Girdlestone resection arthroplasty of the hip: Current perspectives


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Summary Modern technological advancements in revision hip arthroplasty have revolutionised the treatment of failed primary total hip replacements. The decision to perform a Girdlestone operation is taken as a last resort, particularly for medically sub-optimal and functionally compromised patients, who have a high anaesthetic and operative risk at one-stage and two-stage reimplantations. Girdlestone resection arthroplasty should be considered as a salvage procedure, primarily aimed at pain relief and infection control. Such patients must be warned to expect 2–3 in of limb shortening and reliance upon a walking aid postoperatively.

Introduction

With an increase in life expectancy, the number of patients with primarily replaced and revised hips is increasing dramatically. Although, revision total hip arthroplasty has revolutionised the treatment of failed primary total hip replacements, medically sub-optimal and functionally compromised patients, who have a high anaesthetic and operative risk, may not be suitable for any further major interventions, especially one-stage and two-stage reimplantations. In such cases, Girdlestone resection arthroplasty (i.e. removal of prosthesis and/or cement) is considered to be an acceptable salvage option.

There are several retrospective studies published on long-term outcome of this salvage procedure, mainly infected total hip arthroplasty with variably reported results.1–10 The indication for the Girdlestone operation has now become a salvage procedure. This article is an overview of Girdlestone resection arthroplasty of the hip with special regard to indications, patient selection, surgical technique, mortality and morbidity characteristics, outcome analysis and prognostic factors influencing outcome.

Historical perspectives

The first report of resection arthroplasty (removal of the head and the neck of femur) as a treatment for septic arthritis of the hip was published by White in 1849.11 In 1928, Gathorne Robert Girdlestone

In 1945, Batchelor recommended dividing the femoral neck distally, flush with the lesser trochanter, to achieve smooth surfaces. He observed that irregular osseous spurs or prominences might cause considerable pain with motion. He also advocated performing an abduction osteotomy in conjunction with the resection of the femoral head and neck to improve stability. The modern Girdlestone procedure predominantly consists of removal of the prosthesis and/or cement following septic and aseptic loosening of total hip arthroplasty or hemi-prosthesis.

Types of girdlestone resection arthroplasty

The Girdlestone procedure can be described into two main categories:

Primary

Performed for primary hip disorders like septic hip, tuberculous hip, and rarely for osteoarthritis and rheumatoid arthritis.

Secondary or modified

Used for failed hip replacements or failed construction after hip trauma (Figs. 1 and 2). For all practical purposes, any Girdlestone procedure performed nowadays can be considered as a secondary or modified Girdlestone procedure.

Why resection, why not revision?

The modern Girdlestone operation involves the removal of the prosthesis and/or cement following septic or aseptic loosening of a total hip prosthesis, hemi-prosthesis or a failed osteosynthesis. It has proved to be an effective salvage procedure, for controlling pain and infection. With the advancements in revision hip technique and technology, Girdlestone resection arthroplasty is rarely indicated as a primary procedure. It is a salvage procedure, and it should not be considered as an alternative to one- or two-stage reimplantations. Indications include infective and aseptic loosening of total or hemi-arthroplasties, recurrent dislocations and un-united operated femoral neck fractures.

Girdlestone pseudarthrosis may also be considered as the first stage of a two-stage revision. The decision to perform a resection arthroplasty without reimplantation of a second prosthesis is based upon multiple factors. Important considerations include infection with multiple organisms or bacteria resistant to antibiotic therapy, poor quality

Figure 1 Early Girdlestone for septic total hip arthroplasty.
local soft tissues, unacceptable complexity of the reconstruction, refusal by the patient to have another operation after removal of the implant, and patients with systemic disease, poor overall health, inadequate bone stock or combinations of these factors.\textsuperscript{12,13} The problem of repeated operations, prolonged morbidity, intercurrent illnesses and repeated invasive investigations after an infected prosthesis leads to depression and dissatisfaction. Table 1 therefore summarises the circumstances when resection may be the appropriate option.

### Surgical technique of girdlestone procedure

A standing anteroposterior radiograph of the pelvis should be taken to plan the resection. The role of preoperative traction is debatable. A direct lateral or posterior approach through the previous scar should include the excision of any sinus or scar. Iliopsoas tenotomy and/or adductor tenotomy may be required. Femoral preparation comprises removal of the prosthesis (with or without trochanteric osteotomy), removal of cement and smoothing of the transected femoral surface. Utmost care should be observed to prevent femoral shaft fractures intraoperatively. Tissue specimens should be sent for both bacteriology and histology. Acetabular preparation consists of the removal of the prosthesis and cement. Primary wound closure is preferred even in infected cases.\textsuperscript{14} Intra- and immediate postoperative blood loss may vary from 1 to 5 l.

### Radiographic classification

Grauer et al.\textsuperscript{11} described four possible levels of proximal femoral resection:

- **Type I**—a substantial portion (> 1.5 cm) of the femoral neck remains, usually performed for failed resurfacings,
- **Type II**—a small portion of the femoral neck remains (1.5 cm or less),
- **Type III**—intertrochanteric resection,
- **Type IV**—sub-trochanteric resection.

The obvious clinical implication of this classification is that the more proximal the resection, the better is the overall function, walking and activity of the patient. Contrary to this observation, no correlation could be found between the radiological appearances and the quality of the result in some studies.\textsuperscript{15,16}

### Overall outcome

Girdlestone arthroplasty patients cannot be assessed with the usual parameters routinely applied for hip evaluation.\textsuperscript{3} The functional outcome in previous studies on Girdlestone arthroplasty is illustrated in Table 2. The reported results of Girdlestone arthroplasty are not uniform. Satisfactory results have been reported by Campbell et al.,\textsuperscript{19} Mallory,\textsuperscript{21} Ahlgren et al.,\textsuperscript{17} Grauer et al.,\textsuperscript{11} Bohler and Salzer\textsuperscript{18} and Castellanos

### Table 1  Indications for resection.

<table>
<thead>
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<th>Indications</th>
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<td>Infection with multiple organisms or bacteria resistant to antibiotic therapy</td>
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<td>Poor quality local soft tissues</td>
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<td>Unacceptable complexity of any possible reconstruction</td>
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<td>Refusal by the patient to have another operation after removal of the implant</td>
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<tr>
<td>Patients with systemic disease or poor overall health</td>
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<td>Inadequate bone stock</td>
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<td>Or combinations of these factors</td>
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et al., 20 while poor outcomes were recorded Clegg, 1 Petty and Goldsmith, 5 Bittar and Petty, 22 McElwaine and Colville 4 and Esenwein et al. 2 In Table 3, the favourable outcome determinants with Girdlestone resection arthroplasty have been listed.

**Mortality analysis**

Intra- or postoperative mortality is reported to be between 7% and 62% following Girdlestone operation for infected total hip replacements. 20 A higher postoperative mortality follows the Girdlestone procedure for failed hip fractures than after revision for failed arthroplasty. 23

**Morbidity analysis**

Complications include infection with persistent discharging sinuses and fistulae, haemorrhage and hypovolaemia, proximal femoral fracture, traction-related problems (pin-site infection, common peroneal nerve compression, joint stiffness, contractures), the effects of immobilisation (decubitus ulcers, urinary infection, chest infection, disuse osteoporosis, muscle wasting), persistent pain, thrombo-embolism, psychological disturbances (depression, psychosis, suicidal tendency), a Trendelenburg gait and generalised fatigue.

**Age, sex, side and body mass index**

Younger patients have higher functional demands and expectation so they are likely to be dissatisfied.
with the operation. The results are reported to be significantly poorer in women, particularly older ones as reported by Grauer et al. The patients were satisfied with the operation in unilateral cases as a secondary operation, but it was generally unsatisfactory as a primary procedure or when performed bilaterally. Grauer et al. also observed that body weight, height and body habitus pose no statistically significant influence on pain, walking or function.

Pain relief

The primary goal of the Girdlestone procedure is pain relief. Adequate pain relief was observed in 60% (Scalvi et al.), 77% (Ballard et al.), 80% (Parr et al.), 83% (Castellanos), 91% (Bourne et al.) and 89% (Sharma et al.).

Infection control

Control of infection has been reported in 73–100% cases postoperatively following the Girdlestone operation. Sharma et al. achieved 100% infection control in the surviving patients, similar to Mallory and Ahlgren et al. Infection control was achieved in the majority of the studies (83%—Parr et al.; 86%—Castellanos; 97%—Bourne et al.).

Castellanos et al. found no correlation between the type of organisms and the persistence of infection, although, Kantor et al. identified worse functional results in patients with chronic drainage. Clegg advocated a complete removal of all the cement in order to achieve an eradication of infection. Practically, it can be quite difficult to get rid of all cement remnants. We agree with the views of Petty and Goldsmith, Ahlgren et al., Bourne et al. that small amounts of retained cement do not seem to influence wound healing after resection arthroplasty.

Leg length discrepancy and need for walking aids

Most of the studies reported limb shortening of approximately 4–6 cm. The degree of shortening is often dependent on the amount of bone lost from the proximal femur and the quality of the scar tissues at the time of surgery. Associated gluteus medius insufficiency magnifies the need for walking aids. McElwaine and Colville noted that calipers were found to be unacceptable in the majority of patients. Grauer et al. reported a positive correlation between shortening and level of resection, patients with less shortening walking

Figure 3 Septic failure of revision total hip arthroplasty with recurrent dislocation is a common indication for Girdlestone procedure.
better, although the difference was not statistically 
significant.
Electromyocinesigraphic examination performed in Girdlestone patients in order to study the automatic function of the muscles with patients standing and walking confirmed that there was no innervation of the hip abductors but high activity in the rectus femoris during standing. The contralateral abductor group and the trunk muscles were hyperactive during standing and walking.

Overall satisfaction

Subjective satisfaction varies between 14% and 100%. in the reported series. It is hard to attach much credibility to this overall measurement in view of this major discrepancy in reported results.

Failed total hip replacements versus failed hip fractures

The mortality was higher in the failed fracture group (68%) in comparison to those with failed arthroplasty (48%) (Figs. 6 and 7).

Delayed reimplantation following girdlestone arthroplasty

Rittmeister et al. reported greater patient satisfaction and better function if Girdlestone hips were converted to a hip arthroplasty rather than being left with the excisional procedure. The incidence of postoperative complications and revisions were similar for both groups. Charlton et al. in retrospective study showed a high rate of dislocation (11.4%) and persistent limp (39%) following delayed conversion. A high dislocation rate following conversion of the Girdlestone procedure to secondary total hip arthroplasty relates to soft tissue contracture, limb length discrepancy, deficient bone stock and malpositioning of the components. A constrained acetabular component should be considered to reduce the dislocation rate.

Schroder et al. followed two groups of patients: 32 patients had a long-standing pseudarthrosis; in the other group of 16 patients, a total hip replacement was reimplanted at an average of 3 years after a pseudarthrosis. The improvement in

Figure 4 Pre-Girdlestone radiograph showing aseptic recurrent dislocation of total hip arthroplasty.

Figure 5 Post-Girdlestone radiograph of the same patient. Note that stable components, cement and circlage wires could be left alone in these relatively high anaesthetic risk patients.
hip function after the reimplantation was marginal and the results were comparable to a well-functioning pseudarthrosis. Personal satisfaction and the activities of daily living were marginally better in the reimplantation group, (Harris hip score 64 compared to 58 in those with a pseudarthrosis). Brandt et al. stated that prosthesis removal and delayed reimplantation arthroplasty is an effective treatment to limit the recurrence of Staphylococcus aureus prosthetic joint infection, provided there is no evidence of infection at the time of reimplantation arthroplasty.

Conclusions

Various studies have confirmed that the Girdlestone procedure is very effective in achieving its primary goals of infection control and pain relief for irreversibly failed total hip joints and to salvage failed operated hip trauma. A high mortality and a poor functional outcome could be attributed to a higher age group, poor general health and highly selected group of patients, who were unfit for reimplantation surgery. Patients who have had resection arthroplasty following failed operated hip trauma do considerably worse than after failed total hip arthroplasty. There is no significant difference between the long-term outcomes of Girdlestone procedures performed at a District General Hospital compared to a University Teaching Hospital.

The decision to perform a Girdlestone operation is mostly taken as a last resort, as all the suitable candidates are filtered off for revision surgery, before reaching the stage of this salvage operation. The decision between revision and resection should not be taken lightly and it should not be considered as an alternative to one-stage or two-stage reimplantations. Such patients must be warned to expect 2–3 in of limb shortening and reliance upon a walking aid postoperatively. This operation can be made acceptable by proper explanation to the patient with realistic expectations.

Practice points

- The primary goals of the Girdlestone operation are pain relief with infection control. It
is a salvage procedure, and should not be considered as an alternative to one-stage or two-stage reimplantations

- A high mortality is observed in the literature with such groups of patients which can be attributed to higher age group, poor general health and highly selected group of patients, who are unfit for reimplantation surgery
- Patients must be warned to expect 2–3 in of limb shortening and invariable assisted mobility postoperatively

Research directions

- Future studies with larger number of patients utilising results from multiple centres may reveal more meaningful results with primary pathology stratification
- Need for a separate questionnaire for assessing Girdlestone patients
- To compare the long-term outcome of patients with septic retained implants with those treated by excisional arthroplasty
- To assess the role of Girdlestone resection arthroplasty for MRSA (Meticillin Resistant Staphylococcus Aureus) infected hips

References