RESULTS AND ILLUSTRATIVE CASES

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LOWER LIMB ARTERIAL OCCLUSIVE DISEASE (GROUP I)

Aortic Lesion

Subgroup Ia

Thirteen patients (8 male and 5 female) ranging in age from 54 yrs to 83 yrs with average of 63.8 yrs underwent diagnostic aortography. The indication for angiography was claudication in 10 patients, rest pain in 2 patients and minor tissue loss in one patient (Table 14).

Total number of lesions were 13 (either diffuse or focal), 12 were in the infrarenal segment (9 involved the aortic bifurcation and 3 were more proximally) and in one patient the lesion extends to involve both the supra and infra-renal portion of the aorta. All the lesions were atherosclerotic in origin. The main aortic angiographic findings in this group of patients was stenoses in 9 patients, aneurysms in 2 patients, occlusion in 1 patient, and stenosis with occlusion in 1 patient. Dilatation, tortousities, wall irregularities and ulceration are other findings commonly met with.

No specific radiological intervention for any of the aortic lesion were done in this study. 12 patients underwent aortic surgical management and/or infra-aortic percutaneous therapy either immediately or within the first 4 months following the diagnostic study. Delayed intervention was due to adequate collaterals at the time of the diagnostic study and/or trial of treatment with medical therapy. Intervention was carried on upon deterioration of patient's symptoms.

Small hematomas occurred in three patients associated with ecchymosis in one of them. These hematomas remained stable for the next three hours after the procedure and resolved spontaneously.

Follow up extended up to 15 months: 4 months in 12 patients, 8 months in 8 patients, and 15 months in 5 patients. Our end point was loss of follow up in 1 patient, death in 2 patients (CVA), peripheral amputation in 2 patients, recurrence of symptoms in 3 patients while clinical improvement was accomplished in 5 patients subjected for surgical and/or medical treatment during the 15 months period.

Table (14) Aortic Occlusive Disease (Subgroup IIa)

Diagnostic aortogram	13 (100)	
Aortic interventional Radiology	0 (0)	
Aortic Surgical Reconstruction and/or infra-aortic intervention	12 (92.5)	
Followup (F/U):		
Loss of F/U	1 (8)	
Death	2 (15)	
Peripheral Amputation	2 (23)	
Recurrence of symptoms	3 (39)	
Clinical improvement	5 (39)	
Complications Minor hematomas Major Complications	 3 (22) 0 (0)	

N.B. Percentage in parentheses

Case 1 Subgroup Ia Fig.(9 a & b):

67 year-old white female with multiple medical problems and a history of a cross femoral bypass graft (left to right). She presented with a couple days history of worsening bilateral lower extremity pain and mottling of her skin up to her hips.

Arteriography was done via left axillary approach and revealed aortic occlusion below the level of the renal arteries. All visceral vessels are patent either primarily or via collaterals.

Large retroperitoneal abscess was detected before surgery (due to bowel fistula). Left axillo-femoral graft was done.

The patient died in the postoperative period.

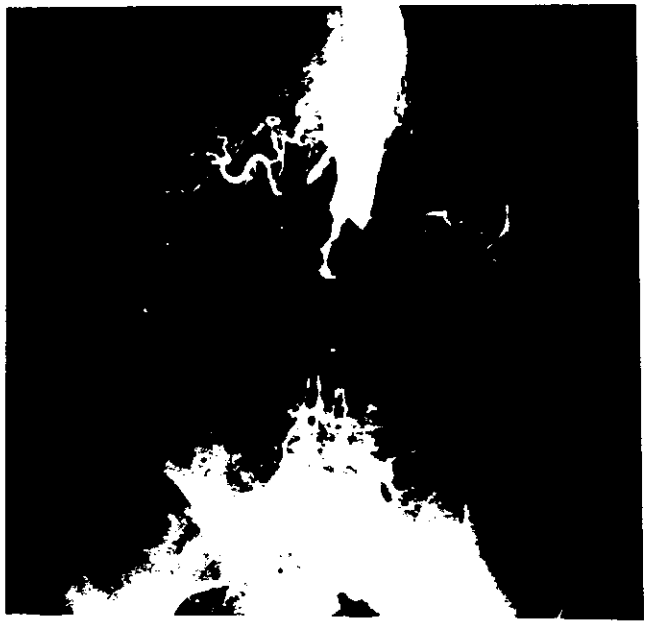


Fig.(9a): Aortogram (AP view) revealed aortic occlusion below level of renal arteries. Collateral circulation through mesenteric intercostal branches could be identified.

Fig.(9b): Pelvic arteriogram (AP view) revealed
faint reconstitution via meseuteric collaterals of the right internal iliac artery,
reconstitution of the right circumflex iliac artery is also noted.

Case 2 Sugroup Ia Fig.(10 a, b & c):

57 year old black female with bilateral leg claudication and rest pain. Aortography was requested for further evaluation.

Puncturing the right CFA demonstrated occlusion of the right external iliac artery at the level of the inguinal ligament.

Subsequent translumbar aortography demonstrated diffusely narrowed abdominal aorta below the level of the renal arteries with significant irregularity and ulceration at the aortic bifurcation (advanced atherosclerotic disease).

Aorto-bifemoral graft was placed and pulses were dopplerable bilaterally. The increase in ABI post-operatively was 0.4 on the right side.

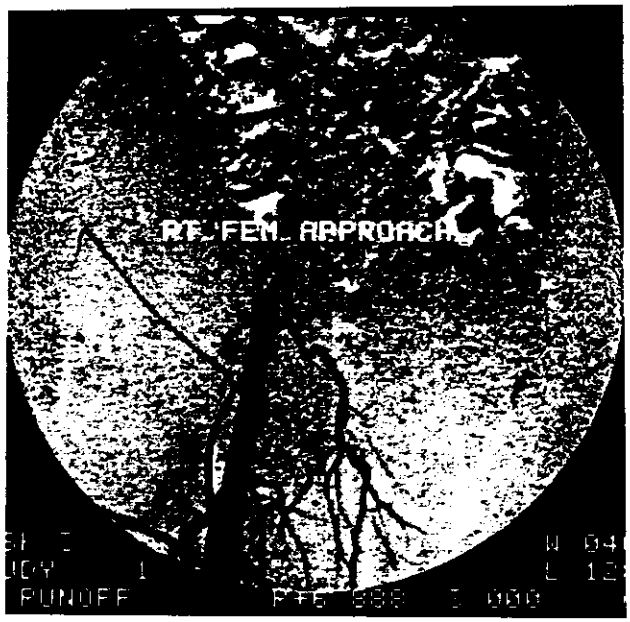


Fig.(10a): Angio. shows occlusion of the right EIA at level of inguinal ligament.

Fig.(10b): Translumbar aortography of the aorta revealed short severe stenosis of the origin of the left CIA The abdominal aorta is diffusely diseased below level of renal arteries.

Fig.(10c): Angio.(pelvis) PA view revealed proximal occlusion of the right (CIA, and EIA) . The CFA is reconstituted via collaterals to circumflex iliac and lateral circumflex femoral.

Iliac and Common Femoral Lesion
Subgroup Ib

The study population consisted of 26 patients (14 male and 12 female) ranging in age from 48 to 85 years with average age of 62.8 years. Total number of lesions was 78 involving; 37 of CIA, 28 of EIA and CFA and 13 of IIA.

Atherosclerosis was the cause of iliac occlusive disease in 25 patients with wide varieties of angiographic findings. In one patient, embolic disease due to MI was the cause of acute ischemic limb, however, it was not certain whether this occlusion was due to embolic disease of other causes such as atherosclerotic disease.

A diagnostic arteriogram was done in all patients. The radiological interventions performed involved 15 patients. PTA outcome of the CFA were included in our study with the iliac statistics 24 angioplasties were done (16 angioplasties for the CIA, 7 for the EIA and CFA, and 1 for the IIA) and 2 stent placements for CIA (will be mentioned separately). The primary technical success rate was 96% with individual artery patency rate up to 15 month period equal to 87% (percentage of initial success). The technical success was evaluated by:

a. Elimination of the hourglass of the properly selected balloon during dilatation.
b. Reduction of the lesion to < 30% residual stenosis (could be inaccurate due to occurrence of arterial cracks during angioplasty procedure).
c. Post dilatation pressure gradient < 10mm of Hg.

Clinical success, on the other hand, was characterized by restoration of strong femoral pulses and/or improvement of peripheral symptoms and was related significantly to the condition of distal runoff vessels.

In one patient, there was technical failure of PTA due to failure of recanalization of the occluded vessel. This did not result in a change in the vascular status nor was the cause of significant morbidity. This patient failing PTA underwent surgical reconstruction and should not have an increased morbidity or mortality over surgery alone. Three late failure angioplasty patients were subjected to repeat angioplasty or stent placement with the same expected results as the primary angioplasty.

The degree of stenosis was reduced from mean 60-90% with average of 74.3% to 10 -30% with average of 20%. Iliac occlusion was encountered in two of our patients and involving the CIA in one case and the EIA in another. Pre-interventional ABI ranged from 0.2 to 0.7 with mean of 0.5. Post-procedural it ranged from 0.4 to 0.8 with mean of 0.7. The mean increase of ABI was 0.2. In 4 patients, there were mild or no improvement of symptoms in spite of technical success (refere to table 4). Some complications were encountered: 1 embolus to the peroneal artery which required further management, 1 minor groin hematoma, and 1 dissection.

ANGIOPLASTY OUTCOME IN SUBGROUP Ib
TABLE (15)

FACTOR		RESULT
Total angioplasties		24 (100)
Initial technical success rate		23 (96)
Primary clinical success rate		20 (83.5)
Patency rate (15 months)		21 (87.5)
Complications:		
Minor:	mild hematoma	1 (4)
	minor dissection	1 (4)
Moderate:	embolus	1 (4)

N.B. percentage in parentheses

Statistical comparison of patency rates for stenotic versus occlusive lesions was not done because of the small number of patients with occlusion (only 2 patients). Results from such would not be reliable in such a small patient population.

In 1 patient with severe bilateral iliac artery stenosis i.e (> 80%) which seemed primarily quite amenable to balloon angioplasty, but no significant improvement post dilatation occured. Using our success evaluating criteria already mentioned, we inserted 2 Palmaz stents. This was done in order to promote the best results on the right side with the planned bypass graft and to prevent any symptoms on the left side once the graft was performed on the right side. Following stent insertion, the caliber of the CIA was uniform and patent up to 15 months.

Case 3 Sugroup Ib Fig.(11 a, b & c):

The patient is a 59 year-old man with a history of PVD who is S/P left femoral-popliteal bypass graft. He now complain of right calf claudication.

On the right, there is a moderate stenosis at the proximal CIA with a gradient of 40 mm/Hg. This was angioplastied with no residual gradient or stenosis at this site.

On the left, there is also moderately severe stenosis at the proximal CIA which also exhibits a 40 mm/Hg gradient. Following angioplasty, however there is no residual gradient or stenosis at that site.

Follow up, thrombolysis was done for his left fem-pop. graft which was unsuccessful followed by dilatation of his left EIA, and finally the patient was subjected to left below knee amputation (BKA). There was adequate perfusion at the margin of amputation.

Fig.(11a): Angio. pre- PTA (AP view) revealed moderate to severe stenoses(proximally) of both CIA.(s).

Fig.(11b): Kissing balloon technique at the aortic bifurcation (AP view) with two 4 cm balloons of 8 mm diameter each.

Fig.(11c): Post-PTA (AP view) shows successful angioplasty of bilateral proximal common iliac artey stenoses.

Case 4 Subgroup Ib Fig.(12 a, b & c):

67 year-old male with CAD. He complains of rest pain in his left leg.

Arteriography revealed diffuse disease of the distal abdominal aorta. On the right, thers is severe stenosis of the CIA, moderate stenosis of the EIA. In addition, the entire right iliac and femoral arteries are small in size. There is complete occlusion of the proximal right internal iliac artery.

On the left, there is complete occlusion of the common iliac artery, proximal internal iliac artery and the entire left EIA. Reconstitution of the distal CFA was noted which continues to the DFA.

A 6 mm X 4 cm balloon catheter was used to dilate the right common and external iliac arteries. Hemodynamic parameters and post angiography result show no residual pressure gradient and uniform dilatation. We performed angioplasty of the right iliacs to provide a better inflow to the right femoral artery for future right to left femoral graft and hopefully to prevent the right iliac artery from future complete occlusion.

Follow-up revealed patent right iliac.

Fig.(12a): Angio. pelvis (AP view) revealed complete occlusion of the left (common, external, and proximal internal) iliac arteries. Reconstitution of the distal CFA was noted. There is diffuse severe stenosis in the Right EIA and CFA around the catheter.

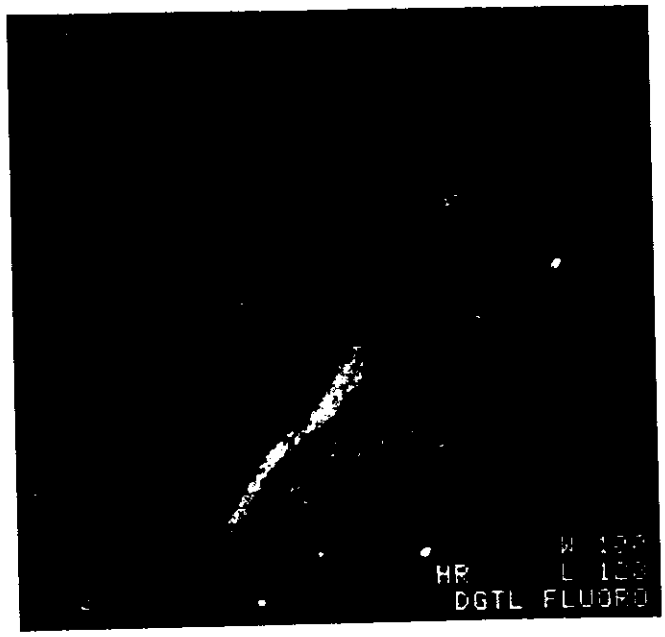


Fig.(12b): Angio.,pre-PTA shows severe stenosis of proximal right CIA and moderate stenosis of right EIA.

Fig. (12c): Post PTA of right, (CIA& EIA) show excellent result.

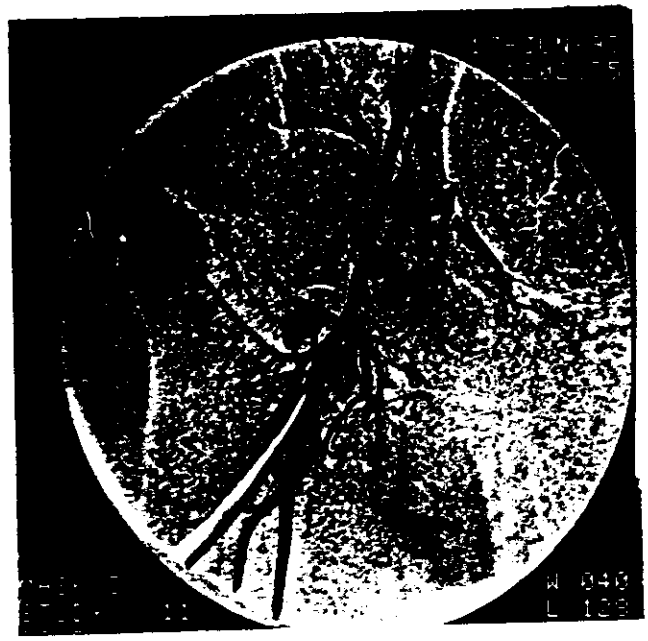


Fig. (12d): successful (CFA) PTA.

Case 5 Sugroup Ib Fig.(13 a, b, c, d & e):

64 year-old diabetic male with non-healing gangrenous right foot.

A pressure gradient of 15 mm/Hg oppressed was measured across the left EIA lesion. An 8 mm X 3 cm balloon angioplasty catheter was used to dilate this lesion, however there was almost no response to the balloon dilatation. An intimal crack was noted distal to the most severe of narrowing. The flow was sluggish below the narrowing. A 39 mm long Palmaz stent was then introduced through a 7 Fr sheath and placed at the site of the narrowing and was dilated with a 8 mm balloon. Following stent placement, uniform caliber of the CIA with the EIA was noted achieving excellent results.

A selective catheter was then advanced around the aortic bifurcation, a 3 mm J-wire could not be passed through the narrowing of the right side. A glide wire was negotiated through the narrowing and a pressure gradient of 15 mm/Hg was also measured. Angioplasty was performed. but it also failed to achieve a satisfactory result, therefore we elected to also place a Palmaz stent. A 7 Fr sheath was advanced retrogradely through the right iliac narrowing and stent was placed. Post stent procedure, the iliac artery appeared excellent.

On follow up; right BKA was done due to patient severe runoff disease.

Fig.(13a): Angio. revealed; diffuse narrowing of both CIA (s) with severe proximal left EIA stenosis.

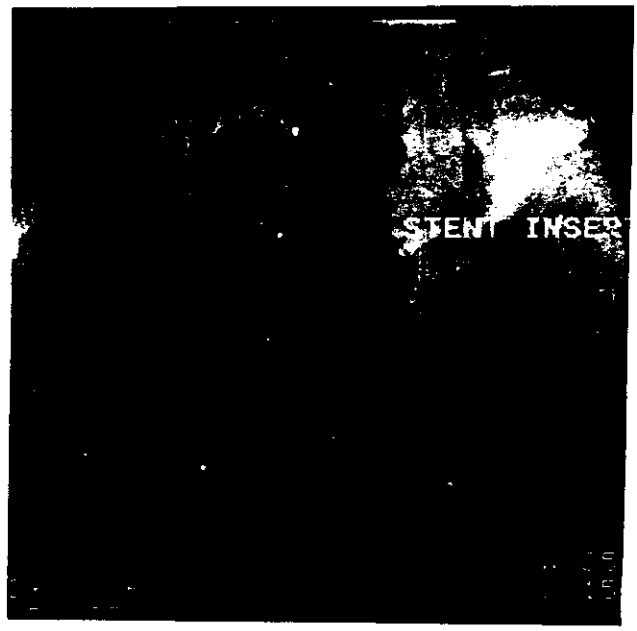


Fig.(13b): 39 mm long Palmaz stent was introduced at the site of left EIA narrowing.

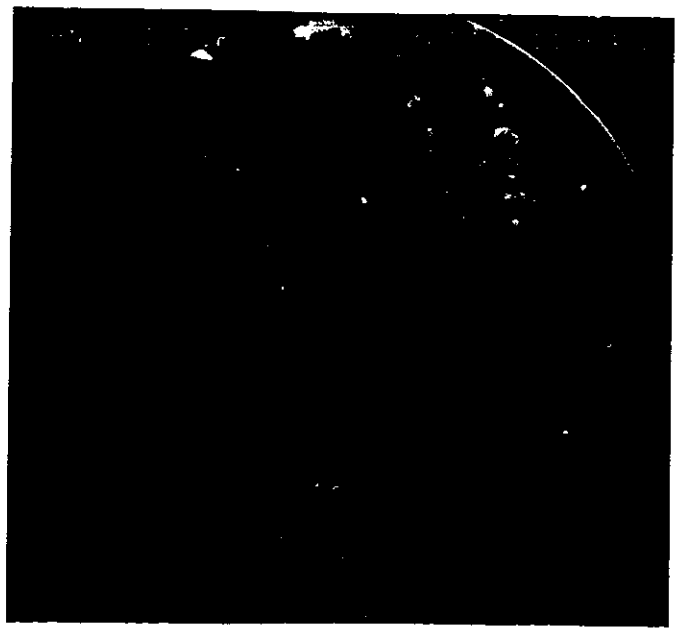


Fig.(13c): Following stent placement uniform caliber of the left (common and external) iliac arteries. Intimal crack proximal to dilated segment is noted.

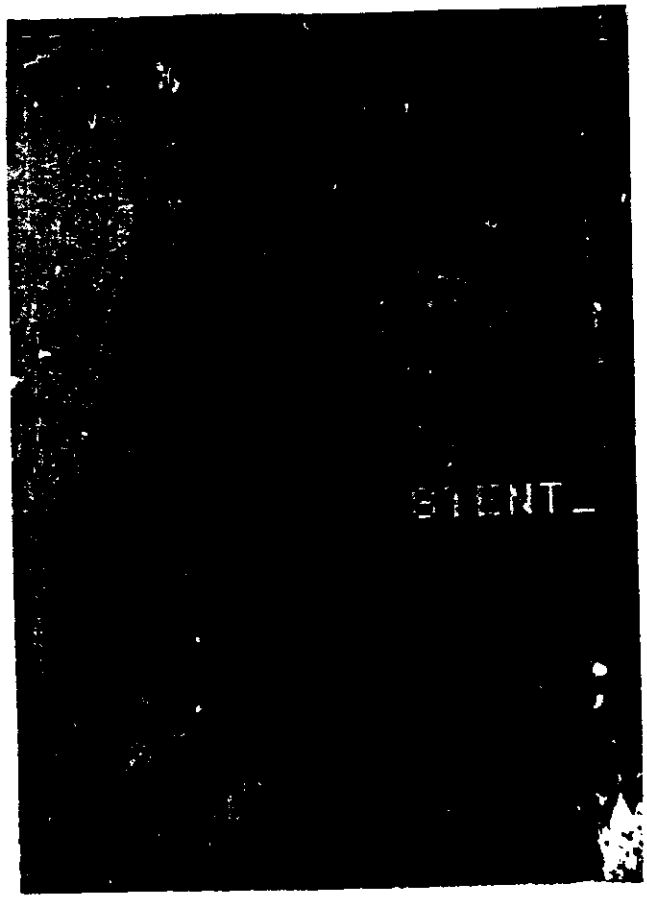


Fig. (13d): Successful angioplasty and Palmaz stent placement in right CIA.

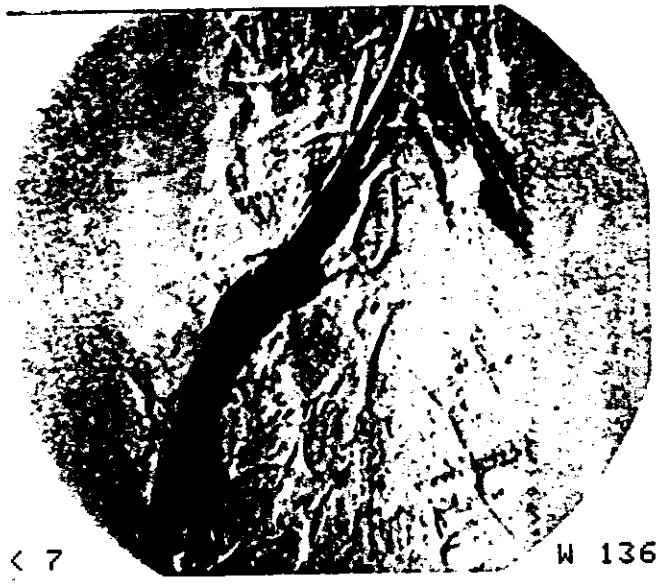


Fig. (13e): Excellent result was achieved with no residual stenosis of rigth CIA.

Case 6 Subgroup Ib Fig.(14 a, b):

Fig.(14a): Angio. pelvis(AP)revealed: Left CIA is occluded with reconstitution of distal vessel via collaterals. 70% stenosis of right CIA.

Fig. (14b): DSA over left hip revealed: Reconstitution of patent CFA, SFA

Case 7 Subgroup Ib Fig. (15 a, b):

Fig.(15a): Angio. pelvis showed: Bilateral tight stenoses of both proximal common iliac arteries at the aortic bifurcation.

Fig. (15b): Post PTA of both CIA(s) revealed: Successful angioplasty of both proximal CIAs.

Case 8 Subgroup Ib Fig. (16):

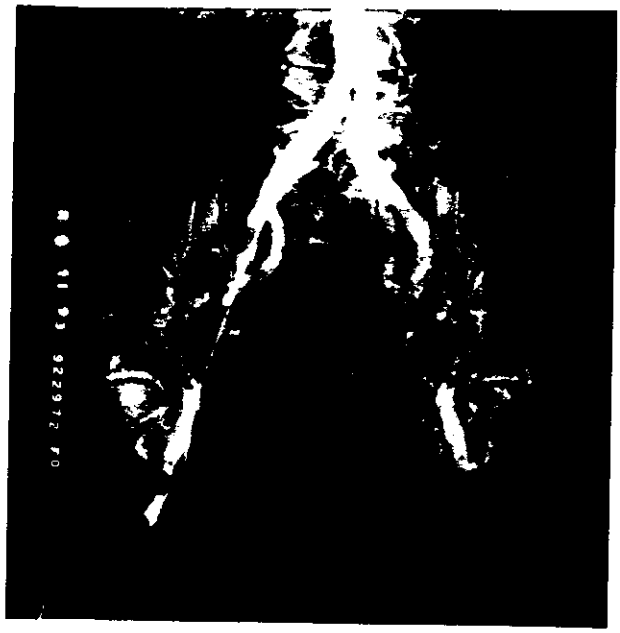


Fig. (16): Angio. pelvis showed:
Filling defect suggestive of embolic
disease in left (CFA, proximal DFA and SFA)

Case 9 Subgroup Ib Fig. (17 a, b):

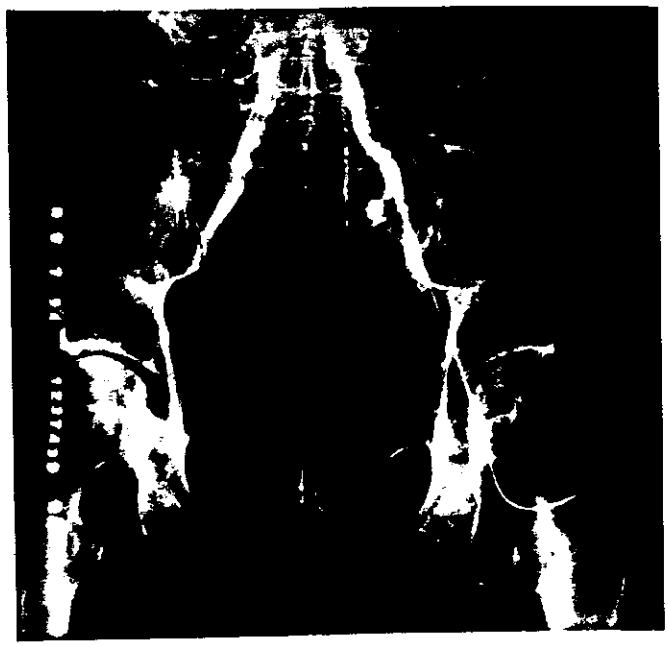


Fig. (17a): Arteriogram of pelvis revealed: Almost 100% short segment stenosis of right CIA just below the aortic bifurcation

Fig.(17b): MRA of the iliac and femoral arteries revealed 1.5 cm high grade stenosis of the right CIA with reeconstitution of distal segment. Mild atherosclerotic disease of left CIA.

Case 10 Subgroup Ib Fig. (18 a, b):

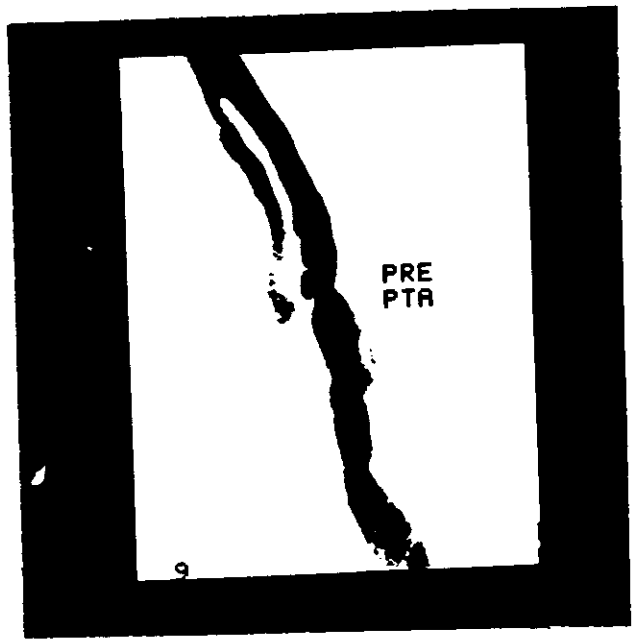


Fig. (18 a): DSA of left EIA revealed >50% stenosis in its midsegment.

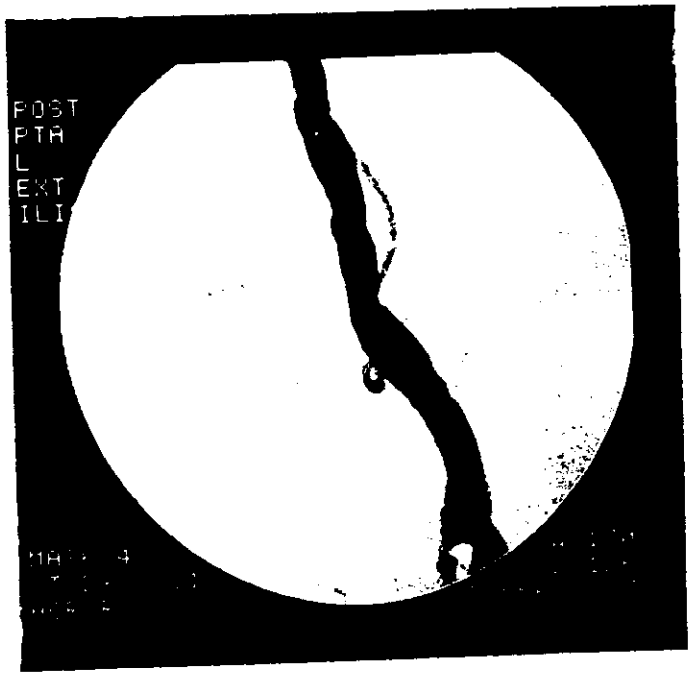


Fig. (18b): Post PTA angiogrram revealed: Successful angioplasty of high grade stenosis of left EIA.

Case 11 Subgroup Ib Fig. (19 a, b):

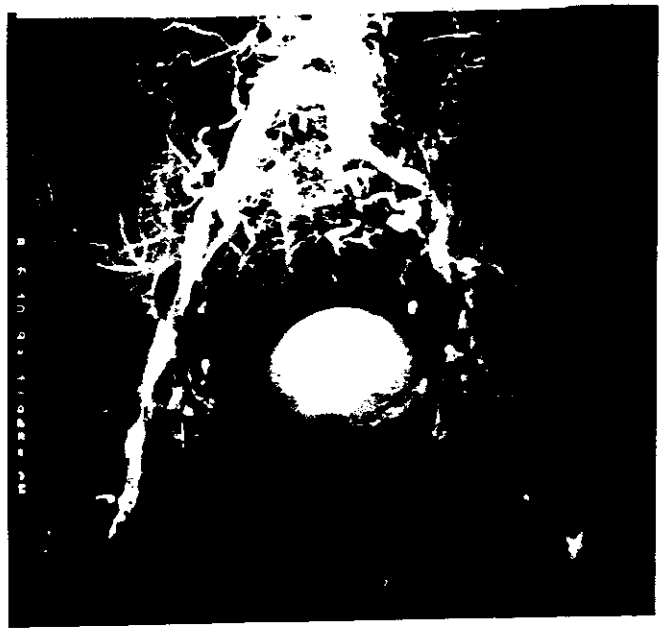


Fig. (19 a): Angio. pelvis showed: Diffuse atherosclerotic changes involving the abdominal aorta, iliac and femoral arteries. It is not believed that the patient would recieve any significant benefit from thrombolytic or angioplasty therapy.

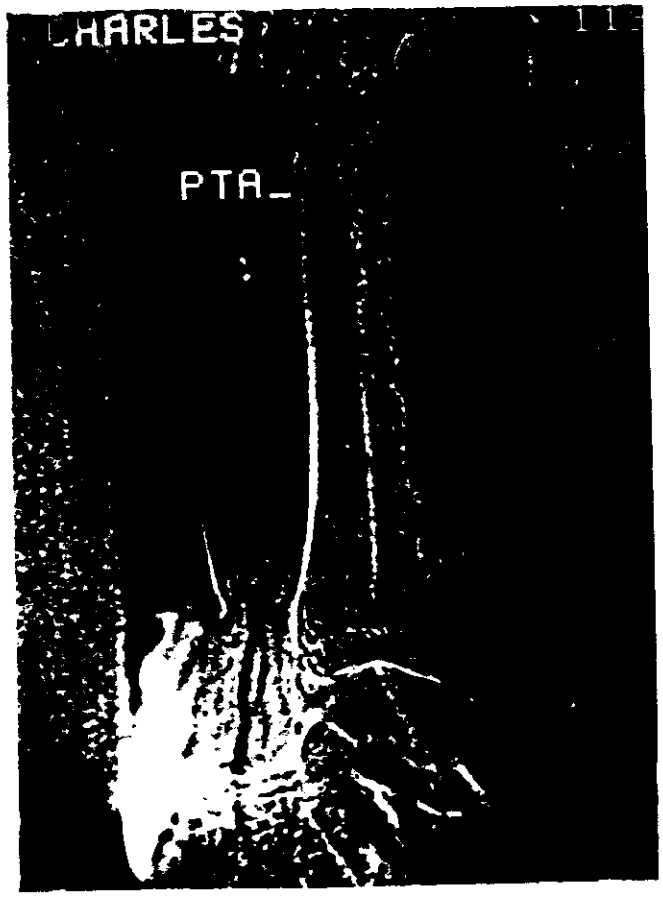


Fig. (19 b): DSA of left leg after blood pressure cuff inflation, the PTa is seen just above the ankle and into the foot giving rise to DP artery Peroneal artery could be also visualized.

(Superficial and Deep) femorals and Popliteal lesions

Subgroup Ic

The study population consisted of 31 patients (20 males and 11 females) ranging in age from 29 to 87 years with average of 63.5 yrs. Total number of lesions was 68 including 39 SFA , 8 DFA, and 21 popliteal. The cause of disease was atherosclerosis in 29 patients, trauma in 1 patient and embolism due to MI vs atherosclerosis in the last patient.

The arteriographic findings include classic atheromatous changes. The traumatic patient scout radiograph demonstrated a bulle, upon CM injection, there was transection of the injured SFA at the bullet level. In the patient with acute embolism, a filling defect was seated in these arteries: CFA, SFA, and DFA with mild atherosclerotic changes in the peripheral vessels.

All patients underwent diagnostic study for the femoro-popliteal segments. 14 patients only were subjected to percutaneous interventions. The radiological interventions performed include 14 angioplasties (8 SFA, 2 DFA, and 4 popliteal), 2 thrombolysis procedures and 1 stent procedure (SFA).

The initial angioplasties and stent placement success rate was 12/14 (86%). Out of the 12 technically successful angioplasties, one patient did not show clinical improvement and was related to the factors demonstrated in Table(4). Another patient's clinical improvement was not complete i.e. intolerable claudication became tolerable and the patient accommodates his new style of life for further intervention upon progression of the disease. Clinical success was estimated to be 83% of the primary technical success rate. The patient of the technically failed PTA due to spiral dissection underwent placement of 3 stents for occluded native SFA. Unfortunately occlusion of the stents had occured, and the patient ultimately required an above knee amputation (AKA). The other technically failed PTA led the patient for surgery and he was subjected to a successful bypass graft. Pre-intervention ABI ranged from 0.4 to 0.5 with mean of 0.4; after the procedure it ranged from 0.5 to 0.9 with mean of 0.7. The mean increase of ABI was 0.3. The durability for these successfully dilated arteries up to 15 months was 84% in terms of primary and secondary patency rate. Analyzing the predictive factors influencing the outcome of PTA, (Refere to Table 4), revealed: claudication in 6 patients (50%), proximal location in 5 lesions (42%), intact runoff in 4 patients (33%), short segment in 9 lesions (75%), stenoses in 8 lesions (66%) and 9 single lesion (75%).

Two thrombolysis procedures were done, one for acutely (SFA, DFA) and the other for subacutely (SFA) occluded lesions with successful restoration of the antegrade flow defined as initial technical success. They remain patent for up to 12 months before reocclusion.

The major complications in these patients was extensive dissection in 1 patient (7%) who required endarterectomy, then fem-femoral bypass graft and finally AKA. 2 patients developed small hematomas which resolved conservatively; one patient had oligemic renal failure postprocedurally due to CM overload treated with dialysis.

Case 12 Subgroup Ic Fig.(20 a & b):

71 year-old black female who has progressive claudication of the left lower leg over the past year. The day before admission, the patient had an acute onset of sharp pain in the left leg followed by pallor of the foot and a cold leg from the thigh down.

Arteriographic findings demonstrate an intraluminal filling defect which was present at the bifurcation of the DFA and SFA. The DFA was completely occluded.

After discussion with the surgery service and the patient, it was decided that UK would be the appropriate therapy of choice in this patient.

Placing 5 Fr side hole catheter at the level of the thrombus and UK was begun and continued through the evening.

Next day, arteriography was repeated which revealed complete lysis of the thrombus with establishment of antegrade flow.

On follow up study, patency of the artery was established.

Fig.(20a): Angio. pelvis (AP view) shows intra-luminal filling defect (thrombus) is seen at the bifurcation of the left CFA (profunda and superficial) The DFA is totally occluded.

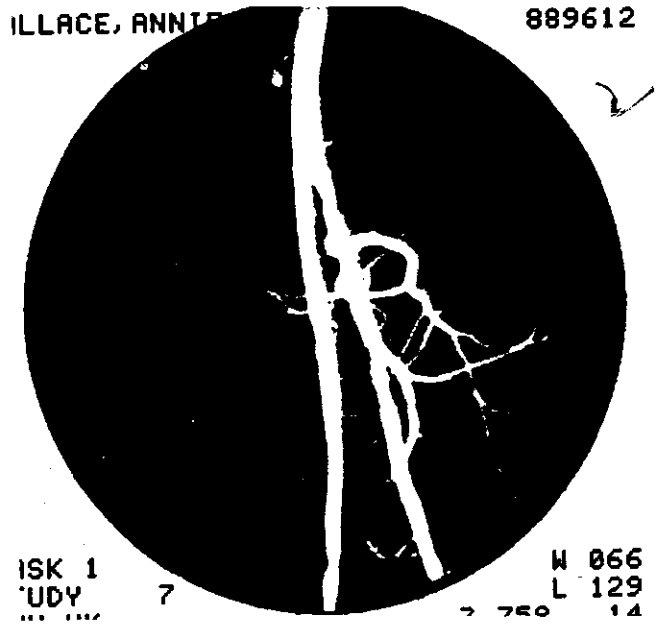


Fig.(20b): Successful thrombolysis after UK therapy with resolution of clots and restoration of antegrade flow in left (profunda and superficial) femoral arteries.

Case 13 Subgroup Ic Fig.(21 a & b)

46 year old black female with a history of hypertension and smoking. She developed an ulcer involving her fourth toe on the right side 4 months ago. She was planning for an operative removal of the toe with incision and drainage of the stump. A left sided femoral pulse was not palpable with weak pulses on the right side.

Arteriography revealed that the left CIA is narrowed but patent, left IIA is occluded, and there is a long segment of occlusion of left EIA. Extensive collaterals are seen around the site of occlusion reconstituting the SFA and DFA at the CFA. On the right, there is moderate atherosclerotic changes involving the right CFA and proximal SFA with occlusion of the origin of right DFA. A right to left fem.fem bypass graft was performed.

3 months later, she presented with ischemic changes of multiple toes of the right foot.

Angiographic findings demonstrate the fem-fem bypass graft. Severe stenosis of the proximal SFA was noted and angioplastied, however a spiral dissection was identified after dilatation. Three Palmaz stents were placed across the dissection up to the origin of the SFA but patency of the artery could not be maintained (unsuccessful technique).

Right BKA was done postprocedurally.

Fig.(21a): Angio. pelvis (AP view) revealed mild disease of the right iliac, moderate stenosis of the distal CFA and severe stenosis at the origin of right SFA and occlusion of right DFA. A right to left fem-fem graft bypasses the left EIA occlusion.

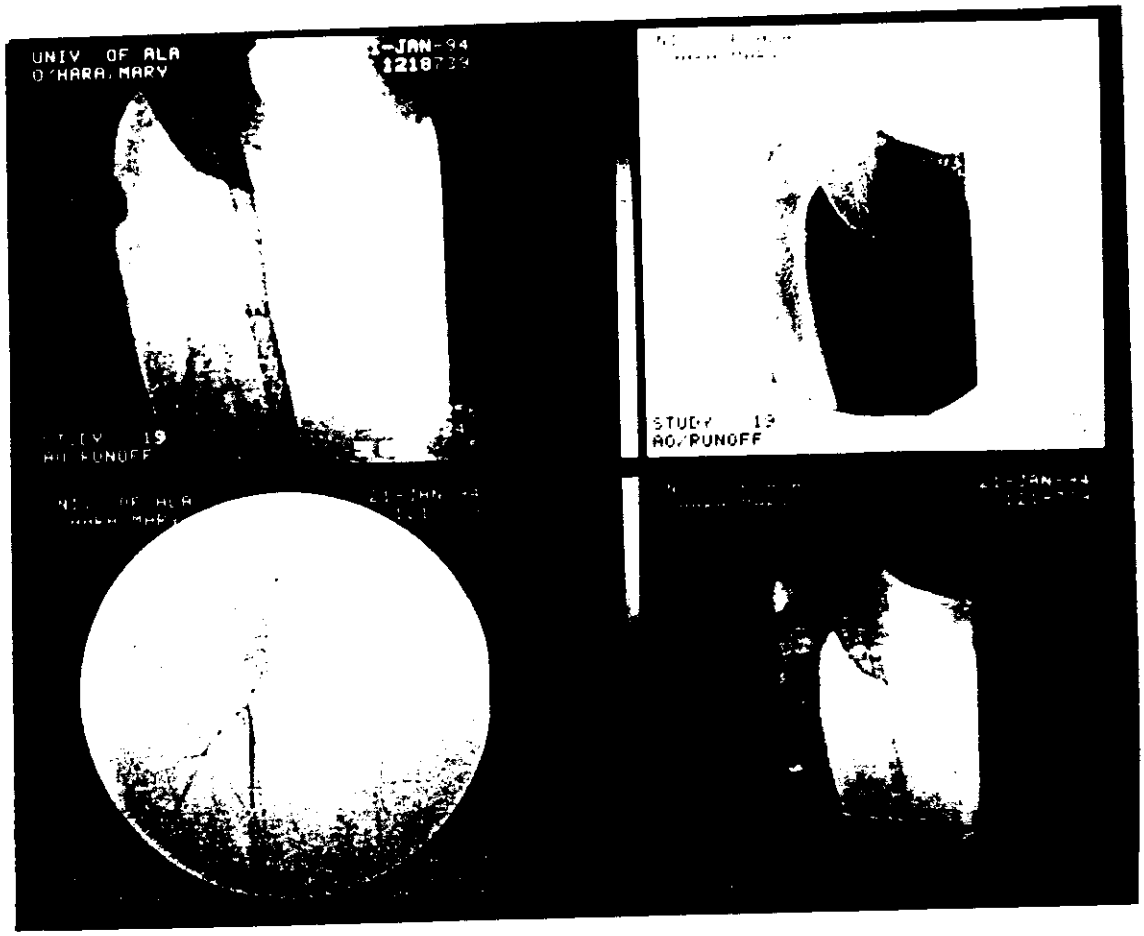


Fig. (21b): Three Palmaz stents were placed from the level of the dissection (due to complicated angioplasty) up to the origin of right SFA but patency of the artery could not be maintained. i.e technically failed procedure.

Case 14 Subgroup Ic Fig.(22 a, b & c):

66 year old diabetic white female who complains of numbness in both lower extremities, much worse on the right. Claudication on the right calf past walking 200 meters distance was also mentioned by the patient. Currently, the patient does not complain of claudication in the left lower extremity.

Arteriography revealed a segment of short occlusion of the right popliteal artery which followed by an area of irregularity and narrowing for 6 cm. Both was angioplastied using 4 mm balloon without complications.

After successful completion of the angioplasty, there was good flow within the right popliteal artery with mild residual area of narrowing.

Clinical improvement was achieved and arterial patency was accomplished up to 15 months (study duration).

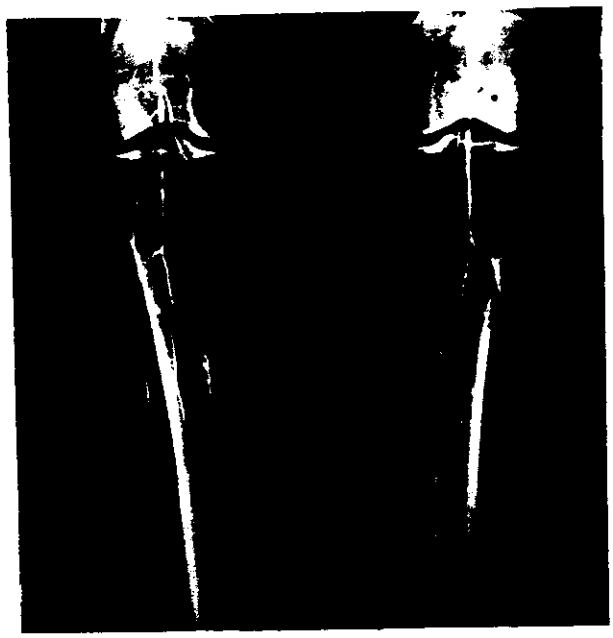


Fig.(22a): Angio. run off (AP view) revealed total occlusion of the mid portion of the right popliteal artery and diffuse distal stenoses.

Fig.(22b): Balloon catheter (4 mm in diameter) inflated at the level of right popliteal artery occlusion.

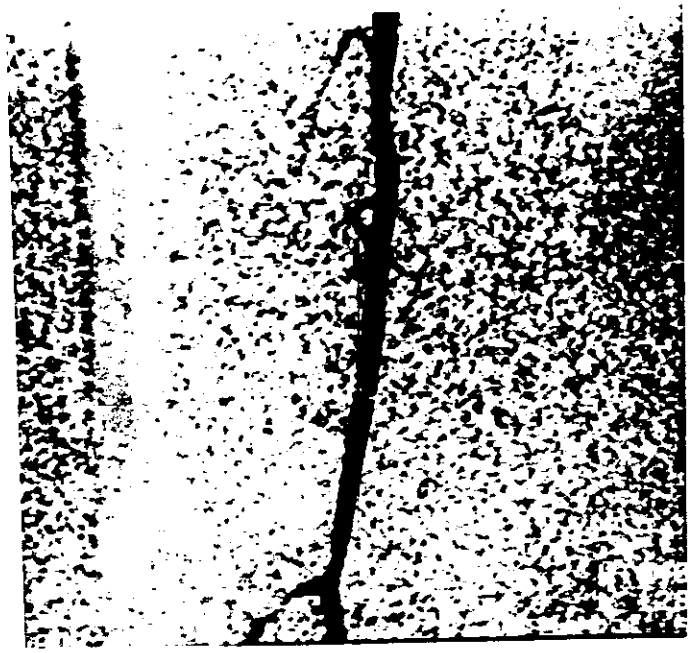


Fig.(22c): Post-PTA: excellent cosmetic results with good flow within the right popliteal artery.

Case 15 Subgroup Ic Fig. (23 a, b):

Fig. (23a): Angio run of both thighs revealed: Right SFA is patent although it contains four separate stenosis throughout its whole course. Degree of stenosis is up to 75%.

Fig. (23b): Downstream arterial puncture to gain access to right SFA. Successful angioplasty of the stenosed segments.

Case 16 Subgroup Ic Fig. (24 a, b):

Fig.(24a): Arteriography of thighs showed: Diffuse disease of both SFAs. On the right, stenosis near level of adductor hiatus. On the left, two stenoses in distal segment.

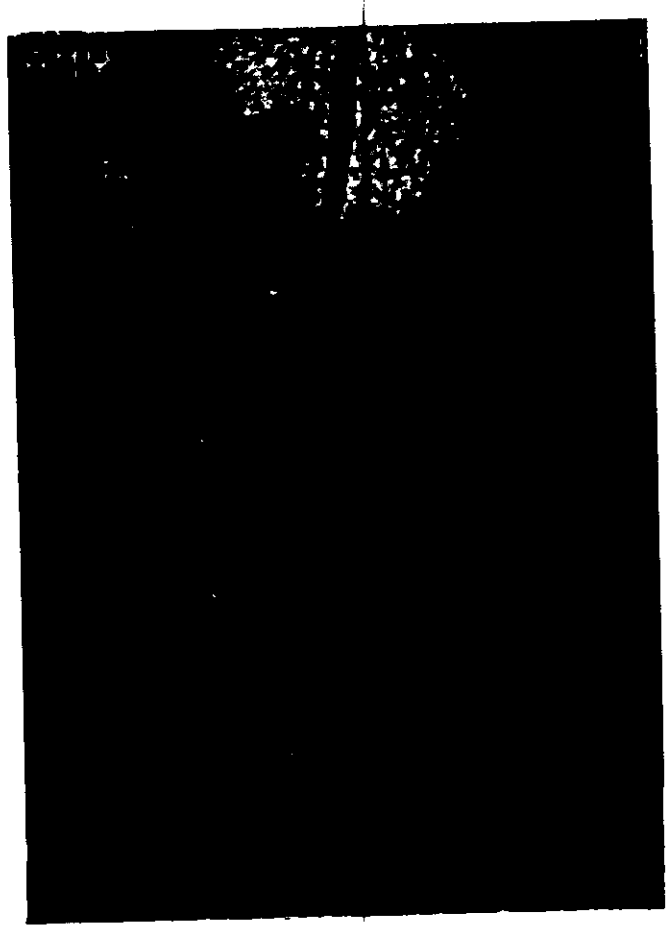


Fig. (24 b): Post PTA angio revealed: Successful angioplasty of two distal left SFA stenoses.

Case 17 Subgroup Ic Fig. (25 a, b):

Fig. (25 a): Right lower limb arteriography showed: Transection of right SFA by a small caliber bullet at level of adductor hiatus with two associated pseudoaneurysms.

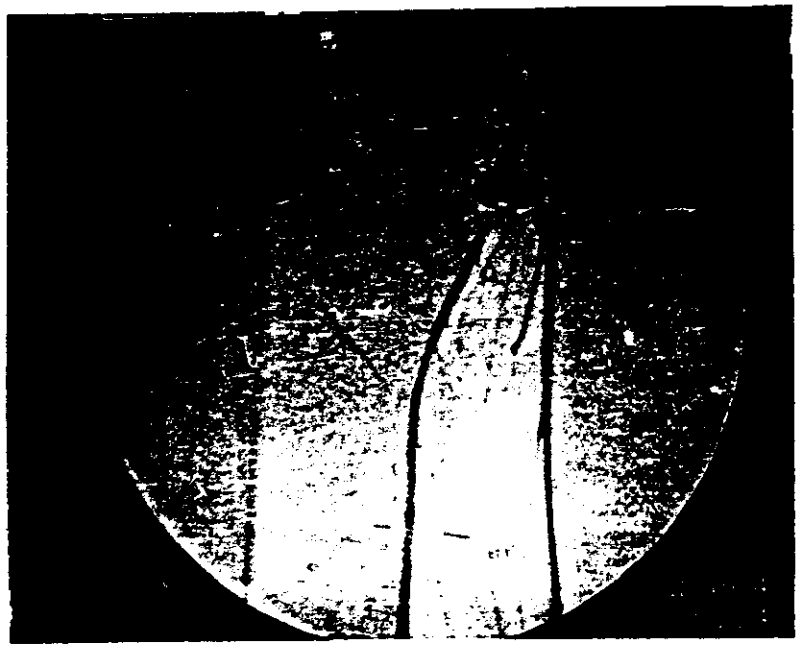


Fig. (25 b): DSA of right thigh revealed: Distal right SFA reconstitutes approximately 2.5 cms distal to the bullet.

Case 18 Subgroup Ic Fig. (26 a, b):

Fig. (26a): Angio. of pelvis and upper thighs showed: Stenosis is seen at the bifurcation of left EIA. The origin of left SFA is occluded. The origin of left DFA is significantly stenotic.

Fig. (26b): Left SFA reconstitutes in upper thigh after a short segment occlusion. Reconstitution is noted also in its lower third. Right SFA is occluded with reformation distally. PTA was unsuccessfully done

Case 19 Subgroup Ic Fig. (27 a, b):

Fig. (27a): Angio. over thighs revealed: focal tight stenosis is seen at the mide level of left SFA. Both thigh vessels show Diffuse atherosclerotic changes.

Fig. (27b): Post PTA angio. revealed: Successful PTA of left SFA with only mild residual stenosis.

Infrapopliteal (Tibial) lesions

Subgroup Id

32 patients with tibial occlusive disease (21 male and 11 female) ranging in age from 28 yrs to 87 yrs with average of 62.3 yrs underwent peripheral diagnostic arteriography. The indications were claudication in 21 patients, rest pain in 1 patient and tissue loss in 10 patients.

Total number of lesions was more than 50 lesions as most of these patients had more than one diseased vessel. There was usually reconstitution of at least one pedal artery.

Diabetes was present in 14 patients (44%). Associated cardiac, cerebrovascular disease, HTN, chronic renal insufficiency, and history of transient ischemic attack or stroke was common. 2 patients died, one from CAD while stroke was the cause in the other.

A diagnostic study was performed for all the patients. Most of the tibial lesions had anatomy unfavorable for intervention i.e., three vessel disease, diffuse nature, poor runoff and primary occlusive rather than stenotic lesion. Also, the concomitant procedure, usually femoro-popliteal artery PTA, was more often necessary in most of the patients having tibial lesion due to multilevel nature of the occlusive disease.

The radiological intervention was carried on 4 patients: 3 patients were subjected for lytic therapy and 1 patient underwent angioplasty. The indication for intervention was limb salvage.

Technical success rate was achieved in all the three lytic patients, and there was restoration of the antegrade flow. Clinical success included restoration of the peripheral pulses, and complete or partial improvement of the ischemic symptoms. Pre-procedural ABI ranged from 0.1 to 0.7 with mean of 0.5 ,postprocedurally, it ranged from 0.7 to 0.9 with mean of 0.8. The mean increase of ABI was 0.3. The arteries maintained their patency up to 12 months.

The PTA procedure was carried out on mid and distal stenoses of the ATa for one patient. Post-procedurally, there was straight line flow through the artery but the residual stenosis distally was of high grade. Post-dilatation, the foot coolness worsened probably secondary to the heavily calcified arteries of the patient as well as the highly diseased runoff vessels i.e. failure was attributed to anatomical factors.

Complications was 0.0% apart from 1 technical failure.

Case 20 Subgroup Id Fig. (28 a, b & c):

86 year-old black male with left lower extremity ischemia. Patient is one weak S/P left popliteal angioplasty, now presents with acute coolness of the left foot.

Arteriography revealed that the only runoff vessel to the left ankle is the ATa. The Left ATa shows moderately diffuse disease with a short segmental occlusion in its mid portion. This is then followed by reconstitution for approximately 6 cm of the diseased ATa which then has multiple severe stenoses and a short occlusion in its distal portion down to the level of the ankle.

A 2 mm X 4 cm angioplasty balloon was advanced over an 0.018 glidewire into the ATa. With road mapping, this was advanced through the multiple stenoses in the ATa which were angioplastied. Following manipulation a digital arteriogram was then performed using 4 Fr straight catheter revealed; good antegrade flow with persistent stenoses within the mid and distal ATa. No complications detected.

Long term patency was low due to diffuse disease and multiple stenoses. The patient underwent BKA.

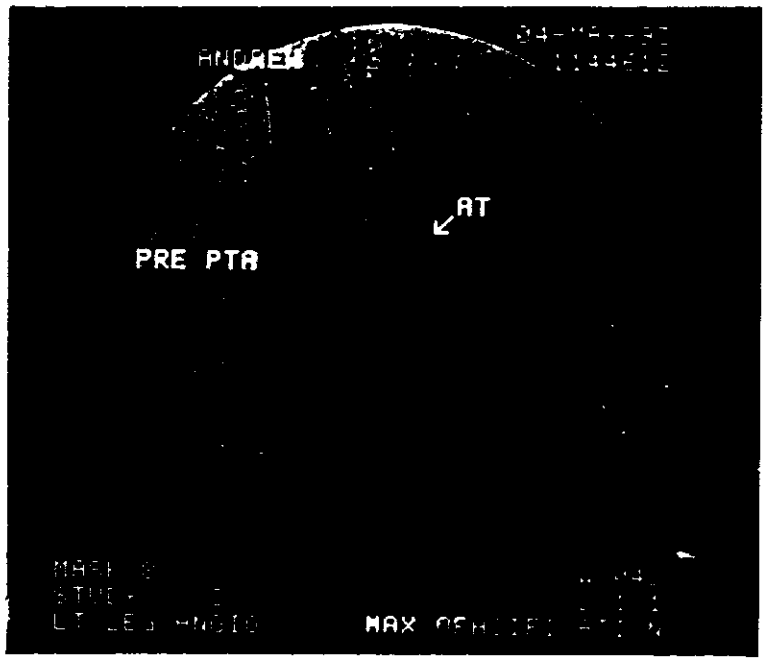


Fig.(28a): Digital lateral left lower leg Angio. shows highly diseased ATa in its midportion and occluded in its lower portion. PTa and peroneal arteries are occluded in the mid calf.

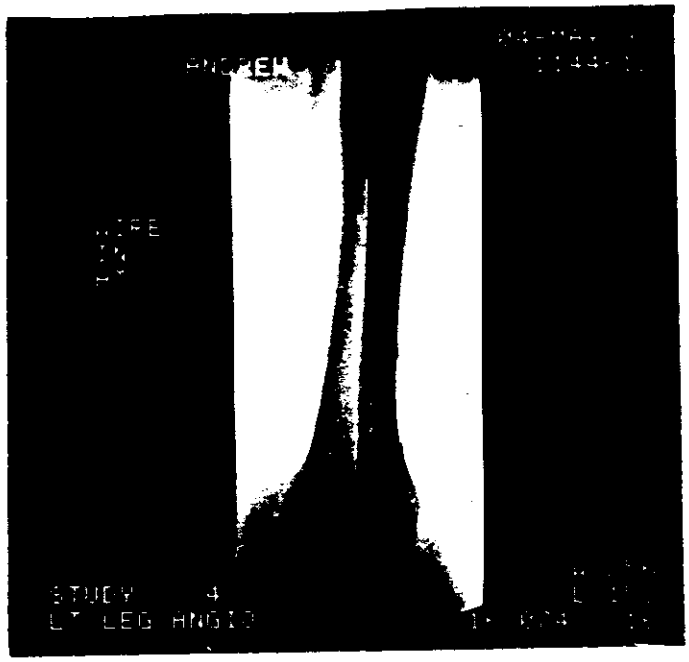
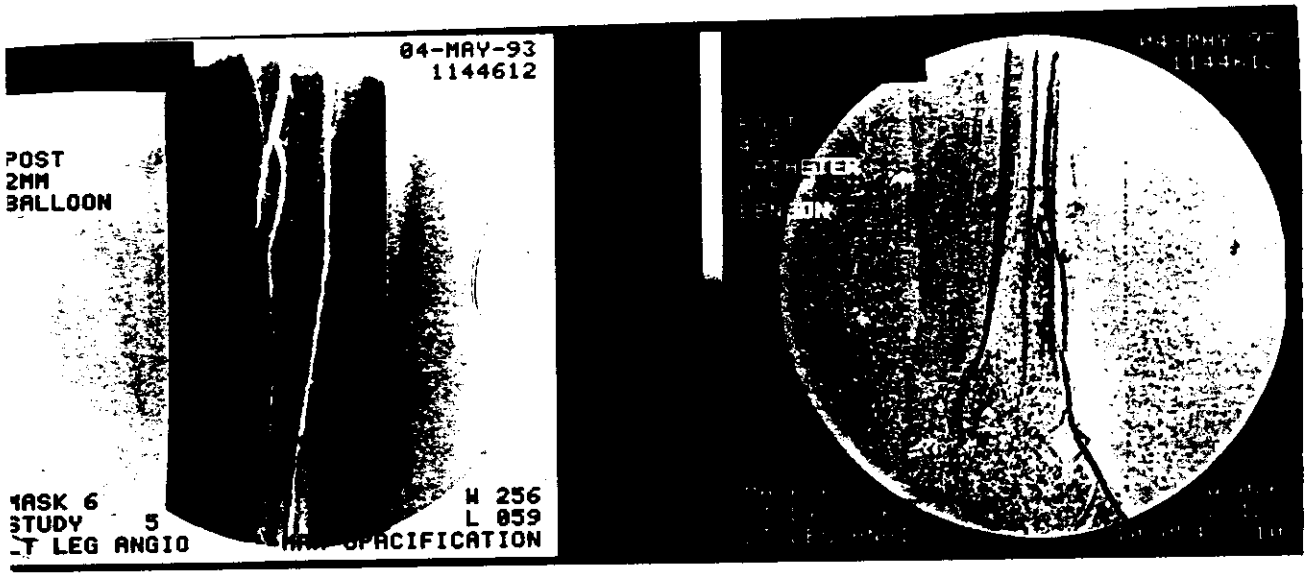


Fig.(28b): Lateral digital film of the left lower leg. 0.018 glide wire was advanced into the ATa down to the dorsalis pedis.



Fig(28c): Angio. Post-PTA (2 mm x 4 cm balloon) of the ATa shows some improvement in its luminal caliber.

Case 21 Subgroup Id Fig.(29 a, b & c):

28 year-old male who has signs and symptoms of right lower extremity ischemia and no distal pulses.

Following "pulse" lysis with UK, the arteriogram revealed partial resolution of the previously diagnosed right popliteal graft thrombus. The ATa shows segmental interval occlusion. With further UK nearly complete clearing of the clot within the popliteal graft and ATa was accomplished. However additional thrombus was seen in the tibioperoneal trunk likely associated with some spasm (treated with intra-arterial nitroglycerine), so the catheter was left in place for continued UK infusion over night (70,000 U/Hr.).

At completion of the study, there was complete lysis of the clot in the popliteal artery with partial resolution of the thrombus and spasm (identified on study done the day before) from the tibioperoneal trunk. Majority of foot is supplied by dorsalis pedis artery (DPa). There was no complications.

Fig.(29a): Right lower leg angio. (AP view) shows; thrombotic occlusion of the popliteal graft, tibioperoneal trunk and proximal ATa.

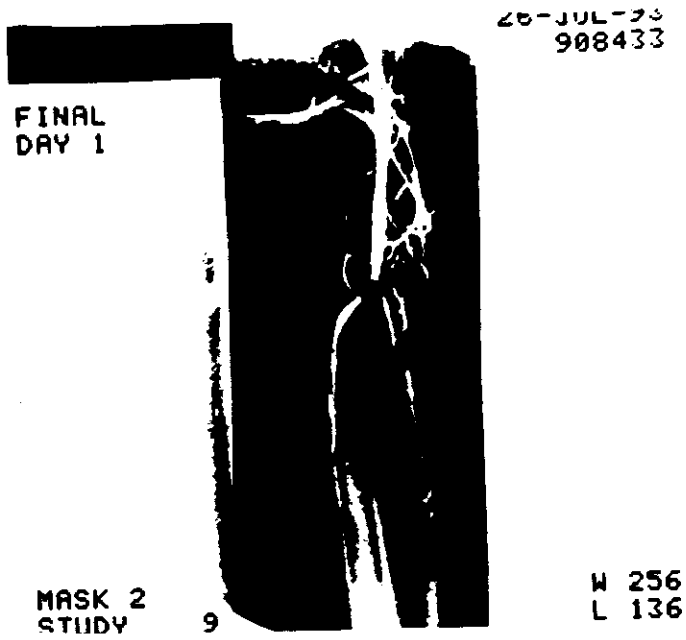


Fig.(29b): After pulse lysis therapy; residual thrombus is seen in the proximal ATa and tibioperoneal trunk which is associated with some spasm.

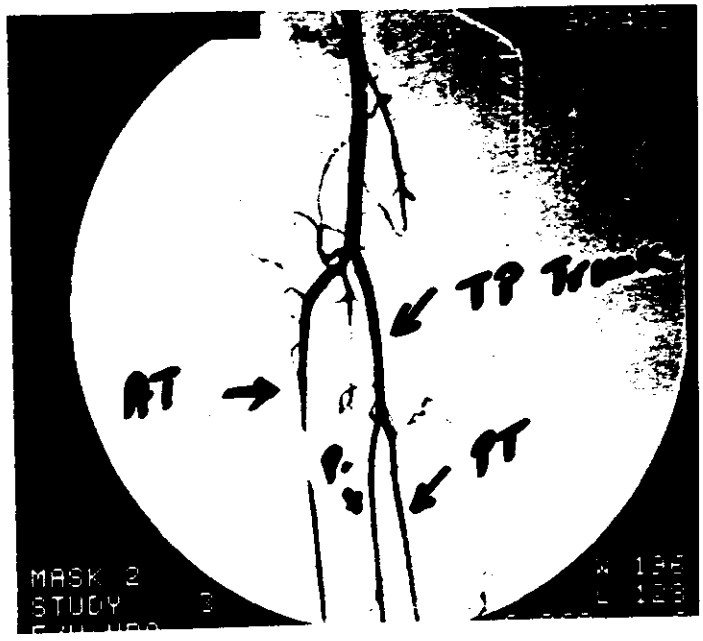


Fig.(29c): After additional UK therapy and intra-arterial antispasmodic therapy (NTG); complete lysis of the clot in the popliteal graft and tibial arteries was accomplished.

Case 22 Subgroup Id Fig.(30 a, b & c):

31 year old white male who is S/P injury to his right lower extremity 3 month ago. He now presents with dry gangrene of the right foot specifically the first three toes. The patient is in external fixation of the tibia, fibula and talus.

Arteriographic findings revealed occlusion of the PTa and peroneal artery approximately 10 cm above the medial malleolus with reconstitution of the PTa at the level of the medial malleolus. The PTa is the sole source of flow to the foot. The plantar arch is reconstituted and supplies the digits. The ATa occludes at the level of the mid calf.

Disease noted in the medial first and lateral fourth digital arteries is most likely responsible for the patient's symptoms. The reconstitution of the PTa which supplies distal vessels provide relatively good arterial flow to the remaining digits and foot.

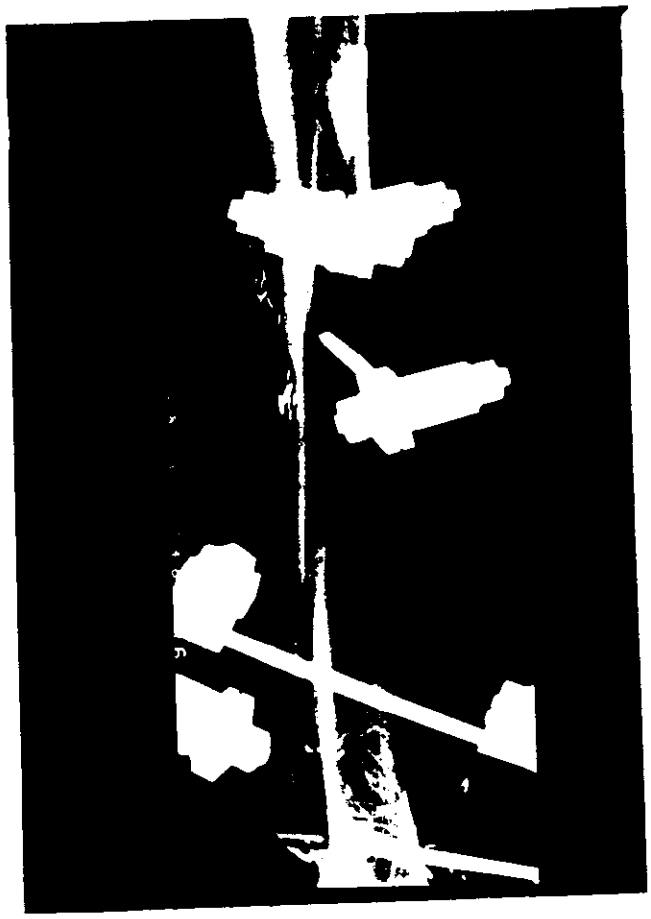


Fig.(30a): Cut film angio. of right lower leg shows; the PTa and peroneal arteries are occluded 10 cm above the medial malleolus. ATa is occluded at level of mid calf.

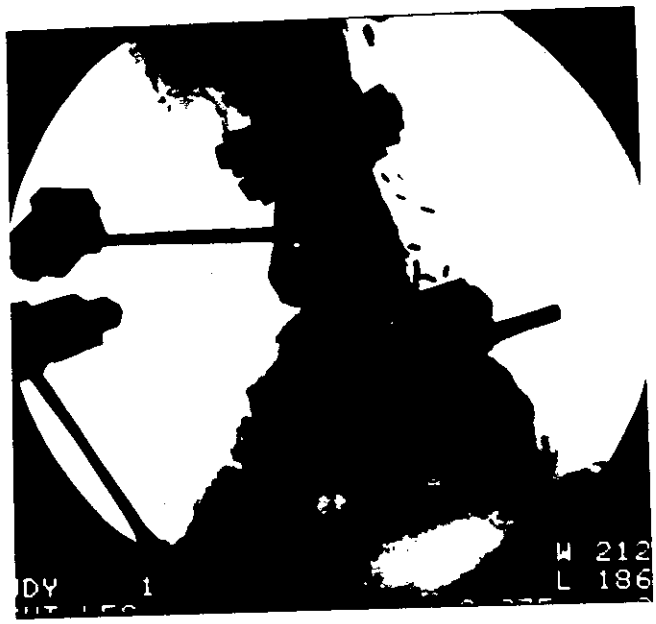


Fig.(30b): Lateral digital film shows; reconstitution of the PTa and plantar arch which is the sole supply to the foot. Collaterals are noted around both malleoli.

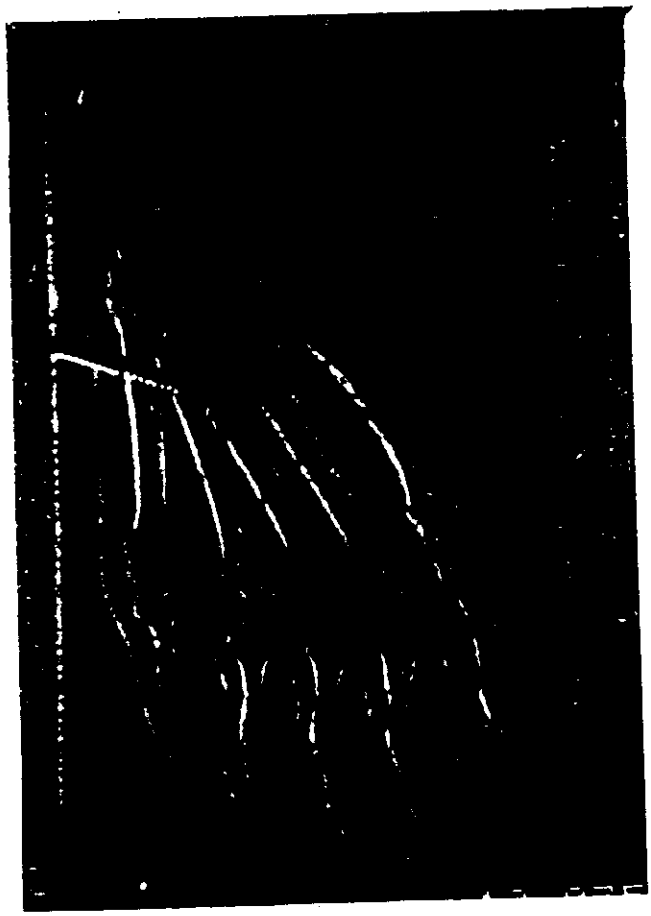


Fig.(30c): AP view of the foot shows: reconstituted lateral branch of the plantar arch supplying the foot. Quality technique is needed for assessing digital arteries.

Case 23 Subgroup Id Fig. (31 a, b):

Fig. (31 a): Angio Runoff oveer both knees revealed: Mid and distal portion of left popliteal artery are patent but with multiple areas of high grade stenosis. Right popliteal artery is patent but with multiple ares of narrowing throughout its course.

Fig. (31 b): Angio. of both legs revealed:
No significant runoff vessels identified at the ankle or foot that could be bypassed. Only tiny twigs represent collaterals. DPa is not visualized on left even post reactive hyperaemia.

Graft lesions

Subgroup Ie

The study population consisted of 14 patients (11 male and 3 female) ranging in age from 28 yrs to 79 yrs with average of 56.2 yrs. All the patients had at least one lower extremity graft procedure previously (10 fem-pop., 1 aorto-iliac, 1 EIA to CFA, 1 SFA to anterior tibial artery, and 1 SFA to pop. grafts). All grafts were reconstructive surgery for atherosclerotic occlusive arteries in 12 patients and traumatic ischemic lesions in 2 patients.

The indication for arteriography was claudication in 9 patients, rest pain in 2 patients and tissue loss in 3 patients.

All patients were subjected to diagnostic arteriography. Arteriographic findings revealed thrombotic occlusion in 10 patients, stenoses with occlusion in 3 patients and stenosis with pseudoaneurysm in 1 patient.

The radiological interventional procedures were performed in 8 patients as follows: 6 thrombolysis, 5 PTA as three patients underwent lysis and PTA at the same sitting. Surgical reconstruction was carried out for 3 patients and amputation was done for the remaining 3 patients (one of them died thereafter from CVS).

Initial technical success was evaluated mainly by restoration of the antegrade flow and some other factors mentioned previously. Technical success rate was 8/8 (100%). Clinical improvement accomplished in 6 patients, refer to factor in (Table 4). Pre-procedural ABI range from 0.1 to 0.7 with mean of 0.5; post percutaneous treatment, it ranged from 0.7 to 0.9 with mean of 0.8. The mean increase of ABI was 0.3. The primary and secondary patency rate up to 12 month was 6/8 (75%). In two patients, graft reocclusion required surgical treatment. One of them underwent repeat graft repair (graft revision) while the other was subjected to amputation due to severe disease of the distal runoff vessels.

The complications included residual thrombosis in 2 patients (graft lesion in one of them and distal arteries in the other patient), arterial spasm treated with antispasmodics (e.g. Nifedipine), residual stricture in distal anastomosis, renal failure treated by dialysis in addition to small groin hematomas which resolve spontaneously.

Case 24 Subgroup Ie Fig.(32 a, b, c & d):

79 year-old female with CAD, S/P left fem-pop. graft 4 years ago. Patient's past medical history is significant for polio involving the left lower extremity. Patient now complains of left lower extremity paresthesia and weakness.

The diagnostic arteriogram revealed that the left fem-pop. graft is occluded at its proximal anastomosis with only faint reconstitution of the popliteal and posterior tibial arteries. Native SFA has severe stenoses throughout its whole course and a mid segment occlusion. Single vessel runoff is noted to the left foot.

During selective catheterization of the occluded graft, proximal obsturction was felt during probing; therefore, it was dilated using a 5mm x 4cm balloon catheter. For lytic therapy a co-axial infusion system was established. Proximal port was at the proximal anastomosis and the distal multi-side holes infusion catheter was within the first 12 cm. of the fem-pop. graft.

On follow up study next day, another area of severe stenosis at the distal graft was revealed, then angioplastied. Also, an area of native popliteal artery distal to the distal graft anastomosis was angioplastied using 5 mm balloon. UK was continued for another four hours due to evidence of residual clot. Final result was a patent graft with residual short occlusion of the popliteal artery.

The occluded popliteal artery segment felt hard to guidewire probing, therefore no further attempts for thrombolysis were done and the procedure was ended.

No complication and the flow through the graft is definitely increased.

Fig.(32a): Angio. of the thighs shows; the left fem-pop graft is occluded at its proximal anastomosis.

Fig.(32b): Run off angio. shows; faint reconstitution of the left popliteal and PTa.

Fig.(32c): Post-lytic therapy angio. shows; the flow in the graft is re-established. The graft outflow tract is partially obstructed.

Fig.(32d): Post- PTA of the distal graft anastomosis and distal left native popliteal artery angio. shows; patent graft and distal graft-pop anastomosis, residual short segment occlusion of the popliteal with collaterals around the area of obstruction supplying good flow to proximal tibial vessels.

Case 25 Subgroup Ie Fig.(33 a & b):

A 67 year-old male, S/P left fem-ATa bypass graft. The patient developed left calf claudication.

Arteriography revealed that the left SFA is occluded and collaterals are supplied by a large and patent DFA. The left femoral to ATa bypass graft did not opacify. However after selective catheterization of this graft, good opacification was obtained. There was marked stasis of contrast for the length of the graft with essentially no distal outflow, but suprisingly no clots were present in the graft. Below the knee runoff consisted of collateral vessels with only a thin and diseased peroneal artery being identified to the ankle.

Next day, angioplasty of the distal graft anastomosis and proximal ATa was done using 6 Fr straight catheter with a tapered tip. After this, we dilated the proximal graft anastomosis. The ATa just distal to the graft anastomosis was patent but highly diseased and occluded in the lower calf.

Even though, we have established antegrade flow through the graft by dilating its outflow tract and increasing its inflow by dilating its proximal portion. Because of the patient's severe runoff disease, we anticipated that further patency of this graft is in jeopardy. No procedural complication.

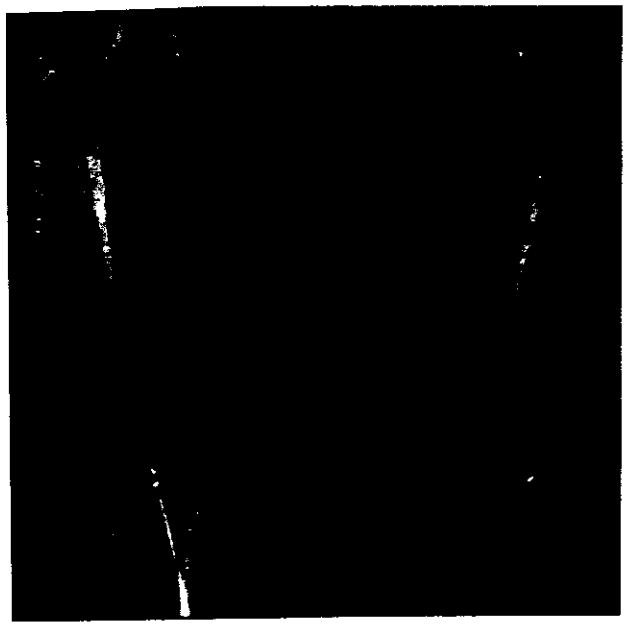


Fig.(33a): Bilateral run off of the thighs shows; the left SFA is occluded. Collaterals are supplied by large left DFA. The left femoral to AT bypass graft did not opacify.

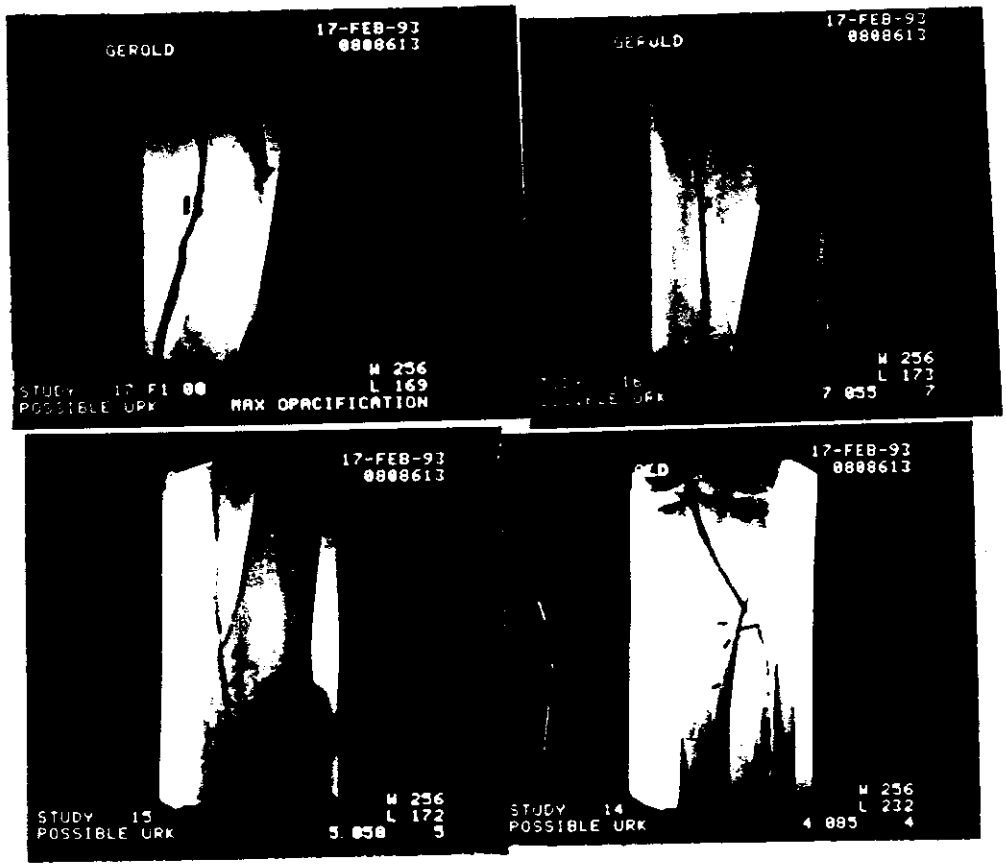


Fig.(33b): Arteriogram of the left lower extremity, post-PTA of the proximal and distal anastomosis of the left proximal SFA to ATa bypass graft with balloon and PTA of the proximal ATa with a tapered catheter revealed; successful dilatation of the proximal aspect of the graft, re-establishment of antegrade flow through the graft, poor distal lower leg run-off.

Case 26 Subgroup Ie Fig.(34 a, b):

Fig. (34 a): Angio. of both thighs revealed: Left fem-pop. graft is occluded. Profunda collaterals is noted.

Fig. (34 b): Post lytic therapy angio revealed: Nearly complete thrombolysis of left thrombosed graft

Case 27 Subgroup Ie Fig. (35 a, b):

Fig. (35 a): Unilateral angio over left hip showed: Occlusion of the graft from left EIA to left CFA. Reconstitution of distal left (CFA, SFA, and DFA) via collaterals from left EIA.

Fig. (35 b): Post lytic therapy study showed: clot in proximal aspect of the graft respond to U/K therapy.

Case 28 Subgroup Ie Fig. (36 a, b):

Fig. (36 a): Unilateral angio. over left knee revealed: Occlusion of distal anastmosis of left fem-pop graft. Occlusion of left popliteal and proximal trifurcation vessels with recostitution in the midcalf and two vessels runoff.

Fig. (36 b): A GW passed into the distal portion of the graft and DSA was obtained which reveals a very slow antegrade flow within the graft related to poor inflow as well as outflow which is occluded.

Group II

UPPER LIMB ARTERIAL LESIONS

3 patients (2 male and 1 female) with their corresponding age of 35, 60, and 40 yrs underwent upper limb arteriography because of the patient's peripheral ischemic symptoms. The ulnar and digital arteries were the only diseased arteries noted in these patients.

The angiographic findings range from stenosis (either single or multiple), diffuse diminution in artery size, slow flow, and or occlusion.

No percutaneous therapeutic intervention was performed on these patients. Pharmacologic intervention in the form of intraarterial priscoline was usually performed to enhance diagnostic visualization of the distal arteries and observe their response to vasodilatation.

Follow up revealed clinical improvement in the first patient (diagnosed as Rynaud's syndrome) afetr treatment in the vascular surgery service with a regimen of meticulous skin care and avoidance of vasospasm. The symptoms improved spontaneously in the second patient (diagnosed as transient vasospastic disorders). The last patient was subjected to reverse vein graft to bypass the ulnar aretry stenosis (diagnosed as Burger's disease). In general clinical improvement was manifested by pain relief, skin colour change to normal....atc.

Complication include some spasm noticed at the catheter tip in the brachial artery in one patient.

Case 29 Group II Fig.(37 a & b):

35 year-old white male with a 60 year pack history of smoking who presents with a chief complain of pain and discoloration in the first through fourth digits distal to the MCP joints. The patient recalls intermitent pain and cold hands with exposure to cold.

Via right femoral artery approach, a 4 Fr H1 catheter was placed into the right subclavian, and a digital arteriogram was performed using low osmolar CM.

Arteriographic findings revealed that the ulnar artery is quite diminutive in size. There are multiple areas of stenoses noted in the digital arteries. In addition, the digital arteries show occlusions along the radial aspect of the second and third digits. There is also an occlusion noted in the ulnar aspect of the digital artery to the fourth digit.

These occlusions and stenoses did not respond to priscoline (i.e fixed abnormality).

These changes are most likely insitu thrombosis of digital arteries in this susciptible patient with an underlying vasospasm (Rynaud's disease).

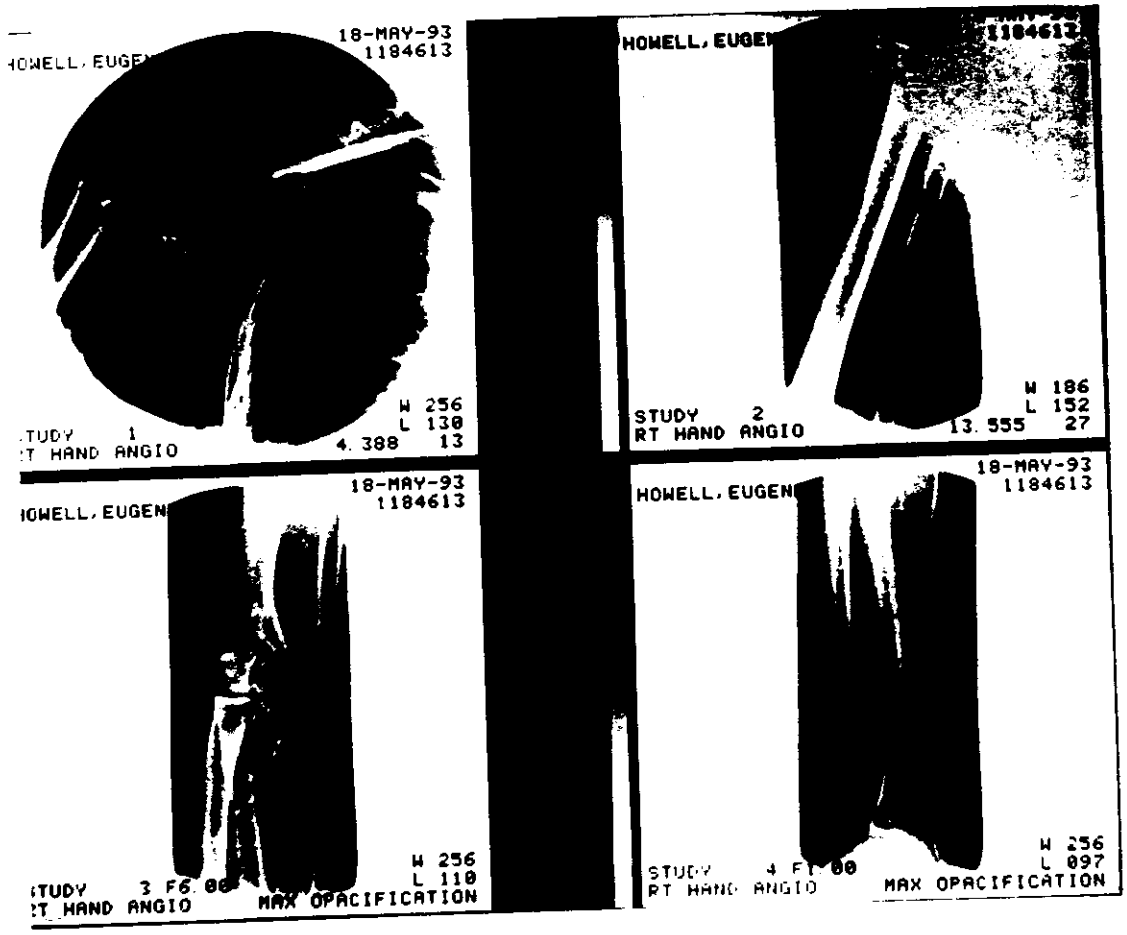


Fig.(37a): Upper extremity arteriogram shows an unusual high origin of the radial artery from the axillary artery; the ulnar artery is diminutive in size.

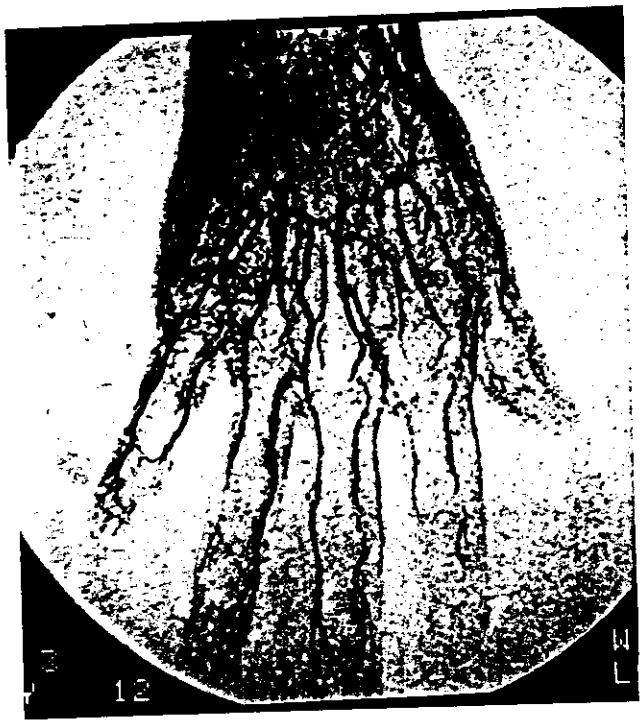


Fig.(37 b): Post-priscoline angio. of the hand (selective ulnar artery) shows; multiple areas of stenosis and occlusion noted in the digital arteries along the ulnar aspect of the digital artery to the fourth digit not responding to priscoline (thrombotic or embolic changes). Similar changes detected also in the radial aspect.

Case 30 Subgroup II Fig (38):

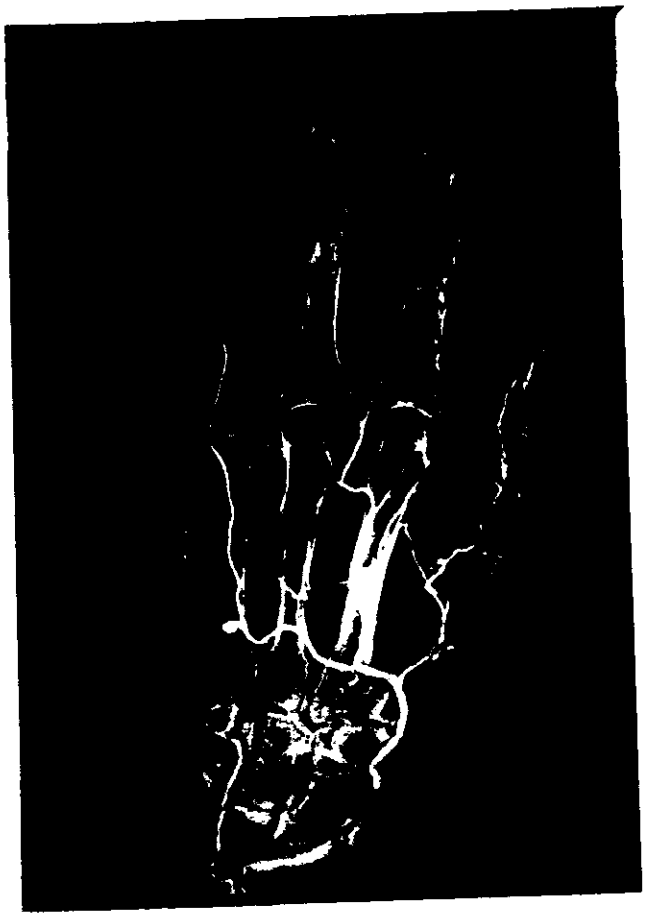


Fig. (38): Angio. of left hand revealed;
Diffuse severe disease with distal occlusion of the left ulnar artery. Incomplete deep and superficial palmar arches. Multiple occlusion of proper and common digital arteries.
Diagnosed as Burger's disease

Fig. (39): Treatment - Surgey / Radiology

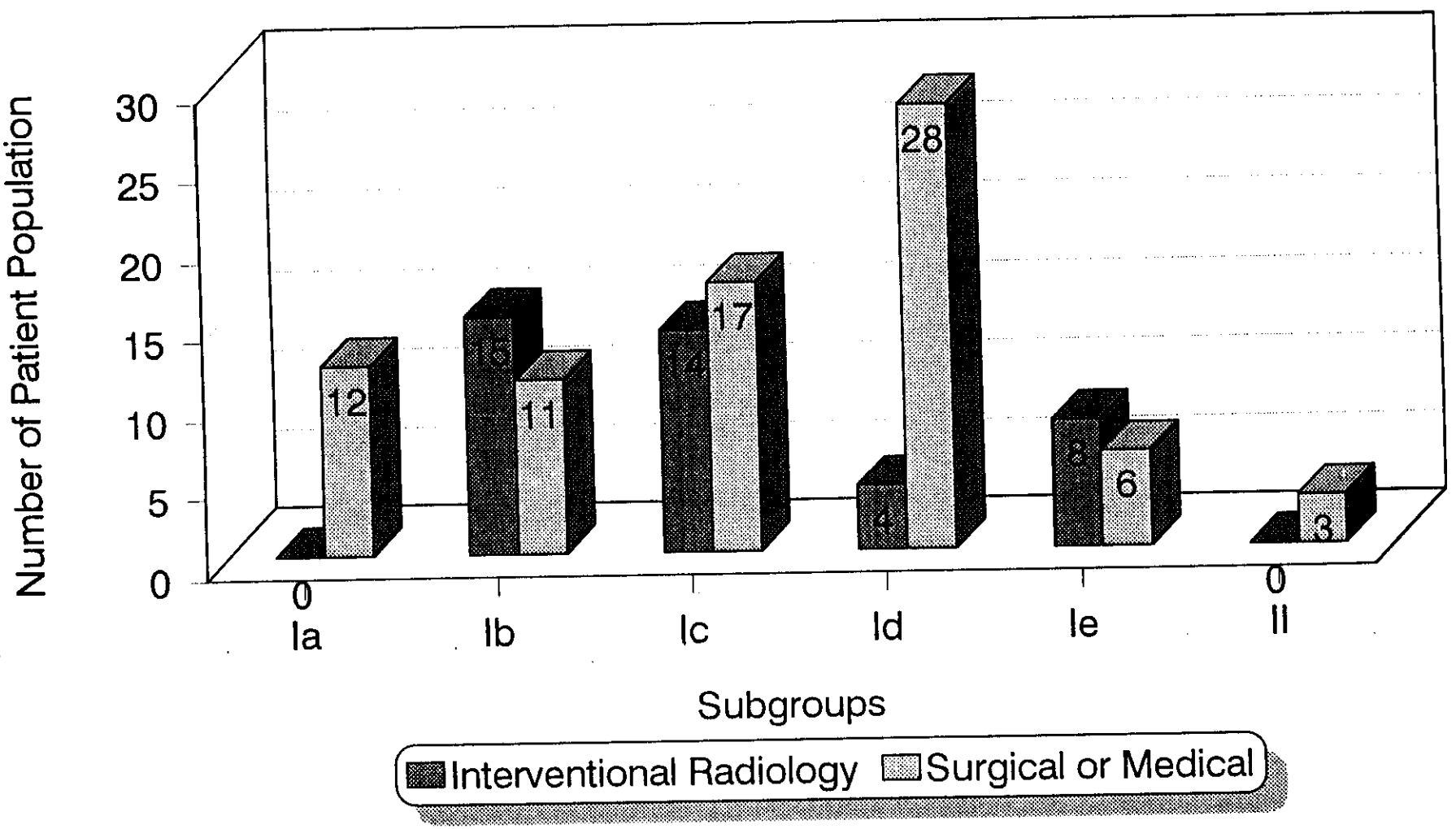


Fig. (40): Success/complication rates

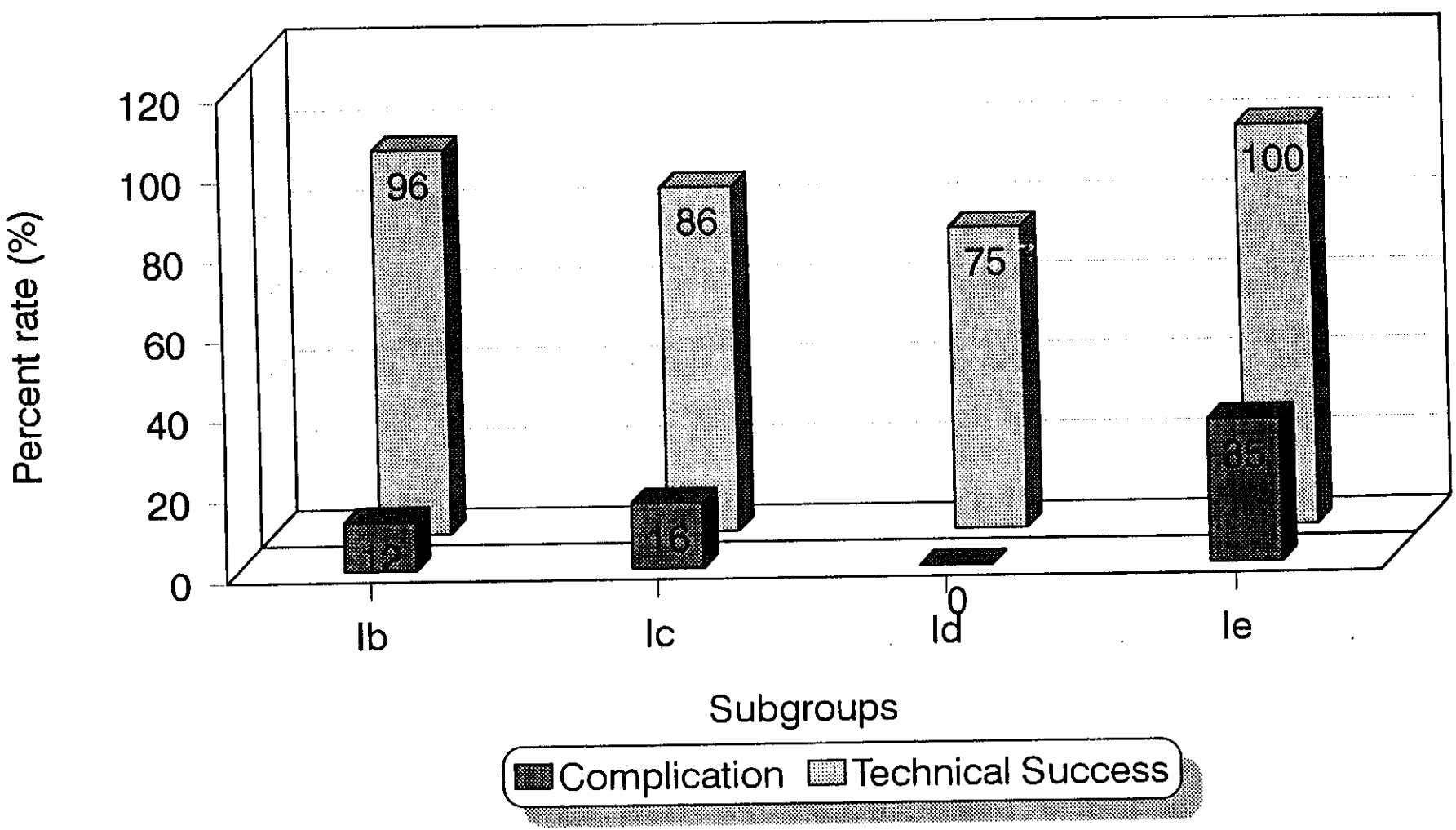


Fig. (41): Ankle Brachial Index