CASE REPORT

Deep femoral artery injury caused by non-fixed lesser trochanter 1 month after osteosynthesis

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Case report

The report is on 59-year-old patient with Bechterew disease who was injured after falling from a bicycle in mid-April 2007. He was admitted and then operated in another hospital. Patient sustained a comminutive pertrochanteric fracture with lesser and greater trochanter separation. It was treated operatively using dynamic hip screw with additional supporting plate for greater trochanter. The fixation of lesser trochanter has not been performed. After that the patient was treated according to the accepted protocol and underwent standard regimen of physiotherapeutic exercises, verticalisation and learning how to walk with limited weight bearing using crutches. No complications were recorded during operation or hospitalisation.

Physiotherapy was continued in the specialised rehabilitation center for treating trauma patients. One month after the osteosynthesis and during physiotherapy he started to experience pain in his left inner thigh. Shortly swelling appeared and eventually he sought help in our surgical department at the end of May 2007.

At admission we noticed the pulsating swelling and suffusion in the adductor region of the left thigh. The thigh was painful on palpation. Distal part of left lower extremity was neurocirculatory intact and no other abnormalities were recorded. On radiographic images it was clearly seen that dislocation of the lesser trochanter occurred (Fig. 1). Initial ultrasound examination revealed the collection of fluid between the muscles extending towards adductory canal, colour Doppler estimation of flow in great vessels was good. Working diagnosis was pseudoaneurysm of deep femoral artery.

As the patient was cardiorespiratory stable and overall in fairly good condition so the decision to operate on following morning with the assistance of vascular surgeon was made. We used anterior approach with longitudinal incision directly over the femoral vessels. First we evacuated the haemathoma (Fig. 2). The sharp-edged bony fragment must have lacerated the artery short time prior to admission as the fibrous layer around the haematoma had not yet been formed excluding the criteria for false aneurysm.

After careful preparation of the femoral arteries we confirmed the laceration of left deep femoral artery caused by bone fragment (Figs. 3–5). It corresponded to rotated and displaced lesser trochanter not fixated during osteosynthesis of pertrochanteric fracture month before.

The damaged artery was repaired using patch graft followed by reduction and fixation of displaced lesser trochanter with solitary screw using the same approach (Fig. 6). Postoperatively we observed minor lymph fluid collection in the region of the operating field and additionally small incision was made for fluid evacuation. There were no other complications and 2 weeks after the repair of deep femoral artery patient was discharged from hospital and returned to physiotherapy. At the beginning of August he was able to walk with full weight bearing of left leg. Radiographs again revealed separation of lesser trochanter and cranialisation due to muscle pulling forces but this time without arterial damage (Fig. 7). In mid November we decided to remove the solitary screw due to uncomfortable sensations and pain...
reported by the patient. Nevertheless we manage to achieve a fairly good functional result.

**Discussion**

The most interesting point in this case is that laceration of profunda femoral artery occurred during physiotherapy 1 month after the osteosynthesis was made. There are a few reports of injury to profunda femoral artery during the operating procedure, mainly iatrogenic caused by transfemoral drilling.\(^3\) Intramedulary nails offer somewhat better solution regarding this problem beside their biomechanical advantage over the plates.\(^3\) Reports of arterial injuries made by non-fixed lesser trochanter are very rare, especially after a certain period of time since osteosynthesis or even after

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**Figures 1 and 2** Radiograph of patient’s left hip at admission to our department, 1 month after osteosynthesis with DHS and supporting plate. Notice the position of displaced lesser trochanter.

**Figure 2** After evacuation of haemathoma.

**Figure 3** Sharp edge of displaced lesser trochanter held with grasper. Only superficial femoral artery is seen. Immediately under it lies lacerated deep femoral artery. Note the proximity of involved structures.

**Figures 4 and 5** The lacerated part of deep femoral artery brought into view (below). Superficial femoral artery lies directly above.
bipolar hemiarthroplasty of the hip, when patients are well inside the physiotherapeutic phase. Murphy et al. described similar case to ours after intertrochanteric fracture treated also with dynamic hip screw. Pseudoaneurysm of deep femoral artery was also noted 4 weeks after the surgery but was treated with ligation of affected artery at the level of pseudoaneurysm. Similarly Bernstein et al. also described a false aneurysm and damage of deep femoral artery 30 days after osteosynthesis of unstable pertrochanteric fracture without fixing the lesser trochanter in 92-year-old woman. In their case the bone fragment was removed and arterial defect bridged with vascular prothesis. Removal of loose fragment was also performed by Ritchie et al. in 74-year-old female to relieve the mechanical stress on vascular structures. Some details of cited cases are presented in Table 1.

It seems that fixing the lesser trochanter is important part of any type of osteosynthesis when treating fractures in proximal part of the femur and effort should be made to do so whenever possible. Of course careful operating technique is mandatory especially with transfemoral drilling. Beside the known biomechanical reasons the anatomical proximity of the lesser trochanter and deep femoral artery seems to be of great importance. The rotation and upward motion of the lesser trochanter caused by the pulling force of iliopsoas muscle together with the sharpness of avulsed bony fragment can definitely cause the laceration of deep femoral artery or even vein which lies relatively fixed in surrounding tissues. The amount of pulling force produced by iliopsoas muscle is quite substantial therefore the fixation of bone fragment with solitary screw (as presented in our case) is most probably not sufficient but it was the most convenient one in a given situation. Using anterior approach the lesser trochanter was clearly visible and easily accessible therefore reduction and fixation was technically not demanding. Considering patient’s age, physical activity and the importance of inserting muscles for medial stability of the hip we opted for re-fixation of lesser trochanter but in an older, less physically active patient we would probably remove the bony fragment. Removal of loose bony fragment is probably the safest solution in such cases but at the expense of above-mentioned biomechanical reasons. The fact that the screw was pulled out

Table 1  Short summary of cited cases

<table>
<thead>
<tr>
<th>Author</th>
<th>OS procedure</th>
<th>Injured artery</th>
<th>Vascular procedure</th>
<th>Bony fragment removal</th>
<th>Time of vascular injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klanke et al. 3</td>
<td>DYAX intramedular nail</td>
<td>Branch of APF</td>
<td>Embolisation</td>
<td>No</td>
<td>Few days</td>
</tr>
<tr>
<td>Ha et al. 2</td>
<td>Hemiarthroplasty</td>
<td>AFS and APF</td>
<td>Prothesis</td>
<td>Yes</td>
<td>Four weeks</td>
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<tr>
<td>Murphy et al. 4</td>
<td>DHS</td>
<td>APF</td>
<td>Ligation</td>
<td>Not stated</td>
<td>Four weeks</td>
</tr>
<tr>
<td>Bernstein et al. 1</td>
<td>Intramedular gliding nail</td>
<td>APF</td>
<td>Prothesis</td>
<td>Yes</td>
<td>Thirty days</td>
</tr>
<tr>
<td>Ritchie et al. 5</td>
<td>DHS</td>
<td>APF</td>
<td>Ligation</td>
<td>Yes</td>
<td>Not stated</td>
</tr>
<tr>
<td>Popovic and Stankovic</td>
<td>DHS</td>
<td>APF</td>
<td>Dacron patch</td>
<td>No</td>
<td>Four weeks</td>
</tr>
</tbody>
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Figure 6  Radiograph taken after fixing the lesser trochanter with solitary screw.

Figure 7  Radiograph taken 3 months after fixing the lesser trochanter. Solitary screw has been pulled out. The rest of bone is healing properly.
eventually confirms that method of fixation we have used (solitary screw from the medial side) is not the best solution.

**Conclusion**

As already stated those injuries are rare and the reasons for the time coincidence of false aneurysm formation in period of 1 month after operation procedure are yet to be determined. We can speculate that at that time most of the patients are in certain phase of physiotherapy, already walking with various walking aids, start to bear weight and perform exercises with injured leg, but for pinpointing the cause the number of cases are far too low. Nevertheless we must always consider the false aneurysm formation as possible late complication when treating those fractures, especially when lesser trochanter is not fixed.

**References**