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Prosthetic replacement in secondary Girdlestone arthroplasty has an unpredictable outcome

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Abstract The functional outcome of hip replacement following a Girdlestone arthroplasty may be difficult to predict. We reviewed 39 hips in 39 patients with a minimum follow-up of 12 (range 12–208) months from re-implantation total hip arthroplasty. The patients were treated in one institution between 1983 and 2000, and their mean age at conversion was 65 (32–85) years. The main indication for the Girdlestone arthroplasty was peri-prosthetic infection. A post-operative complication occurred in 26 cases and in 17, surgical revisions were performed. The average Harris hip score (HHS) following conversion was 62 (24–93), and only three hips were graded as very good whereas 23 were graded as poor. Microbiological culture, patient age, duration of Girdlestone arthroplasty and the number of preceding surgical procedures did not correlate with the functional outcome after conversion.

Résumé Le résultat fonctionnel après conversion d'une arthroplastie de Girdlestone peut être difficile à prédire. Nous avons examiné 39 hanches chez 39 malades avec un minimum de suivi de 12 mois (gamme 12–208 mois) après réimplantation d'une prothèse totale de la hanche. Les malades ont été traités entre 1983 et 2000 dans une institution et leur âge moyen à la conversion était de 65 ans (32–85 ans). La principale indication pour l'arthroplastie de Girdlestone était une infection périprothétique. Une complication postopératoire s'est produite dans 26 cas et 17 révisions chirurgicales ont dû être faites. Le score moyen de Harris (HHS) après la conversion était de 62 (24–93) et seulement trois hanches ont été notées comme très bonnes

alors que 23 ont été notées comme mauvaises. La culture microbiologique, l'âge du patient, la durée d'arthroplastie de Girdlestone, et le nombre des interventions chirurgicales précédentes n'avait pas de corrélation avec le résultat fonctionnel après conversion.

Introduction

Nowadays, the majority of Girdlestone arthroplasties [10, 11] are secondary procedures, at least in Western countries [1, 4, 5, 19, 20]. They result from failed primary or exchange total hip replacements (THR). Literature on secondary Girdlestone arthroplasties almost invariably reports an unsatisfactory outcome from both the patients' and physicians' perspectives [3, 18, 20].

Previous publications have shed light only on whether a total arthroplasty should be attempted in a Girdlestone hip with a previous infection in terms of recurrence [2, 7, 9, 12, 15, 17]. However, apart from the risk of re-infection after conversion, the extent of restoration of hip function is an important focus of interest. The intention to convert a Girdlestone arthroplasty must be measured against the unpredictable functional outcome [6, 12, 15]. Pre-operatively available patient data might give an indication of post-operative success rates and help in the decision whether or not to attempt conversion. We therefore raised the question of whether patient parameters can predict the functional outcome.

Materials and methods

In this study, 63 patients (63 hips) had THR following secondary Girdlestone arthroplasty. From 1983 to 2000, 72 Girdlestone hips at the first author's institution had undergone conversion. We excluded primary Girdlestone hips ($n=6$) resulting from osteomyelitis and hips with a follow-up of less than 12 months ($n=3$). Hospital records including radiographs were available in the remaining 63 cases. It was not possible to examine 24 patients, as 14 had

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died of an unrelated cause, follow-up was incomplete in six, and four did not want to participate. The remaining 39 patients were clinically and radiologically assessed at an average of 93 (12–208) months after conversion of their Girdlestone arthroplasty.

There were 35 women and 28 men and 33 left and 30 right hips. The Girdlestone arthroplasty resulted from a peri-prosthetic infection in 62 and from a recurrent dislocation in one. Mean patient age at the time of conversion was 65 (32–85) years. Indications for conversion were often multiple: Trendelenburg gait, leg-length discrepancies, non-radicular low-back pain and ipsilateral hip or knee pain. Many patients had functional disabilities such as inability to sit comfortably or to dress independently or were permanently dependent on brace and cane. Conversion was only attempted in those Girdlestone hips where the ESR and CRP were within the normal range.

Implants, surgeons and cementing techniques varied during this 17-year period. The majority of implants were cemented stems from various manufacturers ranging from 150 mm to 300 mm in length. The surgical approach and rehabilitation protocol was standardised. All procedures were performed in the supine position using the antero-lateral approach. Mobilisation with minimal weight bearing started on day one for a period of 6 weeks and was followed by a gradual increase to full weight bearing. Patients routinely received peri-operative intravenous prophylactic antibiotics using second-generation cephalosporin administered within one hour prior to incision and continued for 24–72 h post-operatively.

At follow-up all patients were examined by the same examiner. The Harris Hip Score (HHS) was calculated [14], and antero-posterior and lateral pelvic radiographs obtained. Radiographs were analysed by two examiners on different occasions. Evaluation of hip radiography has been described previously [8, 13] and included parameters to provide an estimate of prosthesis fixation [16]. The end point was defined as the hip score according to Harris. The Wilcoxon–Mann–Whitney *U* test and Spearman's correlation test were applied where appropriate; *p* values <0.05 were considered significant.

Results

The HHS following conversion displayed a wide range, averaging 62 (24–93) points. Results were graded as very good three times, good six times, fair seven times and poor 23 times. No correlation was found between the HHS at follow-up and a number of variables, including length of follow-up, age of patient at primary hip replacement and age of patient at conversion. Nor was the mean duration, 16 (range 1–192) months, of Girdlestone arthroplasty prior to THR related to the HHS at follow-up. The mean hip score in 23 patients in which the Girdlestone arthroplasty prior to the conversion had lasted 10–18 months was 63 (24–90) while it was 68 (37–93) in 11 patients in whom the duration of the Girdlestone arthroplasty was at least 24 months.

The number of total hip replacements prior to the Girdlestone arthroplasty varied and ranged from one to six but did not correlate with the HHS at follow-up. In 53 patients, there was only one THR prior to the Girdlestone arthroplasty, and the mean HHS for these patients was 63 (24–93). Three patients had four or more replacements before conversion: Their mean HHS was 68 (60–74).

Postoperative complications occurred in 26 cases and were delayed soft tissue closure necessitating surgical revision (*n*=17), dislocation of the hip (*n*=5), nerve palsy of the sciatic or femoral nerve (*n*=2), deep venous thrombosis (*n*=2), peri-prosthetic femoral fracture (*n*=1) and heparin-induced thrombocytopenia (*n*=1). There was no correlation between the numbers or type of complications and the HHS at follow up.

Intra-operative cultures were positive for bacterial growth in 31 of the 63 hips at the time of THR removal and Girdlestone operation (Table 1). More than one micro-organism was observed in some of the 31 hips, accounting for a total of 40 positive cultures. *Staphylococcus aureus* was the most common micro-organism. The HHS at follow-up was not significantly influenced by the presence of a positive bacterial culture.

Following conversion of the Girdlestone arthroplasty, further surgical revision was found necessary in 17 cases, of which 12 required just one revision while five required two. One revision was performed for recurrent hip dislocation while the remaining revisions were soft tissue debridement and lavage for wound drainage or suspicion of deep infection. At follow-up, there was no difference in the HHS between patients with and without further surgical revision (61 versus 63). Among the 17 revised hips, eight had had previous positive cultures for bacterial growth at the time of the Girdlestone arthroplasty. The necessity for surgical revisions did not correlate with a previously positive bacterial culture of either Gram positive or negative organisms in the Girdlestone hip. All hips in

Table 1 Micro-organisms found in 31 of 63 hips at the time of Girdlestone arthroplasty

Micro-organisms cultured from hips at the time of conversion	Number of positive cultures (<i>n</i> =40)
<i>Staphylococcus aureus</i>	9
<i>Staphylococcus epidermidis</i>	5
<i>Enterococcus</i>	5
<i>Staphylococcus saprophyticus</i>	4
<i>Pseudomonas</i>	4
<i>Propionibacterium</i>	2
<i>Proteus mirabilis</i>	2
MRSA	2
<i>Peptostreptococcus</i> species	1
<i>Candida albicans</i>	1
<i>Klebsiella</i>	1
<i>Streptococcus viridans</i>	1
<i>Serratia marcescens</i>	1
<i>Actinobacter baumannii</i>	1
<i>Streptococcus</i> type B	1

which a MRSA-positive culture was found required two revisions following the conversion. Statistically, there was, however, no difference between hips with a positive MRSA culture and hips with a positive culture for other micro-organisms.

Radiographic loosening was seen in seven patients (seven stems and three sockets). Progressive osteolysis was seen around five stems, of which two also had progressive radiolucency at the cement–bone interface. In two cases, stem migration was observed: one associated with radiolucency and one with osteolysis. Three cups had progressive radiolucency at the cement–bone interface, of which one showed peri-acetabular osteolysis. No prosthetic components were exchanged.

Discussion

Literature on THR conversion of Girdlestone arthroplasty is sparse and almost uniformly relates to the problem of recurrence of infection. There have been previous studies on the prognosis of THR in terms of sepsis in relation to the type of prior procedure, i.e. hemi- or total arthroplasty. The relevance of the nature of the organism for the recurrence of infection and the possibility that recurrence rates were higher following a haematogenous infection has also been considered. It is possible that as recurrence of infection is the major threat, the functional outcome and parameters influencing function after conversion has been more or less neglected. Our aim was to assess the function of THR in former Girdlestone hips. The studied population lacked homogeneity, and there was a dropout of 24 patients. There is little information on pre-operative functional status, partly due to the fact that this study was retrospective.

The HHS averaged 62 points in our patients with THR following Girdlestone arthroplasty. In contrast, the HHS averaged 38 points in 32 patients treated with secondary Girdlestone arthroplasty at our institution during the same 17-year period [20]. Others have found function in 32 patients with Girdlestone arthroplasty and in 16 patients with THR following Girdlestone arthroplasty only marginally different, with an HHS of 58 compared with 62 points [21]. Another source reported on 13 conversions 2–10 years following Girdlestone arthroplasty, resulting in seven satisfied patients while six complained of continuing pain, weakness and limited flexibility [22]. In another series, functional results following conversion in 44 patients were superior to ours, with HHS averaging 78 points [6]. Apart from a lower patient age, a shorter follow-up and a considerably shorter interval from removal of prosthesis to conversion, these series also differ in the number of revisions. Although there were 33% complications related to the hip, of which 11% were dislocations, only three hips were surgically revised. One hip was revised for haematoma, one for recurrent dislocation and one hip six times for infection, dislocation and prosthesis fracture [6]. In our study, surgical revision was performed far more frequently,

with 16 patients requiring soft tissue revision. This may be one reason for our inferior functional results.

The reason for the more frequent soft tissue debridement in our study possibly relates to the fact that the causal micro-organisms were only known in 49% of cases. Charlton et al. [6] identified 86% of causal organisms in Girdlestone hips, which may have allowed for a more effective antibiotic regimen. The distribution of isolated micro-organisms was similar in both series and was predominantly by *S. epidermidis* and *aureus*.

We hypothesised that patients with a shorter duration of Girdlestone arthroplasty would do better compared to those with a longer duration. Our finding did not support this contention. In a study of 16 patients with conversion arthroplasty, Schroeder et al. [21] suggested that 12 months would be the optimal interval between removal and conversion, however it remains unclear on what basis this conclusion is drawn.

The number of preceding surgical hip procedures did not correlate to the functional outcome after conversion. Our patients had up to six surgical hip procedures, including the Girdlestone procedure, prior to the conversion. However, the hip scores were no better in patients with few procedures compared with those with many.

Conversion of Girdlestone hips in our series mostly resulted in poor to fair hip function as evaluated with standardised hip scoring systems. We conclude that bacterial culture, patient age, duration of the Girdlestone arthroplasty and the number of previous surgical procedures did not help to predict the functional outcome after conversion of the Girdlestone arthroplasty.

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