Total hip replacement for elderly neck of femur fracture patients

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Abstract

In keeping with recently published national guidelines, the use of total hip replacement for treating displaced intracapsular hip fractures in elderly patients has significantly increased. This is based on the principle that it provides improved functional outcomes when compared to hemiarthroplasty. Whilst recent published evidence supports this hypothesis, there are concerns regarding higher dislocation rates, cost-effectiveness and difficulties with service provision. The aim of this review is to discuss the benefits of total hip replacement surgery over hemiarthroplasty and to explore patient selection criteria. A review of surgical techniques and difficulties specific to this patient cohort will also be presented. We hope to provide the reader with an up-to-date summary of total hip replacement surgery for hip fractures in elderly patients in order to help decision making, minimize complications and guide further research.

Keywords arthroplasty; hip fracture; intracapsular; total hip replacement

Introduction

Intracapsular femoral neck fractures in the elderly are amongst the commonest injuries that present to orthopaedic trauma units and their incidence is expected to rise with an increasingly ageing population. Approximately 70,000 hip fractures occur each year across England, Wales and Northern Ireland and demographic projections estimate this number will increase to 100,000 by 2020.[1,2] The subsequent cost to the National Health Service (NHS) currently amounts to approximately £2 billion a year and this huge financial burden is also expected to escalate with time.[3] Approximately half of hip fractures in elderly patients are intracapsular and two-thirds are displaced.[1] Intracapsular fractures in younger patients are usually treated with timely reduction and internal fixation but in the elderly population, bone quality is poor and fracture healing can be impaired. Cognitive impairment in this patient group is also common and therefore compliance with postoperative protected weight-bearing for fracture fixation is challenging. For these reasons, arthroplasty surgery is normally the procedure of choice.

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Hemiarthroplasty is used in the majority of patients and it remains the most widely used implant in individuals with low functional demands. However, as many older patients are now enjoying more active lifestyles, their functional requirements from surgery are much greater. For this reason, total hip replacement (THR) surgery has become a more attractive option. The UK National Joint Registry (NJR) reports a steady increase in the proportion of THR surgery performed for hip fractures from 1% to 3.9% between 2003 and 2014.[4] There is also a growing body of evidence that suggests improved levels of function from THR supporting this observed trend in clinical practice. However, concerns exist with THR surgery regarding longer operating times, greater physiological insult, and increased implant costs.[5] In addition, there are increased dislocation rates compared with hemiarthroplasty and elective THR surgery and therefore, questions remain unanswered regarding the suitability of THR in this patient group.[6]

The purpose of this article is to review patient selection guidelines, surgical technique, implant selection, clinical outcomes and complications of THR for femoral neck fractures. Organizational challenges regarding the delivery of THR surgery in the trauma setting will also be addressed.

Hemiarthroplasty

The hemiarthroplasty was initially developed to treat degenerative joint disease but due to high rates of implant migration, femoral osteolysis and revision surgery it was abandoned in favour of THR.[7] The initial designs incorporated a host of femoral bearing surfaces including rubber, ivory and acrylic but it was Austin T. Moore who performed the first metal head hemiarthroplasty in 1940 for a pathological femoral neck fracture following recurrence of a giant cell tumour.[8] This press-fit straight-stemmed implant was later refined to include two fenestrations to allow bone ingrowth. In 1950, Frederick R. Thompson developed an uncemented metal hemiarthroplasty with a curved femoral stem and following the advent of bone cement, a smaller stem design was introduced to allow cemented fixation.[9] Both these implants gained widespread popularity and up until recently, had been the standard of care for most elderly patients with intracapsular fractures. However, due to problems with thigh pain, implant loosening, intraoperative periprosthetic fractures and difficulty instrumenting narrow femoral canals, modern stem designs have been implemented such as polished taper-slip cemented stems.

An important concern with monoblock hemiarthroplasty is acetabular cartilage erosion that may subsequently require revision to THR. Dalldorf et al. performed histological analysis of acetabular cartilage from twelve elderly patients undergoing revision of hemiarthroplasty and found considerable degeneration compared with an age-matched control population.[10] The severity of degeneration correlated with time since implantation and complete loss of cartilage was observed in all patients in whom the implant had been in place for more than five years. Bipolar implants have a dual articulation design and were developed in an attempt to reduce shear forces between the femoral head and native acetabulum. An additional theoretical benefit is increased stability due to a greater range of motion prior to neck-rim impingement. However, compared to less

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expensive unipolar implants, there is little evidence to support their use with respect to function, dislocation rates, complications, reoperations or acetabular erosion at 1 year.[11] In a prospective study of 61 patients over 2 years, Moon et al. showed that bipolar hemiarthroplasties correlated with a mean acetabular cartilage linear wear rate of 0.23 mm per year, and a mean volumetric wear of 114 mm^3 per year.[12] They also observed that the rate of degeneration was higher in more active individuals.

Pre-existing degenerative acetabular disease is also associated with increased rates of acetabular erosion following hemiarthroplasty and therefore, these patients may be better suited to THR. Examples include osteoarthritis and rheumatoid arthritis in which THR has been shown to be functionally superior to internal fixation.[13] However, the presence of incidental radiographic arthritis has recently been questioned as a predictor of poor outcome with hemiarthroplasty. Boese reported on 126 elderly patients undergoing hemiarthroplasty and observed no difference in function, complications or reoperations at 1 year in those with Kellgren–Lawrence grades 0–2 compared to those with grades 3–4 osteoarthritis.[14] Therefore, only symptomatic pre-existing hip disease should be considered an appropriate indication for THR.

Total hip replacement

Elective total hip replacement surgery is a highly successful operation for improving the quality of life in patients with arthritis and there is growing evidence that THR for displaced intracapsular hip fractures (Figure 1A and 1B) in selected elderly patients provides superior functional results compared to both internal fixation and hemiarthroplasty.[15]

Modern studies report excellent functional outcomes and low reoperation rates with up to 90% of patients returning to their pre-injury activity levels following THR.[16] A meta-analysis performed by Parker and Gurusamy confirmed that arthroplasty (both hemiarthroplasty and THR) resulted in less pain and fewer reoperations compared to internal fixation.[12] Keating et al. compared THR to both internal fixation and bipolar hemiarthroplasty in a series of 207 elderly patients and reported the highest functional levels following THR at two years.[17] Chammout et al. compared the long-term outcomes of THR to internal fixation and reported greater function and fewer reoperations with THR and observed 91% implant survivorship at 17 years.[18] Compared to revision THR for failed internal fixation, primary THR for hip fractures has been shown to provide better function, fewer complications and lower reoperation rates.[19]

Numerous randomized controlled trials have been performed comparing THR to hemiarthroplasty. Macaulay et al. reported on 41 previously independent patients aged over 50 years and allowed surgeons to use their preferred surgical approach, method of implant fixation, and type of hemiarthroplasty (unipolar or bipolar) but stipulated that all THR procedures utilize a minimum head size of 28 mm.[20] Their results indicated better hip function and quality of life with THR at two years with no significant differences in mortality or complications. Hedbeck et al. compared bipolar hemiarthroplasty to THR in 120 elderly patients and again, reported improved hip function and quality of life in the THR group.[21] Avery et al. compared unipolar hemiarthroplasty to THR in 81 patients and showed greater function, reduced mortality and lower revision rates in the THR group at nine years.[22]

Several evidence-based studies have confirmed similar findings to those published in individual reports. Hopley et al. reported the pooled results of 15 studies comprising a total of 1890 patients in an extensive systematic review.[23] They found that THR provided significantly higher function and lower reoperation rates than hemiarthroplasty with no difference in one-year mortality. More recently, Burgers et al. performed a meta-analysis of eight randomized controlled trials involving a total of 986 patients.[24] Whilst the authors reported that the overall quality of studies was generally very low, their data analysis revealed better hip function, relief of pain, and quality of life scores with THR. The rate of dislocation was significantly higher in the THR group (9% vs 3%) but no significant differences were found regarding other complications or one-year mortality. There was also a non-significant trend towards higher revision surgery in the hemiarthroplasty group (7% vs 4%). Finally, Carroll et al. investigated cost-effectiveness of THR compared to hemiarthroplasty and concluded that despite being a more costly procedure, THR is likely to offer a more cost-effective long-term solution than hemiarthroplasty when considering quality of life scores, quality-adjusted life-years and mortality rates.[25]

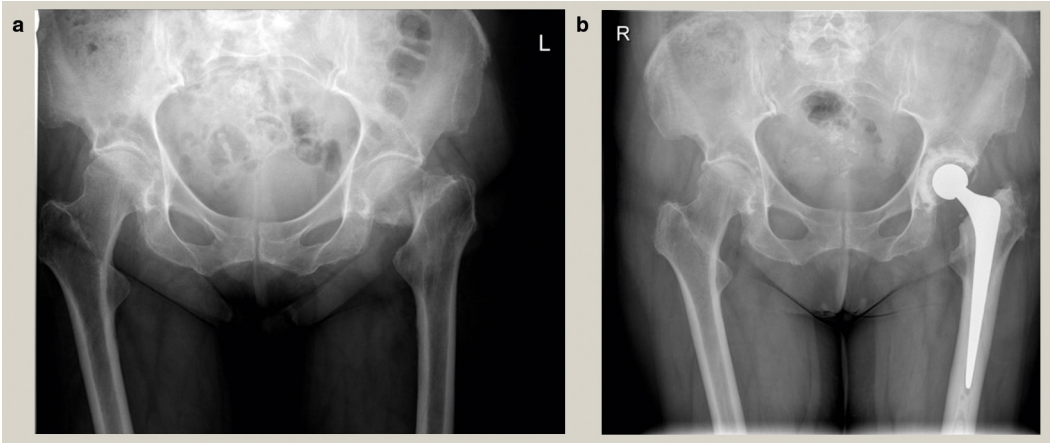

Figure 1 (**a**) Displaced left intracapsular femoral neck fracture. (**b**) Cemented left total hip replacement.

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