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Case report

Vascular lesion in hip revision arthroplasty: a case report

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Abstract. Vascular injuries during hip revision surgery can be life-threatening complications for patients. There are many aspects to consider when approaching this type of surgery for an optimal diagnostic and therapeutic strategy, as a careful planning with extensive preoperative investigations, a full attention during the surgical procedure and the use of suitable material for a proper treatment. This kind of surgery can require a dedicated and trained multidisciplinary team. We report a case of an acute intraoperative vascular lesion during an acetabular revision performed in a 55-years-old patient. (www.actabiomedica.it)

Key Words: Acetabular revision, vascular lesion, femoral artery lesion, femoral vein laceration

Introduction

Over the years there has been a progressive increase in the number of hip replacement (1-4) and the incidence of arthroplasty is expected to continue to rise due to the greater number of primary implants and revision procedures. The reasons for a revision include dislocation-instability, infection, implant malposition, wear and periprosthetic fracture.

In the United States, the literature suggests that the number of hip revision procedures is projected to reach 72,000 for year by 10 years (5, 6).

Revision surgery is a difficult procedure burdened with potential complications in a large number of cases.

Potential complications can be distinguished into biological, anatomical and mechanical.

The main biological complications are early or late infections, while mechanical complications comprise those related to the implant and anatomical complications include vascular and nerve injuries.

There are many aspects to consider when approaching this type of surgery for an optimal diagnostic and therapeutic strategy, as a careful planning with extensive preoperative investigations, a full attention during the surgical procedure and the use of suitable material for the proper treatment in each individual case.

It is a high-level surgery and thus is preferable to concentrate these procedures in specific centers where dedicated surgical teams can safely perform this type of surgery and are prepared to deal with even the most fearsome complications.

We report a case of an acute intraoperative vascular lesion of common femoral artery with a concomitant laceration of the femoral vein during an acetabular revision performed at our Institution (San Bortolo Hospital, Vicenza) in a 55-years-old patient.

Case report

The patient came to our attention for chronic pain in her right hip. She reported three previous hip surgeries and the last one was an acetabular revision with a reinforcing ring and a polyethylene cemented cup, performed 13 years earlier.

At the clinical examination the patient complained a severe functional limitation, walking pain and a disability to carry out the normal activities of daily life with a significant reduction in the quality of life.

All conservative attempts to solve her problems had failed; therefore, in accordance with the patient, we decided to perform an acetabular revision.

After clinical and instrumental evaluation, we planned the acetabular replacement with the implant of the REDAPT Fully Porous Shell (Smith & Nephew Memphis - TN - USA) augmented with screws (both compression and angular stability types) with a cemented liner.

We performed an antero-lateral approach to the hip with the patient in a supine position and the interval between the *gluteus medius* and the *tensor fasciae latae* was developed.

We initially removed the previous acetabular components. Twenty minutes after the removal of the reinforcing ring, the patient reported an important episode of hypotension with a consequent hypovolemic shock. The patient was immediately transfused with blood, colloids and crystalloids.

An evident source of bleeding was not identifiable in the operating field, therefore we activated the vascular surgeons' team of our multidisciplinary unit which was previously alerted to the type of procedure in order to control the hemostasis.

A vascular surgeon of the team performed a right inguinocrural approach and isolated the femoral tripod, sparing the lymph nodes package. It was showed a tearing of the femoral artery extended to its bifurcation and a concomitant tearing of the femoral vein. Venous bleeding was then successfully controlled by direct suture of the breach through a continuous suture with Prolene 5/0.

A direct suture of the lesion of the femoral artery was impossible to achieve due to its extension and to the condition of the vasal wall which showed multiple adherences of previous surgeries.

Therefore, an iliac-femoral bypass was performed with the use of an inverted great saphenous vein (GSV) with a proximal termino-lateral anastomosis between the GSV and the iliac artery through a continuous suture of Prolene 6/0 and a distal oblique termino-terminal anastomosis between the GSV and the superficial femoral artery through a continuous suture of Prolene 6/0. The deep femoral artery was previously ligated (fig 1).

After the vascular procedure, we completed our revision with the new acetabular cup and its liner. Then we performed the final reduction with the new femoral head and tested the stability of the implant.

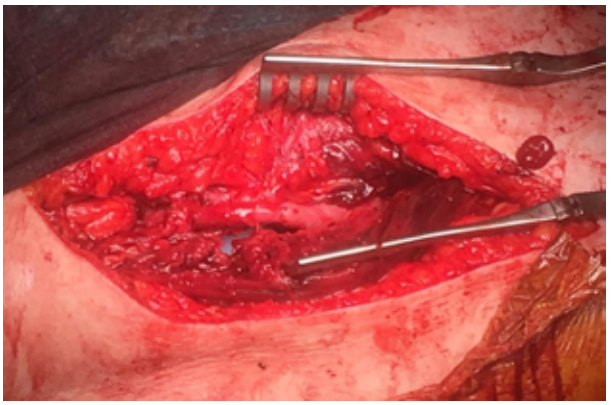

Fig 1. iliac-femoral bypass performed

The patient was sent to the Intensive Care Unit for 2 days in the post-operative period and, after few days in our department, she was addressed to the rehabilitation departement to start functional recovery.

Six months after discharge, the patient recovered a good walking ability assisted by crutches, the passive hip range of motion was complete, while active movements as hip flexion were limited. Six months later, the patient was still walking with crutches due to a complete deficit of muscles innervated by the femoral nerve.

Discussion

Revision hip surgery is a procedure that hides pitfalls and needs to be carefully planned.

Despite a proper preparation, intraoperative complications can be serious and life-threatening for the patient. There are important and large vessels in the pelvis near the acetabulum, as well as relevant nerve structures: the surgeon is required to pay the utmost attention. (8)

In the literature several authors report rates of vascular complications with an incidence ranging from 0,08% to 0,67% (9, 10).

Vascular complications are defined as multiple pathological condition. These are divided into acute complications, such as intraoperative bleeding, acute ischemia and the formation of hematoma, and chronic complications like pseudo-aneurysm and arterial-venous fistula, which can cause late ischemic signs.

In acetabular revision procedures, vascular lesions can easily be determined from the presence of local adhesions, fibrous tissue or vessel displacement, as the results of previous surgery and also bone deficiencies, that can alter the anatomical relationships and the physiological location of the vessels.

According to Shoenfeld et al. (11) and Jonsson et al. (12) fibrosis and metallosis promote the adhesion of the vessels to the prosthetic implants. At the same time, Calligaro et al (9) did not find a significantly higher risk in revision surgery compared to primary implants in their series of 9,581 THA and 1,769 revisions (they reported 8 cases of acute arterial complications, 7 after primary THA and 1 after hip revision). The same authors described a rate of acute arterial complications six times higher in total knee arthroplasty than in hip arthroplasty (0.36 versus 0.06).

This may be due to the lower incidence of these complications that makes it difficult to study in a large numbers of patients.

Although these limitations, and as indicated by Bergqvist et al. (13), there is a predominance of vascular lesions in female patients and the left hip seems to be at a higher relative risk.

Other authors (12-14) state that infection may be a predisposing factor to vascular complications due to inflammatory local infiltration with anatomical alteration.

Another possible mechanism of injury could be due to the wrong Homann retractors positioning. Riouallon et al (15) described the factors that can lead to an incorrect placement of the Homann retractors with consequent vascular lesion caused by its tip.

Several studies have shown that the surgical approach in hip replacement is not a leading cause for neuro-vascular damage but the retractors must be placed in the correct position.

The lesion of the femoral artery described in this case is definitely an acute injury with a potential serious risk for the patient's life. The emergency treatment developed by vascular surgeons has prevented the patient's exitus.

According to Duparc, mechanisms of injury can be divided into 3 groups:

- torsional vascular lengthening during dislocation and reduction maneuvers;
- trauma caused by continuous pressure of the retractors;
- direct injuries often due to screws perforation.

In addition, several authors (11, 15-18) pointed out two additional factors: first the excessive acetabular reaming and second the exothermic reaction during cementation.

In our opinion, the femoral bundle lesion reported in this case was related to a tearing mechanism due to adhesions between the vascular structures and the cement of the acetabular component that was used in the previous surgery.

A progressive arterial hypotension was noted until the shock during the removal of the cement between the reinforcing ring and the cup.

Looking at the removed components it was noted that a part of soft tissues was tenaciously adherent to the cement mantle (figs 2, 3).

This adherence gave rise to an abnormal tension on the vessel until it was torn apart and ruptured.

The relationships between the vessels and the prosthetic components had been carefully evaluated with a preoperative CT-scan, but it had not been possible

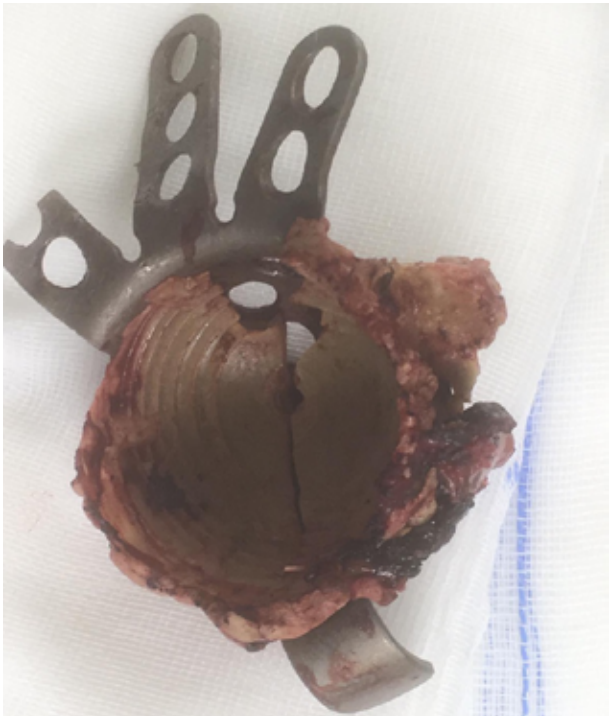

Fig 2. Reinforcing Ring and cement mantle

Fig 3. Vessel adherent to the cement mantle

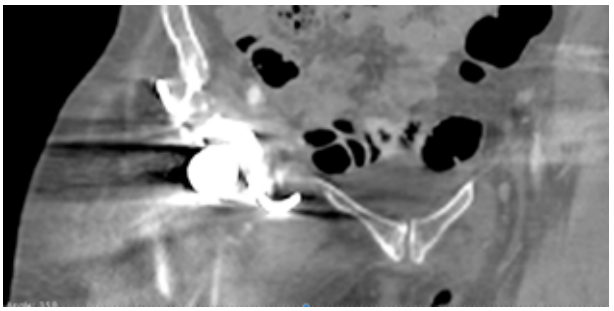

Fig 4. Pre-Operative CT scan

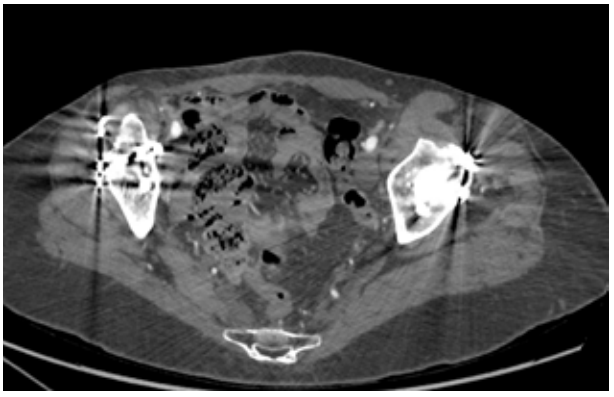

Fig 5. Pre-Operative CT scan

to detect this close adhesion with a radiotransparent material (Figs 4, 5).

About 450 hip replacements are performed annually in our department, both primary THA and revision implant.

Nevertheless, we believe that this vascular complication is not related to the number of hip replacements and the experience of the surgeon, because it is unpredictable and not preventable even with an accurate preoperative planning.

The multidisciplinary approach which includes vascular surgeons has been successful in preventing lethal complications for the patient in our case.

Conclusion

Vascular lesions are rare and uncommon complications in hip replacement, and their occurrence can put the patient's life at risk.

Therefore, due to the low number of this type of injuries, performing this kind of surgical procedures requires a dedicated and trained multidisciplinary team.

In a high-level institution the presence of experienced orthopaedic surgeons, trained anaesthetists and vascular surgeons able to perform both endovascular and open procedures allow the early diagnosis, management and treatment of intraoperative vascular lesions.

Conflicts of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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