The Practical Limitations of Resurfacing Hip Arthroplasty

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Abstract: Resurfacing hip arthroplasty has recently experienced a resurgence in popularity, associated with an unprecedented amount of coverage in the media. This article assesses what proportion of a consecutive series of young adults presenting for total hip arthroplasty would have been suitable for resurfacing arthroplasty. Retrospective review of the preoperative radiographs was performed, with templating for the resurfacing prostheses. The hips were divided into those appropriate and those inappropriate for the procedure, and those in whom the procedure would be technically challenging. Sixty-one hips in 57 patients were reviewed, with ages ranging from 17 to 49 years. Twenty-eight hips were assessed as suitable, 26 as unsuitable, and 7 as technically challenging. Reasons for unsuitability included collapse and/or cystic degeneration of the femoral head. **Key words:** resurfacing, hip arthroplasty, young, AVN, DDH, templating.

Early attempts at metal-on-metal resurfacing were associated with an unacceptably high incidence of failure [1]. The importance of polar bearing in a metal couple had not been appreciated, and equatorial bearing led to high shear forces at the implant-bone interface. The acetabular component of metal-polyethylene resurfacing devices, such as the ICLH [2,3], the Tharies [4], and the Wagner [5,6], failed catastrophically because of inadequate polyethylene thickness, among other mechanical problems.

The incrimination of polyethylene particle–mediated osteolysis [4,7-10] resulted in a resurgence of interest in the metal-on-metal articulations. The importance of a polar bearing with an optimized equatorial design was recognized. McMinn et al [11] and Amstutz et al [12] have led the development of new metal-on-metal resurfacing devices and have improved the fixation interfaces. After problems with acetabular cementation [13], cementless fixation of the acetabular component and cementation of the femoral shell are currently favored.

The media have enthusiastically presented these new resurfacing arthroplasties as the panacea for the surgical treatment of arthritis, particularly in the younger patient who is keen to resume a fully active lifestyle [14,15]. This has resulted in the surgeon being exposed to considerable pressure from patients specifically requesting a resurfacing procedure. Only recently, however, has peered reviewed literature been published reporting the early results of these devices [16,17].

The objective of this article was to assess the proportion of young patients from a general population presenting for hip arthroplasty in whom resurfacing would be a practicable surgical option. The exponents of the resurfacing technique feel they can offer the procedure to 80% to 85% of their patients younger than 50 years (personal communication). This paper hypothesizes that

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Submitted August 21, 2003; accepted February 20, 2005.
No benefits or funds were received in support of the study.
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0883-5403/06/1906-0004$32.00/0
doi:10.1016/j.arth.2005.04.016

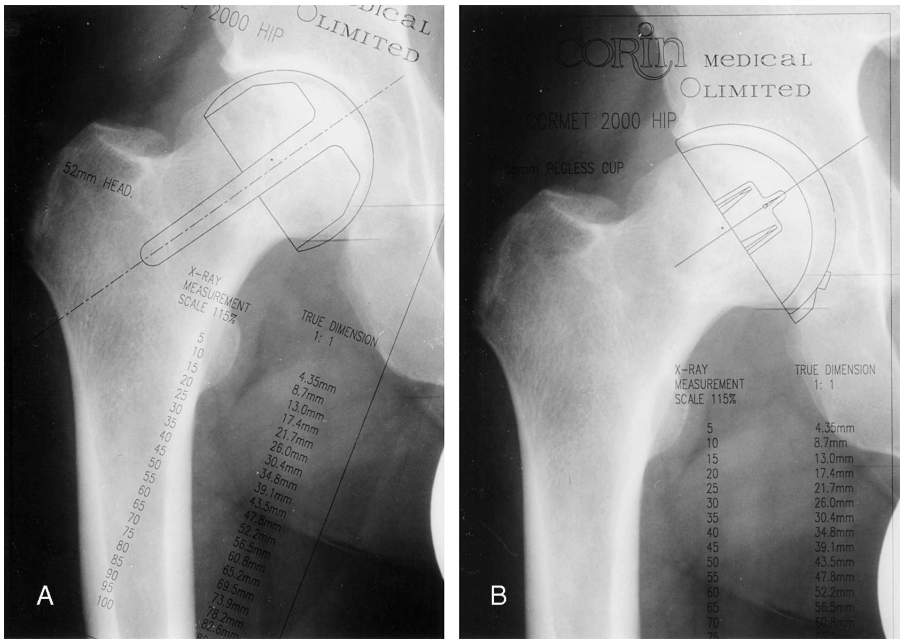

Fig. 1. A, B, Templating to assess suitability for resurfacing.

for a surgeon for whom resurfacing arthroplasty is merely 1 option in a surgical armamentarium, the indications for the procedure are likely to be more limited.

Materials and Methods

The hip arthroplasty practice of the senior author at a tertiary referral center was reviewed from 1995 to 1999. The records and radiographs of all consecutive patients younger than 50 years who had total hip arthroplasties were reviewed retrospectively.

Details regarding age at presentation, age at surgery, diagnosis, difficulties encountered at surgery, and implants used were recorded from the notes. Radiographs were assessed for center-edge angle and percentage subluxation of the femoral head. Templates provided by a resurfacing arthroplasty manufacturer were used to assess whether resurfacing was possible on morphological grounds and, if so, the likely size of components (Fig. 1)A and B.

Table 1.

Primary diagnosis	No. of cases
AVN	15
Perthes	2
DDH	17
OA	13
SUFE	5
Trauma	1
Rheumatoid arthritis	1

The radiographs were then reassessed by a second surgeon. The senior author arbitrated on any equivocal measurements or where there was disagreement between assessors.

In considering the patients suitability for resurfacing, 3 groups were identified. Those clearly suitable for resurfacing, those obviously unsuitable, and those who would present particular technical difficulties and would therefore be likely to have a higher incidence of complications and failure.

Results

Sixty-one hips in 57 patients were reviewed, with ages ranging from 17 to 49 years, mean 35.3 years.

Table 2. Unsuitability for Resurfacing

Reason	Frequency	Notes
Mechanical		
Primary deformity of head	4	Usually in DDH, too severe to be shaped
Collapse (head)	11	ie, AVN
Severe cystic degeneration	7	AVN or OA (confirmed at surgery or on MRI) (Fig. 2)
No functional femoral head	2	Nonunion of # neck (Fig. 3) or previous arthrodesis (Fig. 4)
Functional		
Severely anteverted neck	2	Would require rotational osteotomy to approximate head and cup

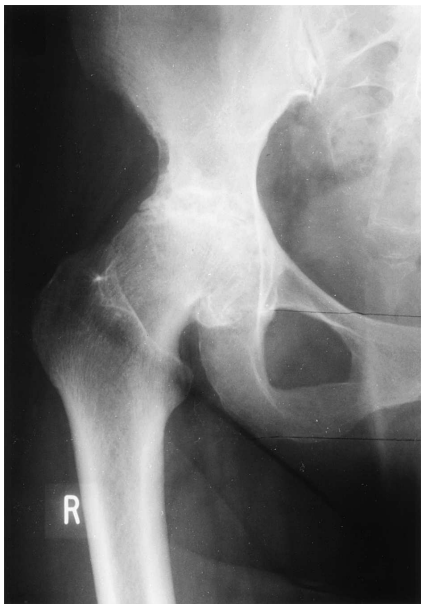

Fig. 2. Radiograph of hip with severe cystic change within the femoral head confirmed at surgery.

Fig. 4. Radiograph of hip showing previous arthrodesis of the joint.

Twenty-eight were women, and 29 were men. Thirty-six left and 25 right hips were presented to the surgeon. Diagnoses were mostly DDH, AVN, or primary osteoarthritis. The distribution is shown in Table 1.

Fifty-eight patients received cementless total hip arthroplasties, whereas in 3, a thrust plate bipolar interpositional hemiarthroplasty was used. No custom prostheses were required, and a variety of component sizes and, importantly, offsets were used.

Twenty-eight hips were deemed suitable for resurfacing; 26 were unsuitable, and 7 may be possible with risk of failure. The reasons for unsuitability are categorized in Table 2. Examples are shown in Figs. 2-4.

Mild to moderate cases of cystic degeneration could be grafted and were included in the suitable or "at-risk" groups. These included cysts less than 1 cm, but not cases where cysts were present in the femoral neck.

Of the 7 at-risk cases, 4 were due to moderate head or neck cystic changes; 2 were due to poor offset risking impingement and dislocation, and 1 due to necrosis, which on magnetic resonance

Fig. 3. Radiograph of hip showing nonunion after fixation of femoral neck fracture.

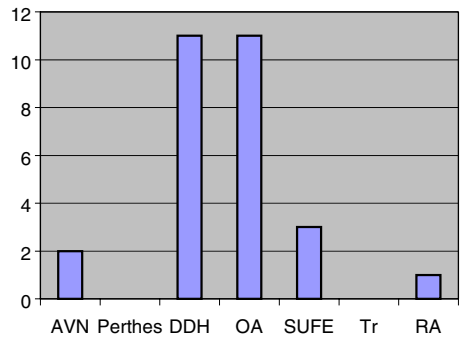

Fig. 5. Suitable Group.

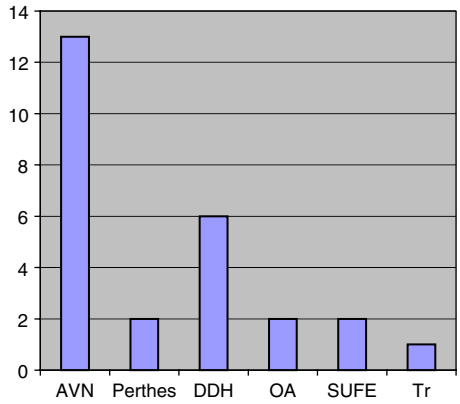

Fig. 6. Unsuitable Group.

imaging (MRI) scan affected around 30% of the head.

The groups had interesting diagnostic profiles, as shown in Figs. 5 and 6. The 2 groups also had differing age profiles as shown in Figs. 7 and 8.

The measurement of center-edge angle produced an average of 28.6° for the suitable group (range, −12°-68°) and averaged 20.25 for the unsuitable group (range, −20°-72°). The percentage femoral head subluxation averaged 10.9% for suitable hips (range, 0% to 41%) and 24.9% (range, 0% to 58%) for the unsuitable. Neither reached significant difference due to the large range and relatively small sample sizes.

Discussion

The many arguments for and against resurfacing arthroplasty have been deliberately avoided. We also avoided the question of longevity because of the development of the Surface Arthroplasty Risk Index as described by Beaule et al [18], which answers this point. Instead, an attempt has been made to assess the initial suitability for resurfacing arthroplasty of a consecutive series of young patients presenting for total hip arthroplasties. The senior author has carried out more than 50 resurfacing arthroplasties and is well versed in the procedure.

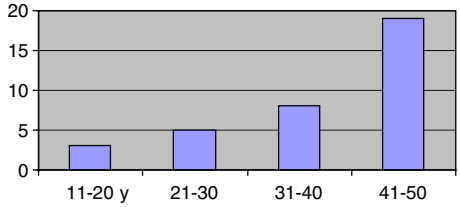

Fig. 7. Suitable.

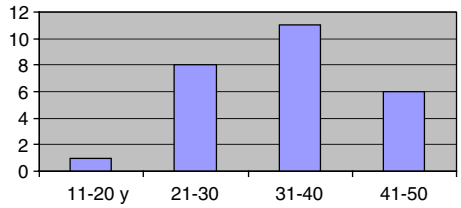

Fig. 8. Unsuitable.

The method of retrospective x-ray analysis could be criticized for its lack of standardization in projection and limb rotation, but all films were taken in the same radiology department over a 5-year period, with no changes to protocol for the anteroposterior pelvis or lateral hip views. In addition, the majority of the patients reviewed had 2 or more films preoperatively, which provided an assessment of orientation and allowed some reproducibility. In many cases where there was doubt as to the degree of deformity or cyst formation, either a perioperative description or detailed MRI images were available for clarification.

The diagnostic groups showed marked differences between the suitable and unsuitable groups. AVN appeared to adversely affect the potential for resurfacing arthroplasty due to collapse or cyst formation. As far as cystic change was concerned, the area immediately within the "collar" area of resurfacing head was assessed on templating. If cysts occupied 25% or less of this region, we propose that bone grafting was reasonable to accommodate resurfacing. If cysts occupied more than 50% of this area, if the cysts were more than 1 cm (as described in the article by Beaule et al [18]), or if they affected the femoral neck outside the confines of the implant (high risk of femoral neck fracture), then the procedure was deemed inappropriate, with total hip arthroplasty being a safer option.

Primary deformity of the head could usually be refashioned adequately with the reamers to allow resurfacing, hence the high proportion of DDH patients in the suitable group. In the unsuitable cases, the bony depth or width of the head was inadequate to allow satisfactory reshaping. It was extremely rare for the acetabular deformity to limit resurfacing. Where there were problems, superior bony defects were the commonest finding (3 cases). All of these could have been addressed with the reconstruction cup with additional horizontal screws allowing structural bone grafting. In 1 case, the defect left less than 10% of the cup uncovered and was deemed not to require the additional structural support.

Postoperative offset was considered in all cases; none of the cases were considered totally unsuitable for this reason alone, and the 2 problem cases encountered were classified as at-risk procedures, with their offset being reduced by an average of 1.4 cm once relocation of the head within the acetabulum was achieved.

The age profiles of the suitable and unsuitable groups differ, with the unsuitable patients being 10 years younger than those considered suitable. This may reflect the greater proportion of those with primary osteoarthritis in the latter group.

The center-edge angle and percentage subluxation failed to reach significantly different values. However, the percentage subluxation of the femoral head (superiorly) in the unsuitable group was twice that of the suitable hips. This can be explained by the increased morphological deterioration and high proportion of AVN in this group.

In summary, 61 consecutive total hip arthroplasties performed by a tertiary referral unit in Bristol in patients younger than 50 years were reviewed. Resurfacing arthroplasty would have been physically possible in 46% and impracticable or impossible in 43%, whereas 11% were felt to be "high-risk" cases. There were distinct differences between the groups in terms of diagnosis and age profile. AVN appears to make resurfacing more difficult, whereas DDH and primary arthritis patients would seem to be more suitable. Although the procedure may provide good functional results in certain patients, it does not appear to be the panacea for all young patients with hip disease as portrayed in the media, and it is important that patients who present with unrealistic expectations are considered and counselled accordingly.

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