CASE REPORT

"TRIPOLAR" HIP ARTHROPLASTY FOR FAILED HIP RESURFACING : NINETEEN YEARS FOLLOW-UP

T. SCHEERLINCK, P.-P. CASTELEYN

The authors describe the case of a 37-year-old patient who sustained a subcapital femoral neck fracture six months after ICLH double-cup hip resurfacing. As the polyethylene acetabular resurfacing component was undamaged and well fixed, a standard femoral stem with a bipolar head was inserted. The outer diameter of the bipolar head was chosen to fit the resurfacing socket. This "tripolar" hip arthroplasty has functioned well for 19 years and was revised for aseptic cup loosening. The cemented femoral stem was still well fixed and was not revised. Although the "tripolar" hip has functioned well in our case, we believe it is not indicated for metal on metal bearings. In this case the use of an appropriate modular head with a correct head-socket clearance is preferred.

Keywords : hip ; arthroplasty ; resurfacing ; double cup ; revision.
Mots-clés : hanche ; resurfaçage ; cupule couplée ; révision.

INTRODUCTION

Several "total hip resurfacings" or "double-cup arthroplasties" were introduced during the seventies and eighties (1, 3, 8, 10). They consisted of a large-diameter metallic shell, fixed to the shaped femoral head and a thin cemented polyethylene acetabular socket. These arthroplasties potentially allowed more physiological stress transmission and bone stock preservation. This was judged particularly important in young patients as later revisions would be easier to perform.

Although initially successful, these types of resurfacing arthroplasties had high revision rates (7, 10, 13). The major problems were wear and impingement of the thin acetabular component caused by the large bearing surface. The production of large quantities of polyethylene debris then lead to early aseptic loosening of both components (7, 11, 13, 17). Another problem was the occurrence of transcervical or subcapital femoral neck fractures (2, 3, 7, 8, 10). When this occurs early after total hip resurfacing, conversion to a standard total hip arthroplasty is not easy. The well fixed socket needs to be replaced by a standard cup, often leading to severe acetabular damage. In order to avoid replacing a well fixed double-cup socket, the use of a femoral stem with a biarticulated femoral head has been suggested as a salvage procedure (5). We describe the case of a late socket revision for aseptic loosening and polyethylene wear, 19 years after such a salvage procedure.

CASE REPORT

A 37-year-old male patient was treated in 1981 with an Imperial College / London Hospital (ICLH) double-cup total hip resurfacing for osteoarthritis of the hip secondary to Legg-Calvé-Perthes. The resurfacing was performed through a

Correspondence and reprints : Thierry Scheerlinck, Department of Orthopaedic Surgery and Traumatology Academisch Ziekenhuis van de Vrije Universiteit Brussel, Laarbeeklaan, 101, 1090 Brussels, Belgium.

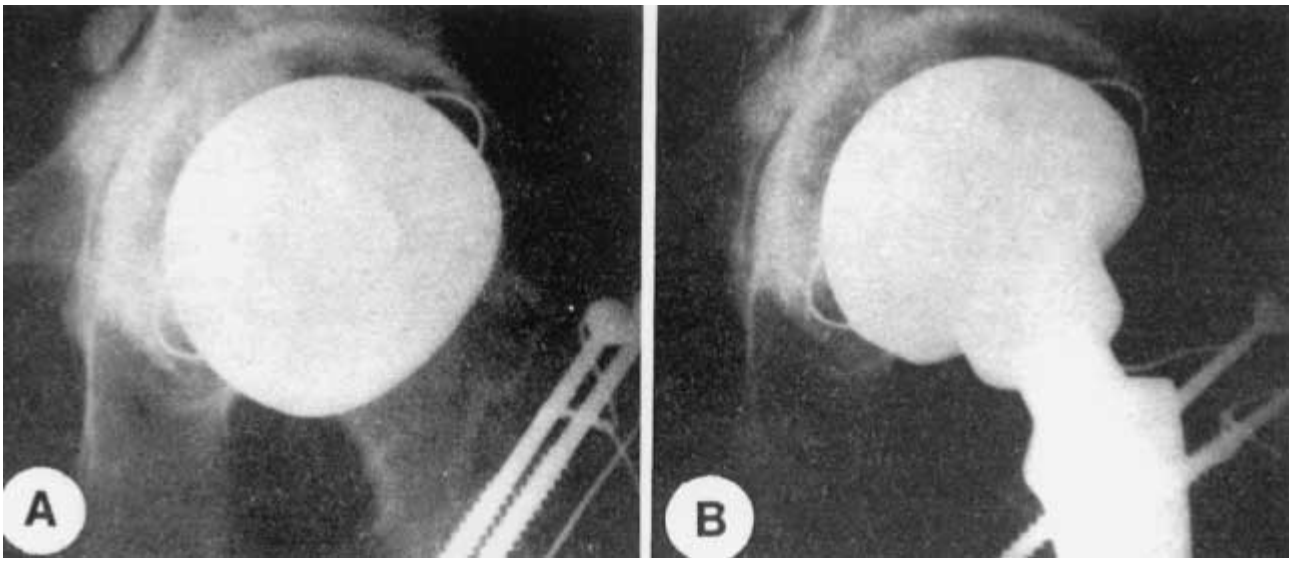

Fig. 1. — ICLH double-cup hip arthroplasty for osteoarthritis of the hip secondary to Legg-Calvé-Perthes (A). The hip resurfacing was replaced by a "tripolar" hip arthroplasty six months later due to femoral neck fracture (B).

transtrochanteric approach. Six months later the patient sustained a subcapital femoral neck fracture and was reoperated. The well fixed and undamaged cemented polyethylene cup was left in place but the resurfaced femoral head was replaced with a cemented Benoist-Girard straight stem and a biarticulated mobile cup (diameter : 28 / 46 mm, neck : + 10 mm). The outer diameter of the mobile cup was chosen to match the inner diameter of the ICLH socket. This case is illustrated in fig. 1 and has been described in a previous publication (5).

In June 1999, 18 years later the patient was evaluated as part of a routine follow-up examination. He had no pain and no walking limitation. Although he was limping, no walking aids were needed. Hip flexion was restricted to 80° but hip mobility in the other planes was almost normal. The Harris hip score was 91 / 100, the Merle d'Aubigné score 15 /18 and the patient rated his functional handicap at 2.9 / 10 on a visual analogue scale (VAS). A standard hip radiograph showed a radiolucency around the cup and marked polyethylene wear. The patient was informed that his hip socket was loose. As he had no major complaints, he did not wish to undergo revision surgery at that time. Close follow-up was advised.

In June 2000, over 19 years after the initial operation, the patient was re-evaluated. He was then 57 years old and presented with groin pain (pain on VAS : 3.8 / 10). Walking was restricted to 500 m and dependent on one crutch. The Trendelenburg sign was positive but hip mobility was unchanged. The Harris hip score was 52 / 100, Merle d'Aubigné 9 / 18 and the functional handicap on VAS 4.2 / 10. Standard radiographs showed a completely worn out and loose cemented polyethylene cup with marked osteolysis. The cemented stem appeared well fixed (fig. 2). A bone scan showed only marked osteoblastic activity around the cup and no signs of inflammation or sepsis were found on blood analysis. Cup revision for aseptic loosening and polyethylene wear was planned.

At revision the worn out and fragmented cemented socket was removed. As the acetabulum was well contained, fresh-frozen allografts could be impacted in the defect. A 62-mm contour reconstruction ring (Smith & Nephew, Memphis, USA) was fixed with four screws to stabilize the grafts. A 58 / 28-mm polyethylene liner with an elevated rim (Smith & Nephew, Memphis, USA) was cemented in the reconstruction ring (fig. 3). The Benoist-Girard straight stem was not replaced as it was well fixed.

Fig. 2. — The "tripolar" hip arthroplasty 19 years after surgery showing marked loosening and wear on the acetabular side.

Fig. 3. — Revision of the acetabular component with graft impaction and a cemented cup in a reconstruction ring. The femoral stem was not replaced.

Seven months after surgery the patient has no pain, can walk over 1 km with one crutch but is still limping. Hip flexion is limited to 60° and there is a 1-cm lengthening on the left side. The Harris hip score is 82 / 100, Merle d'Aubigné score 12 / 18 and the functional handicap on VAS 3.6 / 10.

DISCUSSION

In the presence of a failed resurfacing arthroplasty with an undamaged and well fixed polyethylene socket, some authors (2, 4) have suggested the use of a stemmed femoral prosthesis with a unipolar head. Although this solution seems attractive, it does not solve the wear problems associated with the use of a large metal head and a thin polyethylene socket. For this reason, suboptimal long term results are expected although no failures have been reported.

In the case described the broken femoral neck and prosthetic resurfacing head were replaced by a standard cemented femoral stem and a bipolar head. This "tripolar" construct has been successful in a young and active patient for almost 20 years. Although no firm conclusions can be drawn from this anecdotal case, the exceptionally slow wear of the acetabular resurfacing component might suggest that most of the hip motion occurred between the 28-mm head and the bipolar component. A similar construct has been described to treat recurrent prosthetic hip dislocations (9) and two constrained cup systems (EOL, Norton, France and Constrained Acetabular Insert, Osteonics, Allendale, USA) apply the same principle. To our knowledge no other long term results of these "tripolar" prostheses have been reported.

Since the reintroduction of metal-on-metal bearings, there has been renewed interest in resurfacing arthroplasties. Metal-on-metal bearings avoid high volumetric polyethylene wear and might solve problems linked to the use of thin polyethylene cups. This could lead to improved results especially when a cementless metal socket is used (14, 15, 12). On the other hand, the problem of femoral neck fracture is not completely solved. These fractures are reported in 0 to 25% of cases depending on bone quality, surgical approach, femoral

component type and positioning as well as the presence of femoral neck notching (16, 14, 15, 12, 13, 7, 8, 2, 10). Several biomechanical studies have demonstrated stress concentration in the cortical bone adjacent to the prosthetic rim even in well-aligned, modern prosthetic heads (16, 6). For this reason and as resurfacing arthroplasties are gaining in popularity, fractures of the femoral neck in the presence of a well fixed large resurfacing acetabular socket might become more common again.

When such a femoral neck fracture occurs below a metal-on-metal resurfacing prosthesis with an undamaged and well-fixed socket, the use of a bipolar head should not be advised. The introduction of polyethylene in young patients in combination with a metal-on-metal bearing carries the risk of third body wear caused by metal debris which could lead to fast progressing aseptic loosening. In this case a solid head for metal-on-metal articulation is recommended (15). Several modular heads with a correct head-socket clearance are now made available for this application. As wear problems of these metal-on-metal bearings do not seem to be a major concern even with a large diameter head, there is probably no advantage in transferring part of the motion to the smaller head of a bipolar prosthesis.

REFERENCES

1. Amstutz H. C. The THARIES hip resurfacing technique. Orthop. Clin., 1982, 13, 813-832.
2. Bierbaum B. E., Sweet R. Complications of resurfacing arthroplasty. Orthop. Clin., 1982, 13, 761-775.
3. Capello W. N., Ireland P. H., Trammell T. R., Eicher P. Conservative total hip arthroplasty. A procedure to conserve bone stock. Clin. Orthop., 1978, 134, 59-74.
4. Capello W. N., Trancik T. M., Eaton R. W. Salvage of the failed hip resurfacing arthroplasty. Orthop. Clin., 1982, 13, 777-787.
5. Casteleyn P.-P., Handelberg F., De Boeck H., Opdecam P. A salvage procedure for failed femoral components in resurfacing hip arthroplasties. Acta Orthop. Belg., 1987, 53, 457-461.
6. Clarke I. C. Biomechanics. Orthop. Clin., 1982, 13, 681-707.
7. Franzén H., Mjöberg B., Rydholm U. Metal backing improves the survival of surface replacement of the hip. Arch. Orthop. Trauma Surg., 1993, 112, 257-259.
8. Freeman M. A. R., Cameron H. U., Brown G. C. Cemented double cup arthroplasty of the hip : a 5 year experience with the ICLH prosthesis. Clin. Orthop., 1978, 134, 45-52.
9. Grigoris P., Grecula M. J., Amstutz H. C. Tripolar hip replacement for recurrent prosthetic dislocation. Clin. Orthop., 1994, 304, 148-155.
10. Head W. C. The Wagner surface replacement arthroplasty. Orthop. Clin., 1982, 13, 789-797.
11. Mai M. T., Schmalzried T. P., Dorey F. J., Campbell P. A., Amstutz H. C. The contribution of frictional torque to loosening at the cement-bone interface in Tharies hip replacements. J. Bone Joint Surg., 1996, 78-A, 505-511.
12. McMinn D., Treacy R., Lin K., Pynsent P. Metal on metal surface replacement of the hip. Experience of the McMinn prosthesis. Clin. Orthop., 1996, 329, 89-98.
13. Mesko J. W., Goodman F. G., Stanescu S. Total articular replacement arthroplasty. A three- to ten-year case-controlled study. Clin. Orthop., 1994, 300, 168-1771.
14. Schmalzried T. P., Fowble V. A., Ure K. J., Amstutz H. C. Metal on metal surface replacement of the hip. Technique, fixation, and early results. Clin. Orthop., 1996, 329, 106-114.
15. Wagner M., Wagner H. Preliminary results of uncemented metal on metal stemmed and resurfacing hip replacement arthroplasty. Clin. Orthop., 1996, 329, 78-88.
16. Watanabe Y., Shiba N., Matsuo S., Higuchi F., Tagawa Y., Inoue A. Biomechanical study of the resurfacing hip arthroplasty : finite element analysis of the femoral component. J. Arthroplasty, 2000, 15, 505-511.
17. Wiadrowski T. P., McGee M., Cornish B. L., Howie D. W. Peripheral wear of Wagner resurfacing hip arthroplasty acetabular components. J. Arthroplasty, 1991, 6, 103-107.

SAMENVATTING

T. SCHEERLINCK, P.-P. CASTELEYN. „Tripolaire" heupartroplastiek geplaatst wegens falen van een heupresurfacing : negentien jaar follow-up.

Wij beschrijven het geval van een 37 jarige patiënt die, zes maanden na een "ICLH double-cup" resurfacing heupprothese, een subcapitale heupfractuur vertoonde. Omdat de acetabulaire component in polethyleen onbeschadigd en goed gefixeerd was, werd de femorale component vervangen door een standaard steel en een bipolaire kop. De buitenste diameter van de bipolaire kop werd zo gekozen dat hij juist in de acetabulaire resurfacing component paste. Deze "tripolaire" heupartroplastiek heeft gedurende 19 jaren goed gefunctioneerd en werd wegens aspetische loslating van de cup vervangen. De gecementeerde femorale steel die nog goed gefixeerd was, werd niet vervangen.

Alhoewel de „tripolaire" heupartroplastiek in dit geval goede resultaten gaf, zouden we voor een dergelijk probleem met een prothese met metaal-metaal wrijvingskoppel, het gebruik van een aangepaste modulaire kop aanraden.

RÉSUMÉ

T. SCHEERLINCK, P.-P. CASTELEYN. Dix-neuf ans de suivi d'une prothèse de hanche "tripolaire" mise en place suite à la défaillance d'une arthroplastie de resurfaçage.

Les auteurs décrivent le cas d'un patient de 37 ans qui, six mois après la mise en place d'une prothèse de resurfaçage de type ICLH, a présenté une fracture sous-capitale du fémur. Comme la cupule en polyethylène n'était pas endommagée et restait bien fixée, une tige fémorale standard avec une tête bipolaire a été mise en place. Le diamètre extérieur de la tête bipolaire a été choisi pour qu'elle s'adapte parfaitement à la cupule de resurfaçage. Cette prothèse «tripolaire» a bien fonctionné pendant 19 ans avant d'être reprise pour descellement aseptique du cotyle. La tige fémorale cimentée était toujours bien fixée, elle n'a pas nécessité de révision.
Bien que la prothèse «tripolaire» ait bien fonctionné dans le cas décrit, cette solution ne serait pas judicieuse dans le cas d'un couple de friction métal-métal. Dans ce cas il est préférable d'utiliser une tête fémorale modulaire adaptée.