig.
		N (%)	N (%)			
Infection Level	Above inguinal ligament	3 (15%)	17 (85%)	X <sup>2</sup> = 2.133	0.144 <sup>(C)</sup>	NS
	below inguinal ligament 2	7 (35%)	13 (65%)			
DVT	No	2 (22.22%)	7 (77.78%)		1.00 <sup>(F)</sup>	NS
	Yes	8 (25.81%)	23 (74.19%)			
	Yes	5 (100%)	0 (0%)			
level of ligation	Femoral	1 (5.56%)	17 (94.44%)		0.002 <sup>(F)</sup>	S
	External iliac	6 (31.58%)	13 (68.42%)			
	Common Iliac	3 (100%)	0 (0%)			

**DISCUSSION:**

Management of pseudoaneurysm patients is a challenging aspect with no guidelines or level 1 evidence about the optimum management. In literature, management plans ranged between: table 13,<sup>(4)</sup>

Ligation only without revascularization, Ligation with immediate revascularization in all cases, Ligation selective revascularization “delayed” and the least popular endovascular management by covered stents.

Table 13:Management options from previous Papers

	Patients	Procedure	Amputation rate	Graft infection	Remarks
Rammell et al(1)	4	Ligation only	25 %	-	
Naqi et al (9)	17	Ligation only	23%	-	
Arora et al (8)	6	Ligation only	0%	-	+ve Pedal Flow in all patients after ligation
Klonaris et al (10)	14	Immediate revascularisation	7.1%	7.1%	Autogenous conduits 86%
Lashkarizadeh et al(11)	21	Selective (14 LE, 5 R, 2 B)	5%	-	Prospective wait and see
Majeed et al (12)	13	Selective (9 LE, 4 B)	7.6%	75%	Retrospective/ no criteria mentioned
Pradhan et al (13)	10	Selective (3 LE, 7 B)	0%	57%	Retrospective/ no criteria mentioned
Tan et al (14)	13	Selective (6 LE, 7 B)	0%	14.2%	Retrospective/ no criteria mentioned
Mousavi et al (6)*	134	Ligation only	0%	-	Retrospective/ no criteria mentioned
Antoniou et al (15)*	2	Endovascular	0%	-	1 patient lost and one thrombosed

LE: ligation excision, R: repair, B: bypass \*Study added to the original table

Our study design is unique as it is a prospective cohort study with follow up time of 18 months and most studies of this population are designed as retrospective cohort with small sample size and short term follow up. Loss of follow up is a major problem in this population reflected by these studies.

Ligation without revascularization is a simple option with good results and is advocated by many surgeons. (1,3,6,8,9) This reduces the risk and morbidity of graft infection and or hemorrhage due to septic rupture of anastomosis which could be fatal. Most of the concerns about this management option stem from a report by DeBakey and Simeone in 1946 in which ligation of SFA and CFA resulted in amputation rates of 54% to 86% respectively (5). However, these data were among military wounds and we don't believe that this population can be compared to IVDAs population as they don't have the same factors that stimulate arteriogenesis in IVDAs as recurrent arterial

injuries, micro emboli, infection, nicotine and opioids.

The biggest support of this management option comes from Mousavi et al series(6) who reported 134 patients managed by ligation and only 2 patients required minimal amputations in the form of forefoot and one toe amputations. On the other hand, some series showed that ligation only strategy resulted in amputation of 25% of cases. (1)

In a large retrospective study over 461 patients, Georgiadis et al reported that immediate (routine) revascularization strategy using either in situ or extra-anatomic bypass has also been associated with high complication rates. Even when it occurs through non-infected tissue planes, the risk of graft infection (early, 21.1%; late, 32.4%) is of great concern, and the possibility of sepsis (together with anastomotic dehiscence (14%) and even amputation) is high (early, 9.8%; late, 11.3%). (7) We believe that immediate bypass construction is not favorable as it increases the risk of graft infection and or failure

while delayed bypass construction carries better outcome. In our bypass cases only 1 patient required immediate revascularization as he was presented with acute ischemia but viable limb and IFAP and subclinical infection was found in this graft as it was found thrombosed and removed after 6 months, after removal patient did not require any further intervention and all wounds are healed and he has only non-limiting claudication pain.

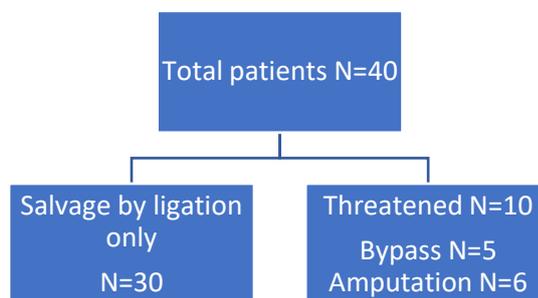
Taking the balance between these management options, we advocated the selective revascularization strategy after ligation and excision of infected tissues. In most papers there were no predictors or determinants for bypass construction or amputation in ligated patients.

There is no strong evidence about the best modality for assessment of leg viability intraoperatively after ligation as clinical assessment of motor or sensory power can't

be done, capillary refilling and Doppler flow signals may also be affected by vasospasm and patient's hemodynamic instability. Tell now, Doppler flow seems to be the most reliable factor in assessment of leg vascularity intraoperatively. Based on this, we calculated and recorded the immediate Post-operative ABI and percent of ABI reduction.

We found a statistically significant reduction of ABI in relation to level of ligation as shown in table 10.

We allocated patients N=40 into 2 groups: Patients were group1 of non-threatened limbs post ligation N=30. Group 2 with threatened limbs post ligation N=10 "required secondary intervention in the form of bypass N=5 or amputation through study time N=6". Bypass followed by graft removal then amputation occurred in same patient.



**Threatened limbs (amputation group):**Above knee amputation was done in 6 cases due to presence of threatened limb and bad general condition or unsafe planes for bypass construction. CIA was ligated in 3 cases, one patient presented with groin swelling, signs of sepsis and massive bleeding per rectum and after exploration, an infective fistula between iliac vessels and intestine found that required ligation of CIA to control bleeding. The other 2 cases with ligated CIA was presented with severe infection up to CIA level that it was not safe to ligate at lower level.

Another case presented with threatened limb 30 days post ligation of EIA, extraanatomical lateral ilio femoral bypass constructed but unfortunately 3 months post-operative, patient presented with sepsis and graft was removed and patient required above knee amputation due to non reconstructable critical ischemia.

Another case presented with massive bleeding and iliac vessels were ligated to control bleeding and patient required inotropic support at ICU and persistent acidosis and increased levels of CK total that required above knee amputation.

Last case was presented by lost limb at follow up that required Above knee amputation.

**Threatened Limbs (bypass group):**  
Bypass was constructed in 5 patients with threatened limbs and good general condition and safe planes for bypass construction.

It was constructed in lateral subcutaneous tract in 4 cases and trans obturator in 1 case. All were constructed by 8 mm ringed graft between external iliac artery and distal part of SFA.

One case required immediate construction of bypass as he was presented with acutely ischemic but viable limb and exploration showed infected thrombosed pseudoaneurysm and construction of lateral subcutaneous ilio femoral bypass was done with success but unfortunately patient presented with pus discharge from bypass tract and loss of previous post-bypass pulse, exploration showed infected thrombosed graft that was removed and patient did not require further intervention.

Another case required bypass POD 1 and due to good medial planes, decision to create a trans-obturator bypass taken and was successfully done. primary patency was 6 months and thrombectomy required as case presented with acute ischemia symptoms.

Another 2 cases required bypass POD 2 in lateral subcutaneous planes, loss of post-bypass pulses occurred in 6 months but no further intervention required, as they were presented with non-limiting claudication pain.

In last case, bypass was constructed POD 30 as patient was presented with critical ischemia. Extraanatomical lateral ilio femoral bypass constructed but unfortunately 3 months post-operative, patient presented with sepsis and graft was removed and patient required above knee amputation.

There has been no report to investigate which characteristic infected femoral artery pseudoaneurysm can be treated by artery ligation and local debridement alone without any fear of ischemic complications.<sup>(3)</sup>

Qui et al tried to correlate between addiction history and outcome and he stated that IV addiction for more than 5 years have a favorable outcome. They mentioned the IV addiction duration in general regardless mentioning duration of groin use.

The other study done on this topic done by El-Ahwal et al.<sup>(4)</sup> as they studied the mode of presentation, site of ligation, pedal Doppler flow post ligation and Pre and post-operative ABI, they concluded that level of ligation and Doppler flow post ligation were predictors of limb outcome but their study unfortunately was small numbered, short term follow up and with loss of follow up of patients.

The determinants we chose are determinates that we thought may directly or indirectly affect limb viability post arterial ligation and they are mainly discussing the factors that may affect collateral circulation around hip joint and thus limb viability and outcome, those determinants are combined from the previous studies with additions: Preoperative ABI, Level of ligation, duration of intravenous drug abuse, Extent of infection (above or below inguinal ligament), Presence or absence of DVT, duration of symptoms and duration of affected groin use.

In contrary to Qui et al, we found that duration of affected groin use in years instead of whole duration of IV addiction was statistically significant for limb salvage as well as duration of symptoms (table 8). This could be explained by time needed for collaterals development.

Pre and immediate post-operative ABI and percent of reduction between both found to be statistically significant for limb salvage (table 11).

**Incidence And Determinants Of Lower Limb Salvage Following Arterial Ligation In Infected**

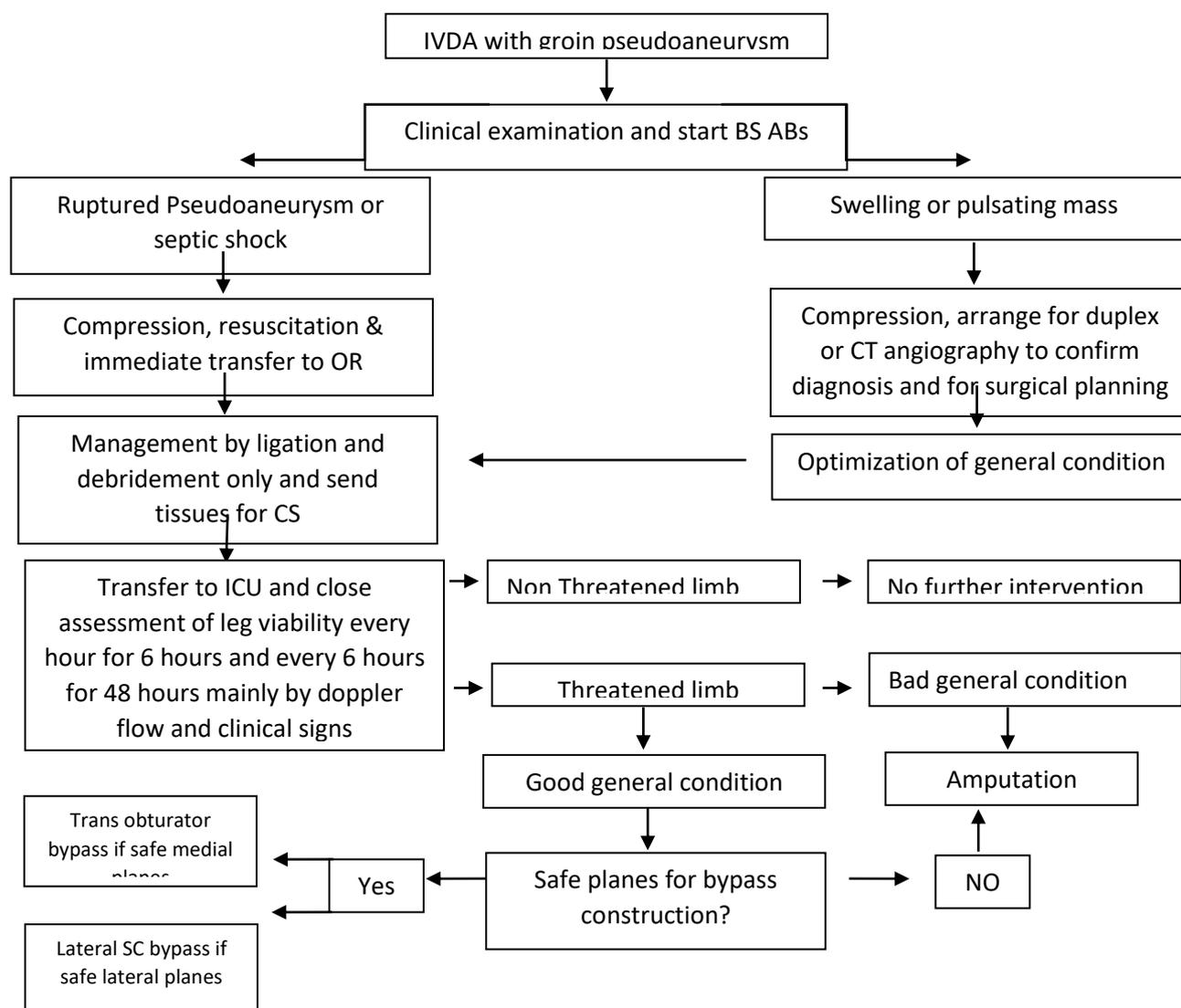
Level of ligations statistically significant (table 12) As all patients with ligated CIA required limb amputation and patients with ligated iliac vessels developed more percent of reduction in ABI post operatively than patients with ligated femoral vessels only and our results are supported by El-Ahwal et al. (4) and Arora et al. (8) and this may be explained by preservation of collateral vessels as deep circumflex iliac and inferior epigastric vessels. We also think that ostial ligation of

affected vessels is better than deep ligation that may affect collaterals and hence limb viability and outcome.

Our results go with El Ahwal et al (4) as regard presenting symptom, we found that patients presented with hemorrhage had unfavorable outcome (table 9).

Presence or absence of DVT and infection level were not statistically significant for limb salvage. 6 patients lost along follow up time.

**We suggest a simple algorithm pattern for management IFAP patients:**



**Diagram (1):** Pseudoaneurysm management algorithm.

**Conflict of interests:**

The authors declare that there is no conflict of interests regarding the publication of this paper.

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نسبة ومحددات انقاذ الاطراف السفلية بعد ربط الشرايين المصابة بالتمدد الشرياني الكاذب الملتهب في مرضى الحقن الخاطئ

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### الملخص العربي

يعتبر علاج مرضى تمدد الأوعية الدموية الكاذب أمراً صعباً لانعدام وجود إرشادات واضحة أو دليل من المستوى الأول حول العلاج الأمثل.

يعتبر الربط مع إعادة التروية الانتقائية خيار علاج معقول. حيث أن استراتيجية الربط الشرياني والتنظيف فقط تحمل قد تؤدي إلى البتر، كما أن استراتيجية إعادة التروية الروتينية الفورية بعد الربط والإنضار تنطوي على مخاطر عالية للإصابة بعدوى ثانوية قد تؤدي إلى انفجار الشريان التي قد تؤثر على حياة المريض وتؤثر أيضاً على قابلية الأطراف للحياة.

يناقش عدد قليل من الدراسات معايير تمدد الأوعية الدموية أو تاريخ تعاطي المخدرات عن طريق الوريد وعلاقتها بالنتائج. حيث أظهرت دراسة أن مدة الإدمان الوريدي هي مؤشر على النتيجة وأظهرت دراسة أخرى أن مستوى الربط وتدفق دوبلر بعد الجراحة مباشرة هما مؤشران على النتيجة. حاولنا في دراستنا الجمع بين المؤشرات من الدراسات السابقة بالإضافة إلى مؤشرات أخرى لمحاولة التحقق من صحة نتائج الدراسات السابقة والكشف عن المؤشرات المحتملة الأخرى للنتائج.

على غرار الدراسة السابقة ، كان مستوى الربط الشرياني ومعدل سريان دوبلر بين شريان الكاحل وشريان الذراع قبل وبعد العملية ومقدار الإنخفاض بينهما مؤشراً للنتيجة، وعلى عكس الدراسة الأخرى ، لم تكن مدة الإدمان الوريدي بشكل عام مؤشراً للنتيجة بل مدة الإدمان الوريدي في الجزء المصاب ومدة وطبيعة العرض الظاهر من المريض كلها مؤشرات للنتيجة.

تعتبر الدورة الدموية الجانبية حول مفصل الورك أمراً بالغ الأهمية والعوامل التي تحافظ على الدورة الدموية الجانبية حول مفصل الورك وتزيدها لها نتائج مؤثرة على حياة الطرف.