

Original Article

DIFFICULT REVISION OF ACETABULAR COMPONENT MIGRATED IN PELVIS IN THA, WITH OR WITHOUT VASCULAR INVOLVEMENT

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Abstract

AIM has a high rate of mortality is showed by the review of literature, in those cases. We want to establish a protocol according to our experience.

Material and methods: Between 01.2006 and 01. 2012 we have performed 8 such total hip revisions with acetabular migrated cup, in 4 cases a vascular graft was needed. Two cases were revised after a spacer for septic revision. The protocol included: planed X Ray frontal and lateral view, angio-CT, biological evaluation, a correct preoperative planning, a minimal 6 units of blood stock, an experienced anesthesiologist, an experienced surgical team which included a vascular surgeon, a versatile arsenal of revision prosthesis, bone grafts and vascular grafts. The approach used: a general antero-lateral approach we usually use for hip revisions and in cases with vascular risk involvement, a retroperitoneal approach, in dorsal decubitus.

Results: The acetabular defect was reconstructed using bone grafts tantal revision cups in 4 cases, Burch-Schneider cages in 2 cases, Kerboull ring in 1 case and oblong cup (Cotyle Espace) in other one. In 4 cases an iliac vessel graft was needed and the procedure was carried out by the vascular surgeon. All patients survived the procedure of revision and still come for follow-up, no septic complications.

Conclusions: Intrapelvic acetabular cup migration is a rare but serious complication that can occur after total hip arthroplasty, in septic or aseptic cases. An experienced

multidisciplinary team of surgeons should take part in planning and conducting such a complicated revision.

Key words: *Intrapelvic acetabular cup migration, revision prosthesis, iliac vessel, protocol, multidisciplinary team of surgeons.*

Rezumat

AIM (*migrația acetabulară intrapelvină*) are o rată de mortalitate redusă în literatură. În acest studiu, am prezentat experiența noastră în aceste cazuri.

Material și metodă. Între 01. 2006 și 01.2012, am practicat 8 asemenea revizii totale cu migrare acetabulară, în 4 cazuri a fost necesară greafă vasculară. Două cazuri au fost operate după revizie septică. Protocolul include examenul radiologic standard cu vedere frontală și laterală, angioCT, evaluare biologică, corectare preoperatorie a deficiențelor hematologice cu minim 6 unități de sânge, un anestezist experimentat, o echipă chirurgicală cu chirurg vascular, un arsenal de proteze pentru revizie, grefoane osoase și vasculare. Calea de abord este de obicei antero-laterală la cazurile cu risc vascular sau retroperitoneală, în decubit dorsal.

Rezultate. Defectul acetabular a fost reconstruit cu grefon osos în 4 cazuri și cu grefon vascular iliac în alte 4 cazuri. Toți pacienții au supraviețuit, fără complicații septice.

Concluzii. Migrarea acetabulară intrapelvină este o complicație rară, dar dificilă, ce poate surveni după artroplastia totală, în cazuri septice sau aseptice și necesită tratament chirurgical interdisciplinar.

Cuvinte-cheie: *migrație intrapelvică acetabulară, revizie protetică, vase iliace, protocol chirurgical interdisciplinar.*

Introduction

Intrapelvic acetabular cup migration is a rare but serious complication that can occur after total hip arthroplasty, in septic or aseptic cases. The severe protrusion of the acetabular component of a total hip arthroplasty is migration of the cement and cup medial to the iliopectineal line of the pelvic bone which entails a defect of the pelvic medial wall that is the floor of the acetabulum.

Removal of an acetabular prosthesis that has migrated into the pelvis can be hazardous⁴. That acetabular component migrated into the pelvis, create a fibrous adherent to the pelvic organ (uterus, rectum, bladder, ureter) but also to the common iliac vessels. That removal can lead to uncontrollable bleeding (Slater, Edge, Salman 12) death or severe complications created by damage to the pelvic organs (Robert, Loudon 9).

Extraction of an acetabular prosthesis that has migrated into the pelvis must be done with complete control of careful liberation of these fibrous adherent to the pelvic organ. The surgery can be performed with 2 separate approach, to observe by the window what happened by other approach. Initially, a

retroperitoneal approach was used for removal of an intrapelvic cup or cement mass by Eftekhar and Nercessian 2. Later on they used the Rutheford Morrison approach which gave direct access for the assessment of the relationship of the prosthesis to the pelvic vessels and organs.

We have used a simple, limited retroperitoneal approach which has allowed the save removal of theses migrated cups.

Material and Method

We have performed such revisions in 8 patients, and in 4 cases a vascular graft was needed.

There were six women and two men with a mean age of 64 years (42 to 78). The primary diagnosis was osteoarthritis in seven patients (two secondary to dysplasia) and rheumatoid arthritis in one. Only three patients were operated by us in prime surgery.

Three patients had Stryker Omnifit prostheses cemented and two others uncemented, one was Zweimuller prostheses, another one was Exeter prostheses and in one the design was not recorded. In eight patients the mean interval between the primary procedure and the revision was 13.25 years (7 to 19).

The cup had migrated medial to Kohler's line. Fortunately, severe medial migration is rare and these nine cases represent only 3.6% of the revision hip arthroplasties carried out in department during the last five years.

Two cases were revised after a spacer for septic revision (*Figure 1*). Infection was excluded in all the patients by preoperative aspiration, scintigraphy, and measurement of then ESR and C-reactive protein. Angiography was used in five of our cases to define the relationship of the prosthesis to the pelvic vessels and organs. The interpretation of angiograms can, however, be difficult because it is impossible to obtain true lateral views. An acetabular prosthesis that appears to be closely related to the vessels on the anteroposterior view may be in a different transverse plane. Angiograms are, however, useful for excluding false aneurysms. Also, we have used MRI and have been impressed with the information that this provides about the course of the vessels in relation to the acetabular prosthesis.

The approach used was differentiated, a general antero-lateral approach we usually use for hip revisions and in cases with vascular risk involvement, a retroperitoneal approach. A skin incision parallel and just distal to the subcutaneous border of the anterior half of the iliac crest extending anteriorly to the midpoint of the inguinal ligament which can be converted to the Rutherford Morrison approach allowing direct access to the external iliac vessels and pelvic organs if haemorage is encountered.

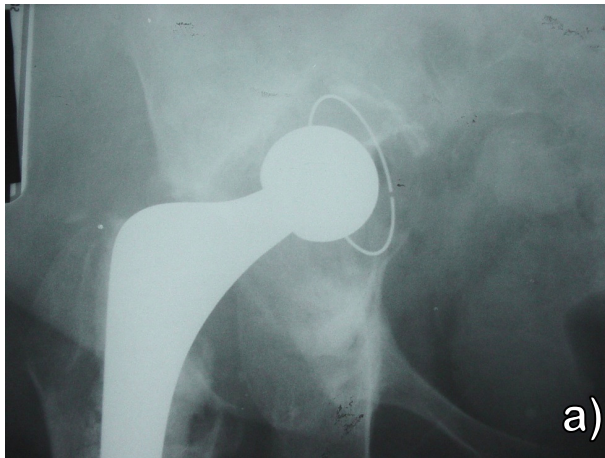
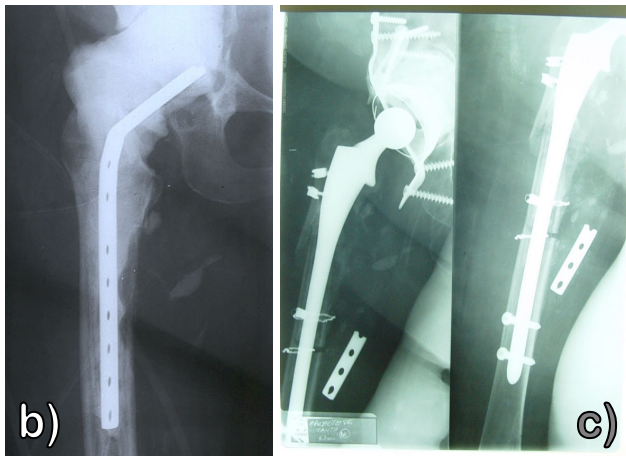


Figure 1: Two stage septic revision of the protruded Exeter prosthesis (a), Septic revision with antibiotic bone cement armed with an angled plate (b), Revision with DLS and Burch Schneider Prosthesis with bone allograft (c)



A multidisciplinary team of surgeons should take part in planning and conducting such a complicated revision. It is for the best to include a vascular surgeon and a general surgeon as such an attempt to remove an acetabular component that has migrated into the pelvis can be hazardous. The common iliac vessels, ureter, bladder, rectum and uterus may be adherent or adjacent to the acetabular component and trying to extract it may lead to organ damage or uncontrollable bleeding. For the safely revisions in those cases we applied a protocol that included: planed X Ray frontal and lateral view, doppler ultrasound, angio-CT (*Figure 2*), biological evaluation including blood test of inflammation – infection, a correct preoperative planning, a minimal 6 units of blood stock, an experienced anesthesiologist, an experienced surgical team which included a vascular surgeon, a versatile arsenal of revision prosthesis, bone grafts and vascular grafts.

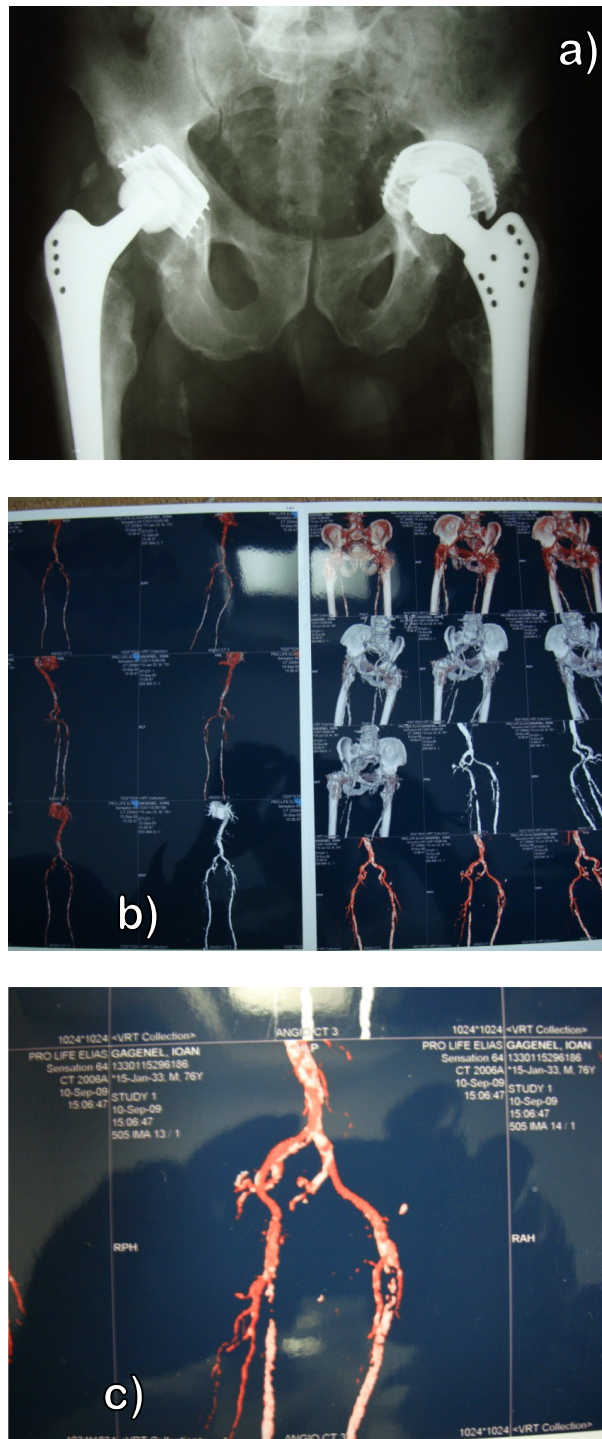


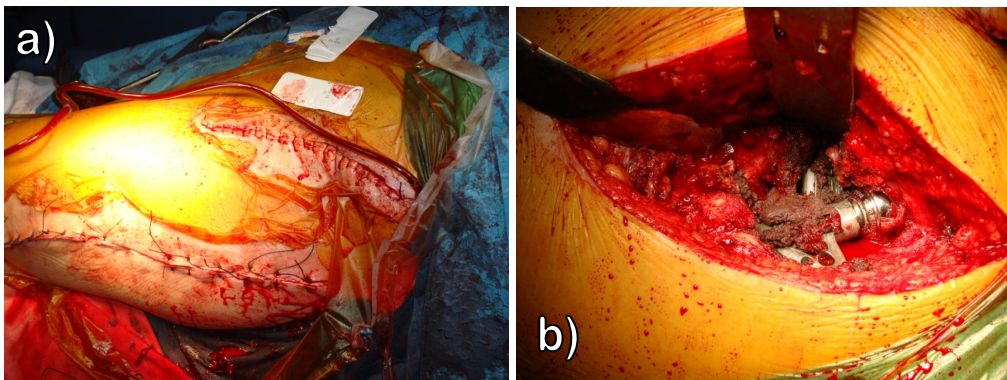
Figure 2: Zweimuller prosthesis protruded X-ray (a), Angio C.T. (b, c)

It is for the best to include a vascular surgeon and a general surgeon as such an attempt to remove an acetabular component that has migrated into the pelvis can be hazardous. The common iliac vessels, ureter, bladder, rectum and uterus may be adherent or adjacent to the acetabular component and trying to extract it may lead to organ damage or uncontrollable bleeding.

Operative technique. The patient lies on dorsal decubitus, but initially we rotated table on the unaffected side, to allow access to the abdomen. A window in the drapes exposes the iliac crest and the proximal femur. A skin incision is made parallel and just distal to the subcutaneous border of the anterior half of the iliac crest extending anteriorly to the midpoint of the inguinal ligament. The periosteum is incised along the iliac crest releasing the fibres of the external oblique, the internal oblique and the transversus abdominus muscles. The lateral end of the inguinal ligament can be reflected in continuity with the abdominal muscles if necessary. Care is taken to identify and protect the lateral cutaneous nerve of the thigh. The muscle belly of iliacus is then elevated subperiosteally from the inner table of the ilium. With medial retraction of the iliopsoas muscle the cup comes into view 5. When the cup has migrated proximally as well as medially, access to it is easy. If the migration is purely medial a more extensive exposure is necessary.

The prosthesis is invariably surrounded by a thick layer of fibrous tissue. The plane between the cup and this fibrous membrane is identified and careful dissection is performed leaving this layer intact. The cup and surrounding cement can then be removed either whole or piecemeal depending on their size and position.

The hip may then be approached through a separate antero-lateral incision, generally by the old approach, or by extending the iliac incision to give an anterior approach for the completion of the revision procedure (*Figure 3*). A separate incision was used in seven of our patients and an anterior extension in one.



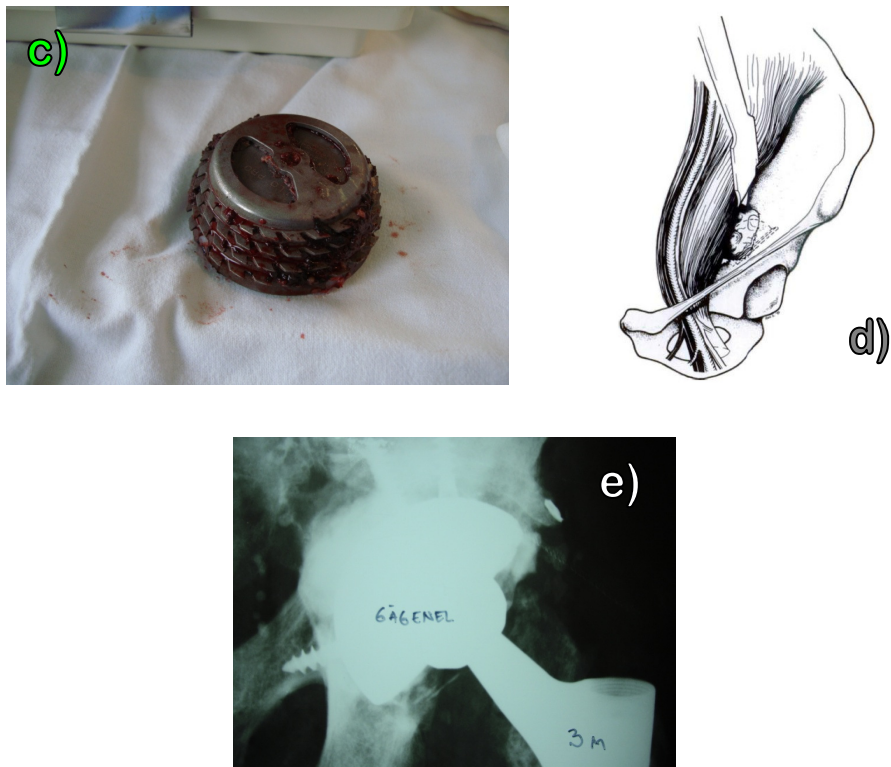
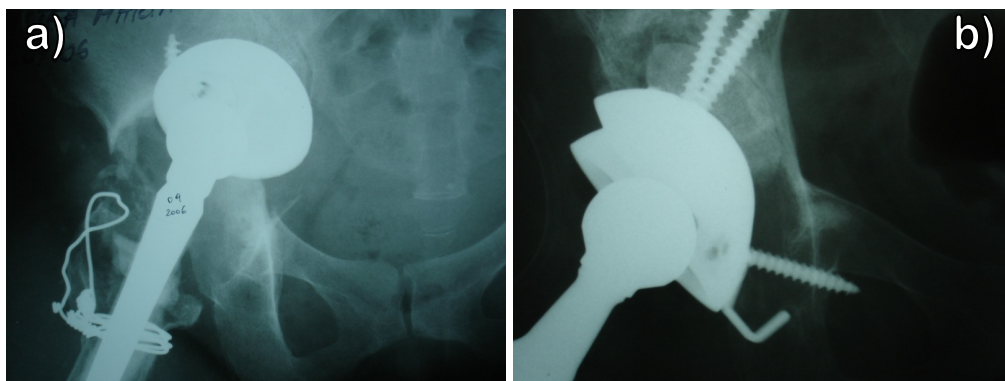


Figure 3: Two separated approaches (a), the granuloma of the Zweimüller prosthesis (b), the cup (c), schema of the approach (d), X-ray result tantalum cup with bone graft substitute Revitan femoral component at 3 months (e)

The acetabular defect was reconstructed using bone grafts tantalum revision cups in 4 cases, Burch-Schneider cages in 2 cases, Kerboul ring in 1 case and oblong cup (Cotyle Espace) in other one (*Figure 4*).



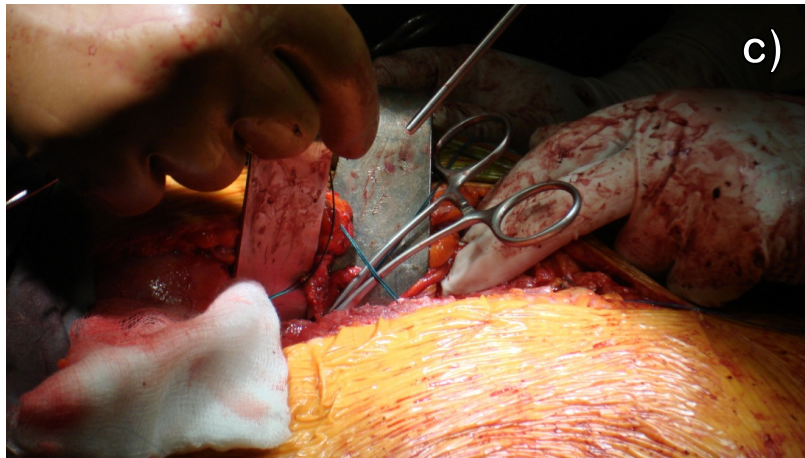


Figure 4: Uncemented omnifit Stryker protruded (a), Cotyle Espace with massive bone graft reconstruction (b), two separated surgery approaches (c)

The acetabular defect was important in two cases, and we removed from external iliac wing, from external compact bone, a quadrate with 5-6 cm large. That external iliac wing was fixed inside the pelvic defect, by creating a new medial wall for the acetabulum and then with autologus or allografted morcellised bone combined with bone substitute.

In 4 cases an iliac vessel graft was needed and the procedure was carried out by the vascular surgeon.

Results

All patients survived the procedure of revision and still come for follow-up.

Operation time varied between 120 min-360 min, blood loss in media was 3 units but we needed 9 units in one case.

All the patients have restored the centre of the rotation of the hip, the equality of the leg lengths and the stability of the revised hip.

There is a risk of paralytic ileus in the postoperative period. It is therefore prudent to introduce oral fluids gradually until intestinal function has returned to normal.

All patients received oral anticoagulant prophylaxis for 45 days with pradaxa (Dabigatran) 220 mg/day, but 7 patients have restriction to full weight bearing for 3-4 months during the bone graft integration of acetabular reconstruction.

In 4 cases an iliac vessel graft was needed and the procedure was carried out by the vascular surgeon. In these cases the dissection of the iliac vessels was impossible. In other one the venous hemorrhage was controlled by direct suture of the bleeding point without the need for exploration of the pelvic vessels [Table 1].

Table 1 Case group

PATIENT / AGE	Primary diagnosis	Type of primary THA	Time between the primary procedure and the revision	Type of revision acetabular implant	Vascular graft	Time of Surgery	Blood units
1/42	Osteoarthritis	Stryker Omnifit uncemented	7	Tantal bone graft substitute		120	3
2/78	Osteoarthritis sec DDH	Stryker Omnifit cemented	13	Tantal bone graft substitute		120	4
3/62	Osteoarthritis	Stryker Omnifit uncemented	19	Cotyle Espace Bone graft	Yes	340	9
4/63	Osteoarthritis	Exeter	14	Septic - Two step revision- Burch Schneider bone graft DLS	Yes	300	6
5/62	Coxitys Rheumatoid	Stryker Omnifit uncemented	12	Septic - Two step revision -Tantal		200	6
6/69	Osteoarthritis	Zweimuller	16	Tantal bone graft substitute	Yes	360	8
7/69	Osteoarthritis sec DDH	Stryker Omnifit cemented	10	Kerboull ring bone graft		220	4
8/68	Osteoarthritis	Stryker Omnifit cemented	15	Burch Schneider bone graft	Yes	230	3

Discussion

Protrusio acetabuli is medial displacement of the acetabulum beyond the radiographic teardrop with medial migration of the femoral head into the pelvis 6, 7. Acetabular protrusion may be found in many bone disorders such as degenerative joint disease, Paget's disease, rheumatoid arthritis, ankylosing spondylitis, osteomalacia, Marfan's disease and as an effect of irradiation 5, 10.

Vascular injuries associated with hip arthroplasty consist of thromboembolic complications leading to distal ischaemia, vessel lacerations, pseudo aneurysms, and arterio-venous fistulas 1, 8. Complications are related to cement incorporation of the iliac vessels, aggressive medial retraction, excessive traction on atherosclerotic vessels, and improper technique in preparation of the acetabulum 11.

Removal of an acetabular prosthesis that has migrated into the pelvis can be hazardous 4. That acetabular component migrated into the pelvis, create a fibrous adherent to the pelvic organ (uterus, rectum, bladder, ureter) but also to the common iliac vessels. That removal can lead to uncontrollable bleeding (Slater,

Edge, Salman 12) death or severe complications created by damage to the pelvic organs (Robert, Loudon 9).

Extraction of an acetabular prosthesis that has migrated into the pelvis must be done with complete control of careful liberation of these fibrous adherent to the pelvic organ. The surgery can be performed with 2 separate approach, to observe by the window what happened by other approach. Initially, a retroperitoneal approach was used for removal of an intrapelvic cup or cement mass by Eftekhar and Nercessian 2. Later on they used the Rutherford Morrison approach which gave direct access for the assessment of the relationship of the prosthesis to the pelvic vessels and organs.

We have used a simple, limited retroperitoneal approach which has allowed the safe removal of these migrated cups. The limited retroperitoneal approach that we have described is familiar to orthopaedic surgeons since it is similar to that used for innominate osteotomy. Intrapelvic migration of an acetabular prosthesis is usually a slow process during which the cup becomes surrounded by a thick layer of fibrous tissue which separates it from the pelvic vessels and organs. Dissection in the plane between the cup and the fibrous membrane allows safe removal of the cup and cement, leaving the fibrous layer intact. This approach is not appropriate for the removal of all intrapelvic cups. If the preoperative angiograms show a false aneurysm the Rutherford Morrison approach should be used and the vessels explored. A large cement mass which has extruded into the pelvis at the time of primary surgery also presents a more difficult problem because it may be directly adherent to the pelvic vessels and organs. The protective effect of the thick fibrous layer is absent and there is a greater risk of damage to the vessels. The Rutherford Morrison approach may, again, be advisable. If, using the limited retroperitoneal approach, haemorrhage is encountered the incision can be extended and the approach converted to the Rutherford Morrison, with mobilisation of the peritoneum off the iliopsoas fascia allowing direct access to the external iliac vessels and pelvic organs. We have found it best to remove the intrapelvic cup before approaching the femur. A rotated acetabular component combined with proximal migration of the femur may 'lock' the prosthetic head and attempted dislocation can then cause fracture of the femur or of the acetabular wall. Extraction of the cup from within the pelvis frees the prosthetic head and allows safe mobilisation of the femur.

In important acetabular bone defect, the removal from external iliac wing, from external compact bone, a quadrate with 5-6 cm large, can be precious. That external iliac wing can be fixed inside the pelvic defect, by creating a new medial wall for the acetabulum and then stabilized with autologous or allografted morcellised bone combined with bone substitute.

Conclusions

Intrapelvic acetabular cup migration is a rare but serious complication that can occur after total hip arthroplasty, in septic or aseptic cases. An experienced multidisciplinary team of surgeons should take part in planning and conducting such a complicated revision. The necessity of a complex evaluation protocol before the surgery is mandatory, and a versatile arsenal of revision prosthesis, bone grafts and vascular grafts is needed.

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