

## Superficial Femoral Artery Rupture: A Rare Experience in Our Proximal Femoral Nailing & Precautions to Avoid Complications

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### Abstract:

**Background:** Iatrogenic vascular injuries are uncommon during the course of proximal femur surgical procedures. We report the case of an 28-year-old male presenting with an SUBTROCHANTERIC fracture, treated by antegrade intramedullary nailing and complicated by a superficial femoral artery laceration at the level of the distal locking screw. Intraoperatively, gush of blood following distal cortical screw drilling, followed by thigh swelling 2 minutes after distal locking. No perioperative & postoperative blood pressure drop or heart rhythm. Postoperative Dorsalispedis, tibialis pulse & Popliteal pulse were not felt but femoral pulse was felt. Immediate Doppler study done revealed no flow beyond middle 1/3<sup>rd</sup> femoral artery. CT angiography revealed postoperative total obstruction of superficial femoral artery beyond 10cm from its origin. Fortunately patient improved well with conservative treatment without any devastating complications.

Perioperative precautionary measures must be taken include: Excessive traction may prevent the vascular axis moving out of the way of the lesion-causing agent. SFA is positioned close (< 10mm) to the medial femur when the lower limb is installed in internal rotation and adduction. Drilling partially sectioned the SFA, with external haemorrhage. Therefore careful drilling under C-arm guidance required to prevent neurovascular injuries.

**TYPE OF STUDY:** Retrospective level 4.

**Key Words:** Proximal femoral fracture, subtrochanteric fracture, Intramedullary nailing, Vascular injury.

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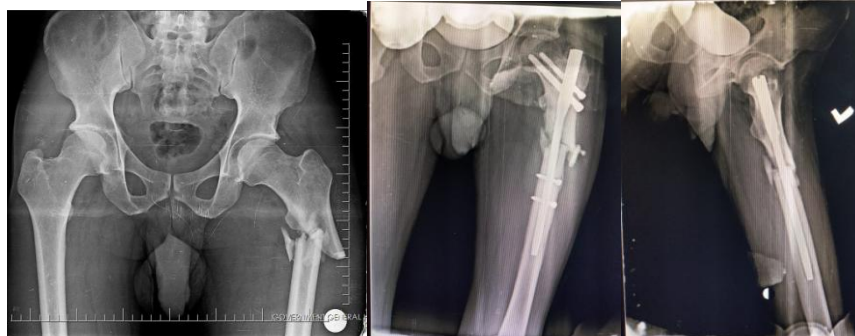
### I. Introduction:

PROXIMAL FEMORAL FRACTURES (PFF) management requires great attention from orthopaedic surgeons because of a high rate of complications and mortality [1,2]. Iatrogenic vascular injuries are uncommon during the course of proximal femur surgical procedures but potentially life- or limb threatening [3]. There is no optimal diagnostic or therapeutic modality for vascular injury [7]. There are infrequent reports demonstrating that the over-penetration of drill bit or distal screws may induce vascular injury of femoral arteries [8–12]. The current common PFF fixation modes are almost outside-to-in screw insertion, which is more dangerous for femoral arteries when travelling in the medial aspect of the femur. Recognition of the relationship between screw & Drill insertion and femoral arteries in the medial aspect of the femur is a practical approach to reduce iatrogenic vascular injury.

### II. Case Report:

Our patient aged 34 years male who is Non-smoker, occasional alcoholic met with with Road Traffic Accident & sustained left sub trochanteric femur fracture with no other systemic injuries. Haemodynamic parameters were stable. Bilateral lower limb pulses present. X-ray fracture classification was Fielding's type 2 sub trochanteric fracture. Case was planned for short PFN because of lack of long PFN nail. Patient was kept on traction table. Entry point, Reduction, Guide wire passage, Reaming done under C-Arm guidance. Nail of size 135 x 10 x 25 with 95 & 85 sized proximal screws inserted. No obstacle occurred until proximal static locking. Gush of blood appeared when static hole drilling done, later stopped after placing dynamic screw. Immediately after screwing, thigh swelling appeared on anteromedial aspect. Distal Pulses were examined, found to be deficit on operated side. Proximal femoral pulse felt. Immediate Doppler study showed biphasic flow in Proximal femoral artery, Monophasic flow in Distal femoral artery, No flow in Dorsalispedis & Posterior tibial pulse. CT angiography revealed "TOTAL OBSTRUCTION OF SUPERFICIAL FEMORAL ARTERY 10CM FROM ITS ORIGIN". Because of poor socioeconomic status & lack of availability of vascular surgeon in the vicinity, Patient was managed conservatively with LMWH 0.6mg daily scbd for 10 days, Tab. ASPIRIN 150mg od for

30days.Fortunately patient limb was survived with decreased pulses. Postoperatively No compartment syndrome, No hemodynamic instability seen.But patient left with feeble pulses Dorsalispedis even after 6months with thigh atrophy on just above knee,Repeat CT angio done showing persistent block with formation of good collaterals.



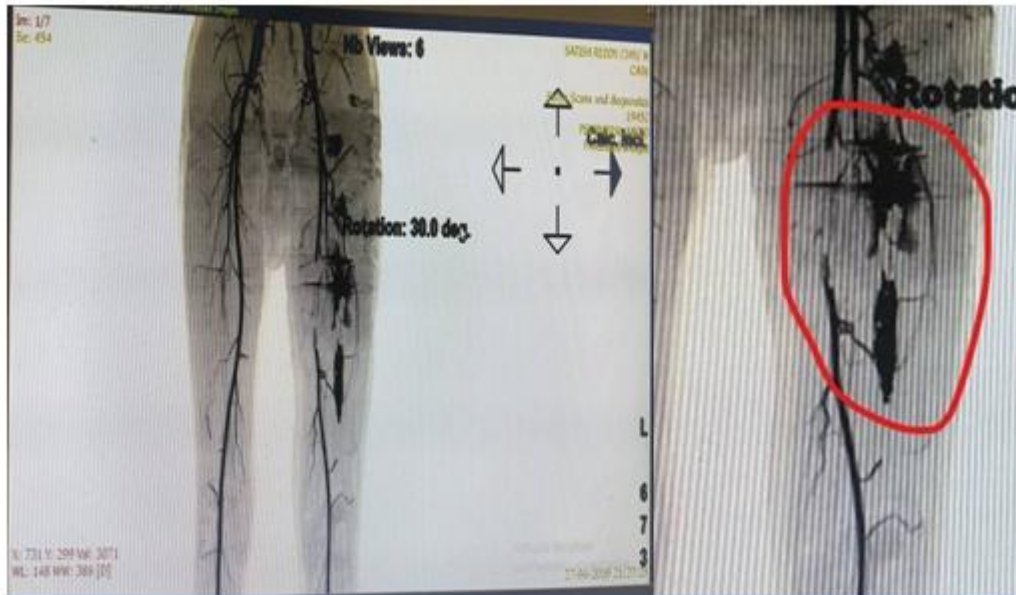
PREOPERATIVE XRAY AND SIX MONTHS POSTOPERATIVE AP AND LATERAL VIEW

**III. Observation:**

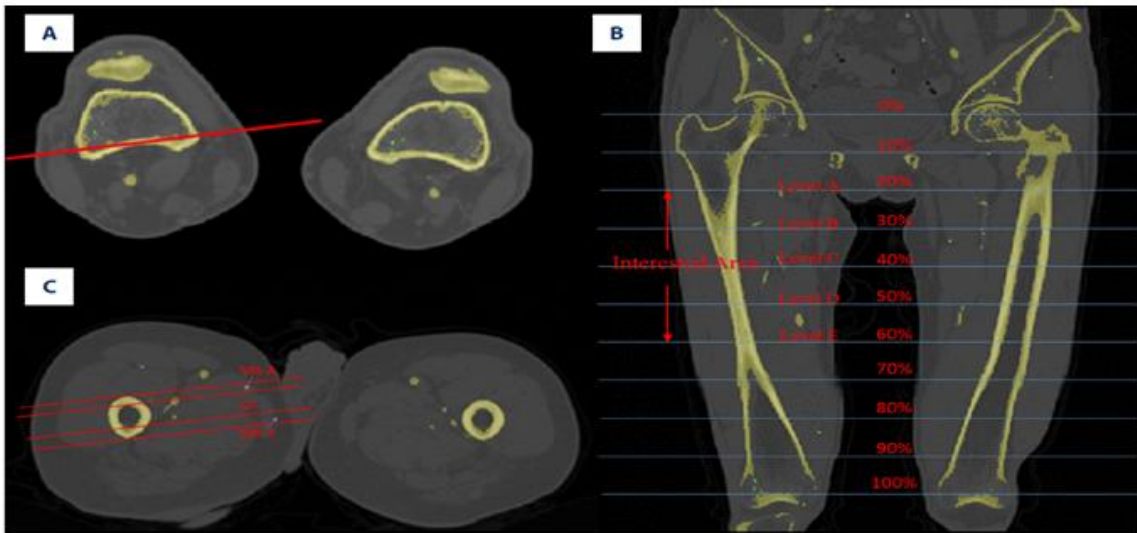
Femoral artery and its branches were mainly located on medial side of middle one third of femur .So any internal fixation has high chances of injuring the vessels & Nerves. The femoral length covering the portion of femoral arteries in the medial femur was divided into five levels equally by percentage of the whole femur: namely, levels A (20%), B (30%), C (40%), D (50%), and E (60%). Femoral arteries were mainly distributed in the medial part of the femur at levels B, C, and D. The least mean distance between femoral arteries and femur in the center region was at level B (12.80±2.38 mm).With respect to distribution in the center region in the risky area, the femoral arteries were concentrated at levels B and C. Moreover, the Profunda femoral artery(PFA) and Deep femoral artery(DFA) were much closer to the femur than the Superficial femoral artery(SFA).The femoral arteries in the medial femur were mainly distributed at levels B (88.2%), C (65.9%), and D (40.6%). The PFAs were closest to the femur in the center region at levels A, B, and C, and the DFAs had the least distance to the femur in the center region at level D.The femoral arteries in the center regions in the risky area, most of which were DFAs and PFAs, were mainly concentrated at levels B (26.93%) and C (11.81%). No femoral arteries existed in the center region in the risky area at level E .Yang et al.,[5] found that Internal rotation and adduction would lessen the distance between SFAs and the femur.Grimaldi et al.,[6]Neutral position with less limb traction would be a better choice in screw insertion for prevention of iatrogenic vascular injury. Diminished traction and adduction before screwing plates or cephalomedullary nails could reduce vascular injury because it would not lessen the distance between the medial femur and nearby vessels.

**SIX MONTHS POST-OPERATIVE FINDINGS**

		<u>RIGHT</u>	<u>LEFT</u>
Circumference Thigh	-	34cm	30cm
Power (MRC grading)	-	5/5	4/5
Reflexes	-	Normal	<u>Normal</u>
Sensations	-	Normal	<u>Normal</u>
Pulses-Femoral	-	Normal	<u>Normal</u>
Popliteal	-	Normal	<u>Normal</u>
DPA,PTA	-	Normal	Feeble



POST OPERATIVE CT ANGIO SHOWING BLOCK



SIX MONTHS POSTOPERATIVE CT ANGIO SHOWING BLOCK WITH COLLATERAL VESSELS

#### IV. Discussion:

The PFAs were closest to the femur in the center region at levels A, B, and C, and the DFAs had the least distance to the femur in the center region at level D. The vascular injury usually occurred where femoral arteries were close to the femur in the direction of screw insertion. The femoral arteries in the center regions in the risky area, most of which were DFAs and PFAs, were mainly concentrated at levels B (26.93%) and C (11.81%). No femoral arteries existed in the center region in the risky area at level E. Internal rotation and adduction would lessen the distance between SFAs and the femur[5]. Neutral position with less limb traction would be a better choice in screw insertion for prevention of iatrogenic vascular injury[6]. Diminished traction and adduction before screwing plates or cephalomedullary nails could reduce vascular injury because it would increase the distance between the medial femur and nearby vessels.

Table 3. The femoral arteries distribution in center region and risky area at each level.

Level	SFA	DFA	PFA	Total
A	/	/	29	29 (1.81%)
B	/	237	194	431 (26.93%)
C	31	158	/	189 (11.81%)
D	15	/	/	15 (0.94%)
E	/	/	/	/

#### V. Conclusion:

Preoperative documentation of Pulses, Exclusion of peripheral vascular disease, Careful drilling & screwing done under C-arm guidance. We therefore recommend underlying steps when the cephalic screw has stabilized the fracture:

- A) Take drill length total of sleeve length+length from near to far cortex.
  - B) Drilling for the distal interlocking screw should be performed with subtlety.
  - C) Complete intraoperative imaging with fluoroscopy should be obtained without technical compromise in every step of the procedure.
  - D) Returning to neutral position to distance the vessels from the medial side of the femur after proximal screw is completed.
  - E) Reducing lower-limb traction, partly to reduce soft-tissue compression between the femur and the perineal support, and also to increase SFA mobility.
  - F) If an obstructed or injured superficial femoral artery is also present, reconstruction of the superficial femoral artery is recommended.[4].
- Being proactive rather than reactive is necessary.

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