

6 years follow-up of hip revision surgery

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Rezumat

Evaluare la 6 ani a reviziilor artroplastiei de șold

Revizia artroplastiei de șold ridică întotdeauna probleme legate de capitalul osos. Scopul acestui studiu a fost de evaluare a rezultatelor reviziilor de șold în funcție de capitalul osos. Au fost urmărite, într-un studiu retrospectiv, 148 revizii de șold efectuate între 2004-2010. Pentru evaluarea clinică și radiologică s-au folosit scorul de șold Harris, clasificările AAOS, SOFCOT 99 și Barrack. Calitatea cimentării acetabulare a fost evaluată. Se observă o creștere semnificativă a scorului Harris de la o valoare medie de 45 preoperator la 77,2 postoperator. Gradul B de cimentare acetabulară a fost observat într-un procentaj semnificativ mai ridicat în cazurile unde era nevoie de reconstrucție acetabulară cu greșă și unde nu s-a putut practica datorită lipsei acesteia. Gradele C și D de cimentare femurală Barrack au fost întâlnite pentru 70% din cazurile SOFCOT 99 III-IV, și doar pentru 5% din cazurile 0-II. Utilizarea grefelor osoase pare a fi o soluție viabilă pentru restaurarea stocului osos și stabilizarea implatului în revizii pentru cazurile cu defecte AAOS II-IV. Deoarece cazurile SOFCOT 99 C și D sunt frecvent asociate cu o cimentare mai slabă, noi preferăm utilizarea implaturilor femurale necimentate lungi fixate distal cu șuruburi.

Cuvinte cheie: revizie de șold, reconstrucție cu greșă, supraviețuire protetică

Abstract

Revision total hip arthroplasty often presents surgeons with difficult bone loss problems. The purpose of this study was to evaluate the results of hip revision surgery according to bone stock. We evaluated, in a retrospective study, 148 hip revision surgeries during 2004 to 2010. The Harris Hip Score (HHS), the acetabular cementation, the AAOS classification, the SOFCOT 99 bone loss grading and Barrack classification were used for clinical and radiological assessment. It can be observed significant improvement of HHS from a mean value of 45 preoperatively to 77.2 points postoperatively. Grade B acetabular cementation was observed in a significantly higher rate for situations that needed acetabular allograft reconstruction and where it cannot be performed because of allografts lack. Barrack grades C and D cementation were associated with 70% of SOFCOT 99 stage III and IV cases and only 5% of SOFCOT 99 stage 0-II cases. Using bone graft seems to be a reliable solution for restoring bone stock and stabilizing the cup in revision total hip arthroplasty with type II-IV acetabular defect according to the AAOS classification. Because SOFCOT 99 stages III-IV are often associated with poor cementation we prefer using uncemented distally fixed with screws revision stems for these cases.

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Key words: hip revision, graft reconstruction, prosthetic survival

Introduction

Revision surgery is much more complex and technically much more difficult than first-time surgery. It involves longer operating time and increased blood loss, and may require an increase in the length of the hospital stay. Revision total hip arthroplasty often presents surgeons with difficult bone loss problems (1). The selection of an appropriate bone graft is influenced by the size of the bone defect, the location, the biology of the bone graft site, and whether the graft is required for structural support. Autogenous bone graft remains the gold standard bone graft material but there only is a limited amount available and there is morbidity associated with the harvesting of these grafts. According to Migaud et al, initial bone stock influenced the results of revisions and underscored the relation between bone stock and cementing quality and therefore implant's longevity (2).

The purpose of this study was to evaluate the results of hip revision surgery according to bone stock.

Materials and Method

It was a retrospective study, during 2004 to 2010. We performed 148 revision surgeries on 80 females and 68 males. The average age was 66 years (range 23 to 84 years). 100 primary implants were cemented, 35 cementless, and 13 hybrid. We performed entire prosthetic system revision in 106 cases, only acetabular component revision in 32 cases, head replacement in 5 cases and acetabular noncemented insert replacement in 5 cases. The reason for revision was aseptic loosening in 100 hips, recurrent dislocation in 39, and traumatic episode in 9. For cement removal of the cemented primary implants chisels were used only. All of the new acetabular components were fixed with cement. Femoral stems were replaced with others designated for primary arthroplasty or with modular components (cemented or distally fixed with screws) according to bone stock. Massive bone grafts were used for filling bone defects in some cases. Those who covered more than 25 % of acetabular component were fixed with screws. When no structural allografts were available any defect was filled with cement before the acetabular component was placed. The Harris Hip Score (HHS) was used for clinical assessment. The AAOS classification was used for acetabular deficiency. The acetabular cement was recorded as grade A when there was no lucency at the cement-bone interface other than in DeLee and Charnley zone 1, grade B was cement-bone lucency in any other zone and grade C was complete circumferential cement-bone lucency. The French Academy SOFCOT 99 bone loss grading system was used to classify preoperative femoral bone loss (3). The Barrack classification assessed the quality of the postoperative femoral cementation (4). The index revision was the first revision in 136 hips and the second in 12. Minimum six-year clinical and radiological follow-up was available for 100 hips.

Results

The mean interval for first revision was 8.17 years (range 2 months to 22 years). The mean interval for Moore revision was 4.7 years (range 5 months to 13 years). Regarding postoperative conditions during hospitalization, there were 7 cases of dislocations resolved non-operatively, 6 hematomas, 5 cases of localized sepsis and 2 cases of popliteal venous thrombosis. Clinical results were assessed using the Harris Hip Score. It can be observed significant improvement ($p < 0,001$) of HHS from a mean value of 45 preoperatively to 77.2 points postoperatively (range 3 to 25 points and 67 to 99 points) (Table 1). For acetabular bone stock assessment, 24 cases were classified as type I AAOS, 40 as type II, 30 as type III and 4 as type IV (Fig. 1). Structural allografts were used only in 60% of cases that needed acetabular graft reconstruction (AAOS II-IV) (Fig 2). At the last follow-up it can be observed radiolucent lines, grade B cementation, in 65% of cases that needed allograft acetabular reconstruction and where it cannot be performed because of allografts lack. Grade B cementation was observed in 15% of cases with acetabular allograft reconstruction. For those cases classified as AAOS I and II where no allograft reconstruction was needed, 5% of cases were classified as grade B cementation. For femoral bone stock assessment, 5 cases were classified as stage 0 SOFCOT 99, 30 as stage I, 28 as stage II, 25 as stage III, and 12 as stage IV (Fig. 3). Regarding postoperative femoral cementation, at the last follow-up, 35 cases were classified as Barrack grade A, 40 as grade B, 15 as grade C and 10 as grade D (Fig. 4). Barrack grades C and D

Table 1. Harris Hip Score

	Preoperative score	Score at the last follow-up
Mean	45	77,2
Minimal	3	25
Maximal	67	99

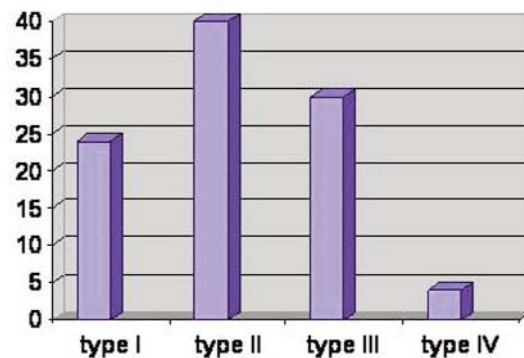


Figure 1. AAOS Acetabular Deficiency Classification. Type I: Segmental Type II: Cavitary Type III: Combined Type IV: Pelvic discontinuity

Figure 2. AAOS III case and reconstruction with acetabular bone graft fixed with screws

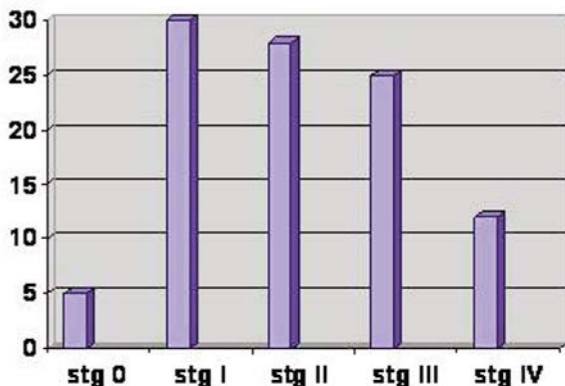
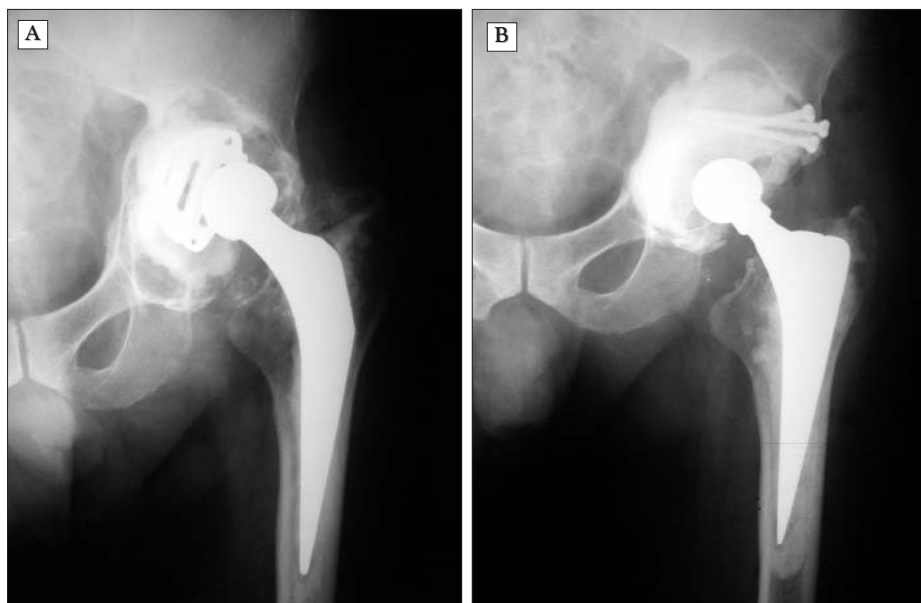


Figure 3. Distribution of bone substance loss according to the SOFCOT 99 criteria. Stage 0: no lesion; stage I: thinned but satisfactory cortex with more or less severe lysis of the Merkel cells; stage II: lateral cortex highly thinned, medial cortex thinned but satisfactory; stage III: lateral cortex highly thinned, medial cortex partially destroyed under the lesser trochanter; stage IV: femur pellucid or disappeared

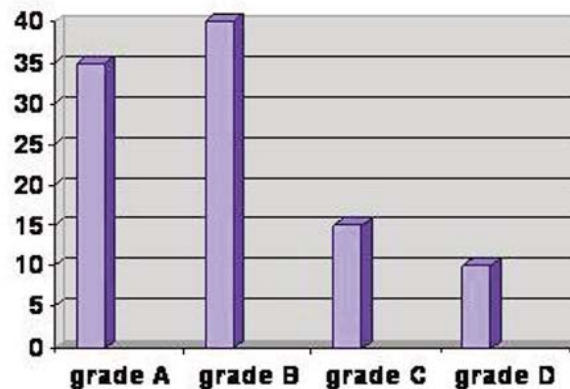


Figure 4. Radiological classification of cementation according to Barrack. Grade A. Medullary cavity entirely filled with cement, bone-cement interface shows no radiolucencies Grade B. Radiolucent line at the bone-cement interface over at least 50% of the surface Grade C. Radiolucent line at the bone-cement interface over 50-99% of the surface or presence on an incomplete cement mantle (cement not covered in one area) Grade D. Radiolucent line at the bone-cement interface over 100% of the surface or stem extremity not covered with cement

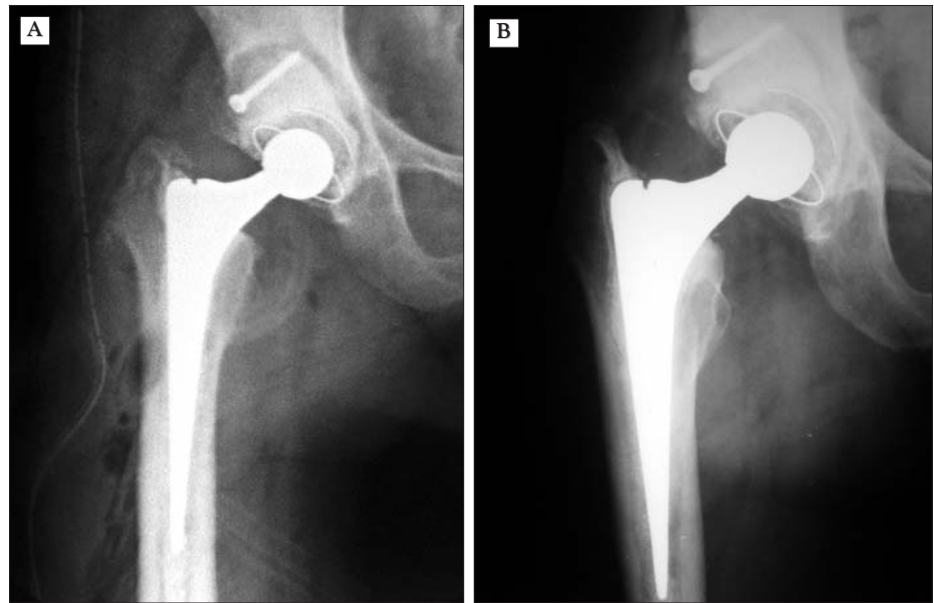
cementation were associated with 70% of SOFCOT 99 stage III and IV cases and only 5% of SOFCOT 99 stage 0-II cases.

Discussion

This study confirm that a proper bone stock creates the opportunity for a good cementation quality and consecutively a longer survival rate of hip prosthesis. Those cases evaluated preoperatively as poor bone stock, AAOS type II-IV for acetabulum, and SOFCOT 99 stage III-IV for femur, were treated better with structural grafts augmentation and cementing, or with uncemented long stems for femur. This

affirmation is sustained by the fact that cases evaluated as AAOS II-IV treated with bone graft augmentation presented a significantly lower rate of DeLee and Charnley grade B acetabular cementation then those treated without bone grafts ($p < 0,001$). The stage III or IV femurs on SOFCOT 99 index had a significantly higher risk of having grade C or D cementation on the Barrack classification ($p < 0,001$). That's why we prefer using uncemented revision stems fixed with screws for these cases. The clinical assessment showed significantly improvement of HHS after hip revision, similar with those described in literature. Bonnomet et al, showed no significant differences for clinical results between different types of femoral

Figure 5. Bone allograft acetabular reconstruction (postoperative control and 6 years Rx)



implant (cemented or uncemented) (5). Estok et al reported that grades A and B of femoral cementation were found in 100% of primary arthroplasties and in only 60% of revisions (6). We have found those grades in 75 % of revisions because more frequent use of uncemented femoral revision long stems. Repten et al showed that the survival rate of a cemented revision femoral stem was improved if this stem extended beyond the zone of bone loss a distance equal to the diameter of the femoral shaft (7). Poor quality cementation in such cases is attributed to proximal femoral osteolysis and absence of cement tip covering. The increased demand for bone allografts makes their supply difficult when the femoral heads of living donors are the only source. Using autograft include pain at the donor site, the potential for local complications such as haematoma or fracture, and the limited supply. That is why we had not dispose bone massive grafts for all AAOS II-IV cases that demands graft acetabular reconstruction. The first goal of grafting in revision of total hip arthroplasty is to transform segmental defects into cavitory defects and obtain a full compaction of the graft in order to restore the bone stock. The second goal is to achieve primary stability of the cup (8-11). Excepting 1 case, all of the others had good integration bone graft at the last follow-up (Fig. 5). Using bone graft seems to be a reliable solution for restoring bone stock and stabilizing the cup in revision total hip arthroplasty with type II-IV acetabular defect according to the AAOS classification. Because SOFCOT 99 stages III-IV are often associated with poor cementation we prefer using uncemented distally fixed with screws revision stems for these cases (Fig. 6).

Conclusion

Osseous capital is a key factor for prosthetic survival. During revision hip surgery bone stock restoration should be a major concern for providing implant stability. Patients delayed



Figure 6. Uncemented distally fixed femoral long stem

addressability to routine orthopaedic evaluations increases the number of cases with major bone deficiencies. Our clinical and radiological medium-term results support the use of graft reconstructive techniques in revision surgery.

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