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Retrospective Study of Angiographic Features in Tao

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I. Aim Of The Study

To study angiographic features in patients with critical limb ischemia, satisfying clinical criteria for Thromboangiitis obliterans, with emphasis on:
– common vessels involved
– site of involvement, and
– patterns of disease distribution

II. Material And Methods

Retrospective analysis
Study period: September 2015 to December 2017

Case records of all patients admitted with the clinical diagnosis of Thromboangiitis obliterans in this period were retrieved. Salient features were then recorded from these case records, including age, clinical presentation and management strategies employed. Patients underwent either, conservative management, primary amputation or angiography with a aim of revascularization. Patients who underwent angiography and satisfied the inclusion criteria formed the main study group. Angiography was done in the radiology cath lab suite by the interventional radiology team of our institution. All angiograms were conventional contrast angiograms done in the single cut-film technique.

The angiographic films were retrieved from the radiology department archives and reported according to the study protocol by the author and then verified by another senior vascular surgeon. Angiograms of patients with features of atherosclerosis were excluded from the reporting.

Inclusion criteria
Criteria for including patients in the study were based on the criteria described for diagnosis of thromboangiitis obliterans.

- Age of onset of disease < 50 yrs
- Tobacco use (current or recent)
- Upper limb involvement
- Absent radial / ulnar pulses
- Allen's test + ve

Exclusion Criteria

- Presence of risk factors for atherosclerosis such as Diabetes mellitus, Systemic hypertension, dyslipidemia
- Angiographic features of Atherosclerosis such as proximal vessel involvement, vessel wall calcification
- Echocardiographic or angiographic evidence of proximal embolic source including cardiac intramural thrombus or proximal arterial aneurysms.
- Laboratory evidence of other vasculitides including raised inflammatory markers (Erythrocyte sedimentation rate and c-reactive protein)

All arteries from the infrarenal aorta to the pedal arteries were evaluated. The main branches of the arteries were also studied. The superficial femoral artery and the popliteal artery were divided into segments for better understanding of the disease pattern.

The arteries studied were:
Infrarenal aorta – Segment of aorta below the renal arteries including the aortic bifurcation
Common iliac artery
External iliac artery
Internal iliac artery – the main artery and its anterior and posterior divisions were studied
Common femoral artery
Profunda femoris artery – the origin and the main trunk of the artery and its perforator branches were studied
Superfical femoral artery – the artery was divided into 4 parts

- Origin
- Proximal SFA – the proximal half of the SFA from its origin to the mid thigh level
- Distal SFA – distal half of the SFA from mid thigh level to the adductor hiatus
- SFA at level of adductor hiatus (at the junction of the middle and lower $1/3^{rd}$ of the thigh where the SFA takes a lateral curve)

Popliteal artery- the artery was divided into 3 parts

- Proximal – from adductor hiatus till above knee joint
- Mid – part of artery lying behind the knee joint
- Distal – part of artery below the knee joint till its bifurcation

Anterior tibial artery
Tibio peronealtrunk
Posterior tibial artery
Peroneal artery
Plantar artery
Dorsalis pedis artery

Each artery was characterized according to the presence or absence of disease and severity of stenosis, if present into 4 categories

- Normal – no evidence of disease
- Non critical stenosis – diseased with stenosis < 50% of vessel diameter
- Critical stenosis – diseased with stenosis more than 50% of vessel diameter
- Occluded – no flow seen within artery / segment of artery not seen on angiogram

The collateral pattern across the occluded segments were studied.

- Specific patterns of collateralization typically described in thromboangiitis obliterans, such as " tree root" collaterals, "corkscrew" collateral were looked for and reported
- The named collateral group in each site of arterial disease were studied.

The results thus obtained were then analyzed.

III. Observation And Results

Age group (yrs)	Number
20 – 30	6
30 – 40	51
40 – 50	40

Table1: Age group distribution – angio group

Age group (yrs)	Number
20 – 30	17
30 – 40	152
40 – 50	112

Table2: Age group distribution – all TAO patients

Symptom	**Number (%)**
Gangrene	218 (77.6)
• Great toe	81 (28.8)
• Other toes	56 (19.9)
• Forefoot	13 (4.6)
• > Forefoot	68 (24.2)
Ulcer	63 (22.4)
• Toes	43 (15.3)
• Foot	20 (7.1)
Asymptomatic	63 (16.1%)

Table3: Clinical presentation – critical ischemia

Site of claudication	All TAO patients	Angiogram group
• Thigh	22	19
• Calf	108	55
• Instep	74	11
Typical claudication	185	79
Atypical claudication	19	6
Total	204 (72.6%)	85 (87.6%)

Table4: Clinical presentation – claudication

Management	Number of patients (%)
Medical	121 (43%)
Angiogram +/- revasc.	97 (34.5%)
Primary amputation	63 (22.4%)

Table5: Management plan

Level of Disease	Number of limbs			
	All patients	Primary amputation	Medical management	Angiogram +/- revasc.
Aorto iliac	14	4	0	10
Iliac	41	18	0	23
Femoro popliteal	165	34	46	85
Tibial	172	12	143	17
Total	392	68	189	135

Table6: level of occlusion – correlation with management strategy

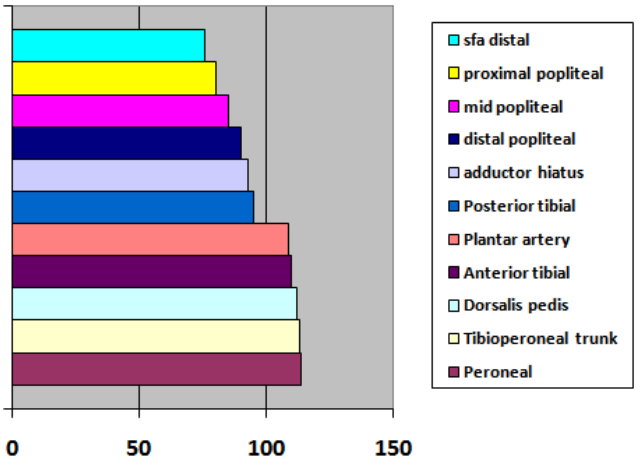


Chart 1: incidence of disease – most common involved arteries

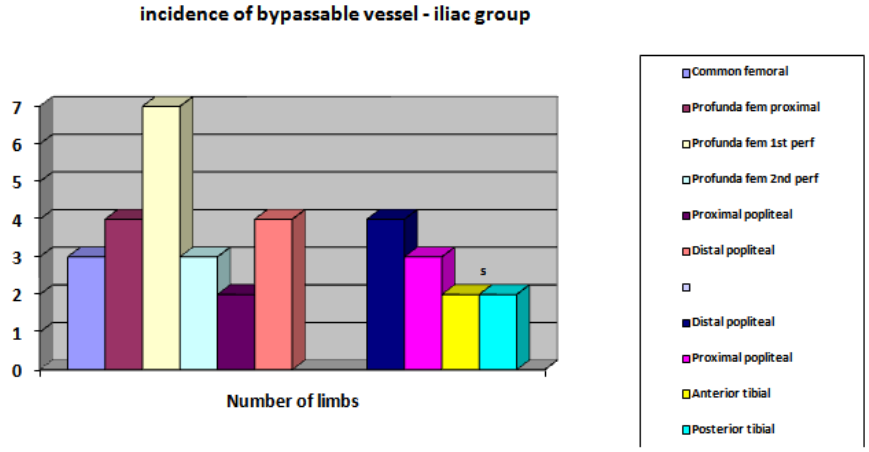
artery	Number of limbs				
	normal	occlusion	critical stenosis	non critical stenosis	incidence of disease
Peroneal	21	112	2	0	114
Tibioperoneal trunk	22	112	0	1	113
Dorsalis pedis	23	112	0	0	112
Anterior tibial	25	106	3	1	110
Plantar artery	26	109	0	0	109
Posterior tibial	40	93	2	0	95
adductor hiatus	42	91	2	0	93
distal popliteal	45	89	1	0	90
mid popliteal	50	85	0	0	85
proximal popliteal	55	77	3	0	80
sfa distal	59	75	1	0	76

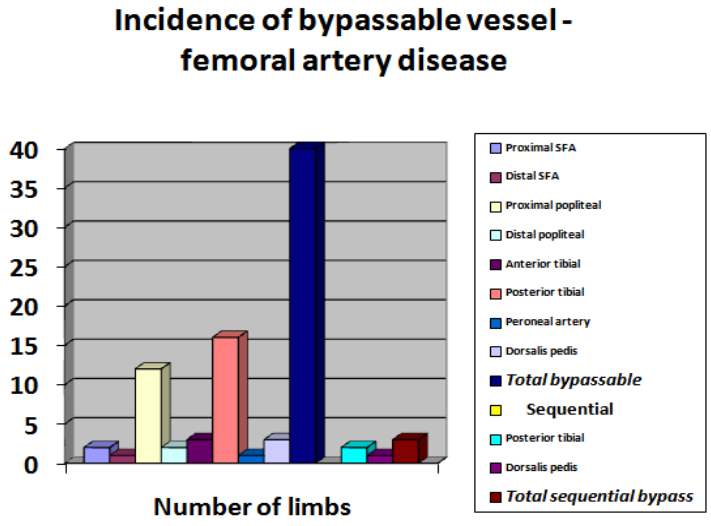
Table 7:Incidence of disease – most common arteries involved

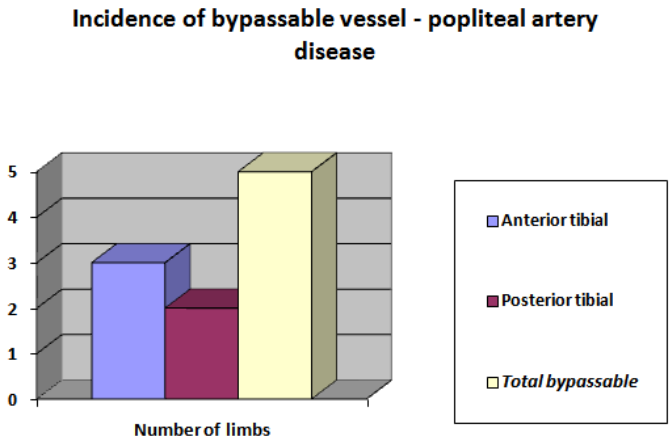
Arteries	Number of limbs				
	Normal	Occluded	Critical stenosis	Non critical stenosis	Incidence of disease
Superficial femoral origin	71	59	4	1	64
Superficial femoral proximal	72	62	1	0	63
profunda femoris origin	93	35	5	2	42

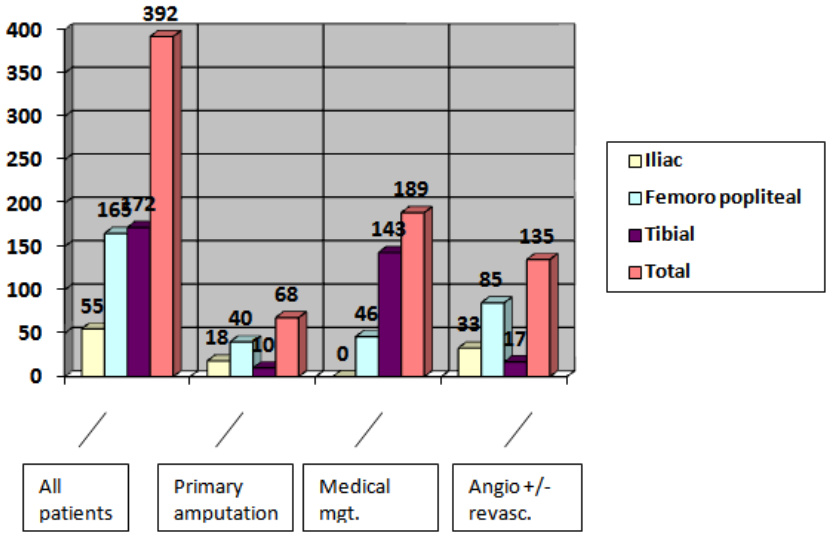
Common femoral	96	35	4	0	39
External iliac	99	35	1	0	36
1st perf	99	28	6	2	36
2nd perf	100	28	5	2	35
3rd perf	100	29	4	2	35
4th perf	100	29	4	2	35
Internal iliac post divn.	123	6	5	1	12
Internal iliac	124	5	6	0	11
Internal iliac ant divn	124	6	4	1	11
Common iliac	133	2	0	0	2

Table 8: Incidence of disease – arteries least involved with disease









Disease pattern	Number
Occlusive	1420
Critical stenosis	63
Non critical stenosis	15

Pattern of disease in TAO angiograms

Category	Total bypassable (%)
Angiogram (study group)	68/135(50.4)
All TAO patients	68/392(17.3)

TAO – probability of revascularization

IV. Conclusion

- TAO continues to be a significant source of limb loss and morbidity
- Supragenicular disease affects a significant proportion of patients with TAO in our population
- All patients with supragenicular disease have infragenicular disease as well.
- The diagnostic criterion of infrapopliteal disease as mentioned by Shionoya should be an angiographic criterion, and not a clinical criterion.
- Suprapopliteal vessel disease is more likely to have distal vessels amenable for revascularization.
- Infrapopliteal vessel disease is unlikely to have suitable distal vessels for revascularization.
- The disease patterns indicate different pathogenetic mechanisms for initiation and progression of disease at different levels in the arterial tree. This, in turn, could have effects on the probability of revascularization and limb salvage.
- Further studies are required for accurate understanding of the etiopathology of the disease and to evolve management strategies to reduce limb loss due to TAO.

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