Hemiarthroplasty compared with total hip arthroplasty in fractured neck of femur: a shift in national practice?

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ABSTRACT

INTRODUCTION The aim of this study was to determine the trends in national practice regarding total hip arthroplasty compared with hemiarthroplasty in fractured neck of femur between 2010 and 2016.

MATERIALS AND METHODS A retrospective review was conducted of NHS Digital data (England) between 2010 and 2016. 'Emergency' neck of femur fracture admissions, hemiarthroplasties and total hip arthroplasties were included. Elective total hip arthroplasties, revisions and prostheses relocations were excluded. Annual percentages for each operation were calculated. Trends were tabulated and displayed graphically for analysis.

RESULTS The total number of emergency neck of femur diagnoses was 257,789. Total hip arthroplasty was performed in 2217, 2737, 3305, 3686, 3670 and 3825 patients and hemiarthroplasty was performed in 21,335, 21,744, 21,115, 21,798, 21,804 and 22,163 patients for each year between 2011 and 2016, respectively. The rate of change for total hip arthroplasty slowed from 24.54% increase/year (2011–2013) to 5.24% increase/year (2013–2016). Uncemented arthroplasties decreased over the same time period.

DISCUSSION Increasing numbers of total hip arthroplasties are conducted for hip fractures; however, this trend has slowed since 2013. Possible explanations include all eligible fractures being treated with total hip arthroplasty, trauma surgeon preference for hemiarthroplasty due to lower surgical specialism or publication of individual surgeon data (National Joint Registry) which may lead to surgeons favouring hemiarthroplasties which have a lower complication rate compared to elective total hip arthroplasties.

KEYWORDS

Hemiarthroplasty – Total hip arthroplasty – Neck of femur fracture

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Introduction

The incidence of hip fractures in the elderly population is increasing in the UK.¹ The reasons for this are multifactorial, including a growing and ageing population with increasing age-related comorbidities such as osteoporosis, associated fragility fractures and fractures due to low-energy trauma.^{2,5} In recent years, progress has been made in optimising the management of neck of femur fractures in elderly patients. This includes the introduction of specialist geriatric services, national guidelines from the National Institute of Health and Care Excellence (NICE) and increased support by allied health professionals.⁴

There is a continuing debate regarding the best practice management of patients with intracapsular displaced neck of femur fractures. The operative options include internal fixation, hemiarthroplasty or total hip arthroplasty (THA). Internal fixation is usually reserved for younger patients

where preserving the patient's femoral head is favourable. Occasionally, internal fixation is also considered for completely non-displaced intracapsular fractures in medically fit elderly patients. However, intracapsular hip fractures are usually managed with either hemiarthroplasty or THA.^{5–7} There remains a debate surrounding replacement of a healthy acetabulum and whether this provides a superior outcome. Factors that must be considered include patient comorbidities (including osteoarthritis), pre-morbid functional status and mental status. The aim of surgery is to restore the patient to full weight bearing and to avoid complications related to a prolonged period of immobility. NICE recommends THA in patients who are able to walk independently outdoors with no more than the use of a stick, are not cognitively impaired and are medically fit for anaesthesia (defined as an American Society of Anesthesiologists (ASA), grade lower than 3) and the procedure itself.⁴ The evidence suggests that patients who undergo primary

THA in place of hemiarthroplasty have better mobility and health-related quality of life (Harris hip scores) and lower reoperation rates.^{8–10} This must be counterbalanced with the higher risk of dislocation and complications associated with a larger operation.¹¹ Additionally, the NICE guidelines recommend cemented implants in patients undergoing arthroplasty.⁴

A clear distinction must be made between the different indications for THA. In non-trauma settings, THA is the elective operation of choice for treating severe osteoarthritis and inflammatory arthritis of the hip.¹² Patients who undergo elective THA can benefit from extensive preoperative planning and medical optimisation. Conversely, patients with a fractured neck of femur may have unoptimised medical comorbidities and distorted anatomy secondary to the fracture. This means that, in general, the patients operated upon due to trauma are at higher risk for perioperative morbidity and mortality compared with the elective cohort.¹³

Our hypothesis is that the release of National Joint Registry (NJR) individual surgeon's outcome data to the public in 2013 may have caused a shift in practice towards performing hemiarthroplasty on a national scale. The NJR's mandate is to collect data on joint replacements to provide an early warning system for patient safety and report outcomes on a national level. Data recorded include the type of implants used and the 90-day mortality. Hemiarthroplasty data are not recorded nor reported.

Materials and methods

Study type

National data from NHS Digital (formerly the Health and Social Care Information Centre) were sourced for this retrospective observational study. These data are freely available through the national websites for NHS Digital.^{14–19} NHS Digital is a national provider of information and data used by clinicians, analysts and commissioners in the UK. It is an executive non-departmental public body funded by the Department of Health. Data made available include the Hospital Events Statistics (HES) for all hospital admissions in England. HES data report details for all admissions to NHS hospitals in England since 1990. The data are collected during each patient's admission to hospital and submitted in order for the hospital to be paid for the care they provide. Data are published annually and cover each financial year.

Patient selection

This study included all patient events in England between 1 April 2010 and 31 March 2016 where a fractured neck of femur (HES code S72.0) resulting in an 'emergency admission' occurred. Subsequently, all patients who underwent emergency primary total prosthetic replacement of the hip joint (THA; HES codes W37.1, W38.1 and W39.1) and emergency primary prosthetic replacement of head of femur

(hemiarthroplasty; HES codes W46.1, W47.1 and W48.1) were collected. Patients who underwent conversions, revisions or closed reductions of dislocated prostheses were excluded. Patients who had an elective THA were excluded.

Analysis

The total number of events coded as neck of femur fractures for 2010–2011 (group A), 2011–2012 (group B), 2012–2013 (group C), 2013–2014 (group D), 2014–2015 (group E) and 2015–2016 (group F) were recorded. The aggregate number of THA codes and the aggregate number of hemiarthroplasty codes were then calculated. Each operation type was then compared to the number of emergency hip fracture operations in each respective year. This was then graphically displayed to view national trends in management.

Patient involvement

Compliance with NICE guidelines for hip fracture management is an important patient-centred outcome measure. This study provides a retrospective observational analysis of hip fracture management trends from published NHS Digital data. Therefore, there has been no direct patient involvement in the design, recruitment or conduct of the study.

Results

Neck of femur fractures

Analysis of NHS Digital data from groups A–F shows the total number of emergency neck of femur diagnoses to be 42,616, 42,432, 42,340, 44,245, 43,662 and 42,492, respectively. This equated to a total of 257,787 emergency neck of femur diagnoses.

Total hip replacement

Cemented THAs occurred in 1411, 1810, 2237, 2578, 2644 and 2771 patients; uncemented THAs were conducted in 656, 753, 883, 970, 914 and 927 patients and THAs where the modality of stem and cup fixation was not coded occurred in 150, 174, 185, 138, 112 and 127 operations for groups A–F, respectively. As an aggregate, the total number of THAs in emergency hip fracture admissions was 2217, 2737, 3305, 3686, 3670 and 3825 for groups A–F, respectively. Therefore, between 2010 and 2016, a total of 19,440 THAs were conducted.

Hemiarthroplasty

Hemiarthroplasties with cemented stems occurred in 13,886, 15,608, 16,015, 17,508, 18,030 and 18,772 patients; hemiarthroplasties without cemented stems were conducted in 6232, 5190, 4286, 3627, 3285 and 2905 and the number of hemiarthroplasties where the stem fixation was not coded occurred in 1217, 946, 814, 663, 489 and 486 operations for groups A–F, respectively. Hemiarthroplasty

therefore occurred in 21,335, 21,744, 21,115, 21,798, 21,804 and 22,163 patients in groups A–F, respectively, resulting in a total of 129,959 operations.

Analysis

Analysis of the data above gives a rate of emergency THA of 5.20%, 6.45%, 7.81%, 8.33%, 8.41% and 9.00% for each successive group. The rate of emergency hemiarthroplasty was 50.1%, 51.2%, 49.9%, 49.26%, 49.94% and 52.16% for each matched group A–F (Tables 1 and 2, Fig 1). The cumulative rate of change for THA was 24.04% (2012), 50.19% (2013), 60.19% (2014), 61.73% (2015) and 73.08% (2016) when compared with a reference year of 2011 (Fig 2). When compared with the previous year, the rate of change was 24.04% (2012), 21.09% (2013), 6.66% (2014), 0.96% (2015) and 7.01% (2016) (Fig 3).

Uncemented implants

The number of uncemented hemiarthroplasty implants has fallen steadily since 2011. There has been a small rise in the number of uncemented THA over the same time

period. Of note, the aggregate number of uncemented implants has fallen (Fig 4).

Discussion

Analysis of a national database has allowed unique insight into trends for managing patients with neck of femur fractures. Several meta-analyses have found that THA is superior to hemiarthroplasty for displaced intracapsular neck of femur fractures.^{11,20,21} Patients who undergo THA report less pain, better function, less deformity and increased range of motion.^{8,10,22} In a prospective randomised controlled trial by Ravikumar and Marsh (2000),²³ THA was found to be favourable in terms of lower reoperation rates as compared with hemiarthroplasty at 13 years. However, the superior outcomes in favour of THA must be counterbalanced with the risks associated with a larger operation. This includes increased operative blood loss, longer operation time and increased surgical specialism necessary for the operation. Patients with fewer physiological reserves may not be appropriate to undergo a THA. Perry *et al*

Table 1 Neck of femur diagnoses, hemiarthroplasty and total hip arthroplasty in each respective year (one-year periods from beginning of April of preceding year to end of March of subsequent year).

Group	A (2010–11)	B (2011–12)	C (2012–13)	D (2013–14)	E (2014–15)	F (2015–16)
<i>Diagnosis</i>						
Emergency neck of femur diagnosis	42616	42432	42340	44245	43662	42492
<i>Operation</i>						
Primary total prosthetic replacement of hip joint:						
Using cement	1411	1810	2237	2578	2644	2771
Not using cement	656	753	883	970	914	927
NEC	150	174	185	138	112	127
Aggregate	2217	2737	3305	3686	3670	3825
Primary prosthetic replacement of head of femur:						
Using cement	13886	15608	16015	17508	18030	18772
Not using cement	6232	5190	4286	3627	3285	2905
NEC	1217	946	814	663	489	486
Aggregate	21335	21744	21115	21798	21804	22113

Table 2 Aggregate replacement percentages of hemiarthroplasty and total hip arthroplasty (THA) in each respective year (one-year periods from beginning of April of preceding year to end of March of subsequent year).

Group	A (2010–11)	B (2011–12)	C (2012–13)	D (2013–14)	E (2014–15)	F (2015–16)
Aggregate THA/emergency neck of femur	5.20	6.45	7.81	8.33	8.41	9.00
Aggregate femoral head replacement/emergency neck of femur	50.06	51.24	49.87	49.27	49.94	52.16

Figure 1 Percentage of operations conducted for neck of femur fractures. The one-year period spans the beginning of April of preceding year to end of March of subsequent year.

Figure 2 Percentage of operations conducted as a total hip arthroplasty from reference year 2011. The one-year period spans the beginning of April of preceding year to end of March of subsequent year.

(2016).²⁴ examined the inequalities in the use of THA. They showed that between 2011 and 2015, fewer surgeons performed THA for patients with an ASA grade greater than two as compared with those with an ASA less than or equal to two.²⁴ A meta-analysis by Burgers *et al.*²⁵ (2012) showed higher dislocation rates for THA as compared with hemiarthroplasty. Additionally, surgeons performing a lower number of THAs per year have been found to have poorer patient outcomes including higher rates of dislocation, reoperation, increased length of stay and death.^{26–29}

In the past decade, the most significant milestone for hip fracture management has been the NICE guidelines, published in June 2011.⁴ In July 2013, the NJR began publishing

individual surgeon's outcome data for THA. The NJR does not differentiate between the individual surgeon's outcomes in trauma versus an elective setting. The current NJR allows comparison between institutions. However, this may discriminate against hospitals that mainly deal with trauma patients versus purely elective hospitals because of the higher risk of THA in trauma patients. This may result in trauma hospitals becoming outliers with a disproportionately higher complication rate compared with elective hospitals. Data should be published in the context of trauma and elective surgery to allow more meaningful comparisons.

There has been an increased percentage of THA operations between 2010 and 2016 but the rate of growth has

declined significantly since 2013. In the year prior to publication of the NICE guidelines, only 2217 (5.20%) emergency neck of femur operations were THAs. In 2013, this had increased to 3305 (7.81%), signifying a 49.08% increase in THAs for neck of femur fractures over a two-year period (24.54% per year growth). However, since 2013, the growth in THA has reduced with only 3825 (9.00%) THA operations in 2016. This signifies a 15.73% increase over a three-year period (5.24% per year growth).

There are several possibilities as to why the rate of THA growth has decreased between 2013 and 2016. The first is

that all patients who were eligible for THA received the operation in each year. This would be refuted by evidence from the National Hip Fracture Database (NHFD), which suggests that only 26.9% of patients who meet the NICE inclusion criteria for THA received the operation.⁵⁰ Another explanation would be that surgeons chose to perform hemiarthroplasty in preference to THA. This may be because more orthopaedic surgeons are subspecialising and may not be performing THAs regularly and therefore prefer to either perform a hemiarthroplasty or refer patients to hip arthroplasty surgeons. There is

increased pressure to operate within 36 hours of presentation to hospital to meet the national best-practice tariff for the NHS in England.⁵¹ Therefore, if a specialist arthroplasty surgeon is not available within this time frame, some units may opt for hemiarthroplasty in place of THA. However, evidence suggests delayed THA is superior to early hemiarthroplasty in such circumstances.⁵² Another possibility for the decline in THAs is the open access to individual surgeon outcome data through the NJR. This may be a deterrent for arthroplasty surgeons as THA in fractured neck of femur patients can be more challenging than electively planned THA and affect their outcome scores due to higher complication rates (Box 1).⁵³

The national data presented show that the use of uncemented implants has decreased significantly since the introduction of the NICE guidelines (Fig 4). There was a fall in uncemented hemiarthroplasties as opposed to uncemented THA. Uncemented arthroplasties are associated with a higher rate of early periprosthetic fracture.⁵⁶ This trend therefore reflects good compliance with national standards and associated lower morbidity for hip fracture patients. Questions arise as to whether the NJR should publish individual surgeon's data for THAs in the context of hip fractures. Should the published NJR outcome data be modified to include percentage of trauma patients? Additionally, further study should be conducted into whether the detriment in delaying a THA for neck of femur fracture outweighs the possibly poorer outcomes from a less-experienced generic trauma surgeon performing the operation. If the reason for delayed THA is due to poor access to local hip arthroplasty surgeons then should patients be transferred to regional hip/pelvic surgery centres with the capacity to perform the operation within the 36-hour best-practice tariff?

Strengths and limitations

NHS Digital data include nearly all admission and procedure events coded in NHS hospitals in England. The same data dictionary for data capture was used between each year of data collection allowing homogeneous inclusion of cases in each dataset. The data collection is very large, which increases the power of this study and decreases the risk of bias. There are, however, limitations to using HES data which includes a lack of fracture demographics (intracapsular vs extracapsular fractures), patient comorbidities

(including whether they meet NICE guidelines for THA) and grade of operating surgeons. It has been assumed for this study that the neck of femur population is so large that there is unlikely to be any statistically different variation over the six years reviewed of patient comorbidities that is able to account for the relative drop in THA since 2013.

Conclusion

The number of THA conducted for neck of femur fractures in England has increased between 2010 and 2016. This is in keeping with national guidelines launched in 2011 that encourages the operation for appropriate patients. The number of uncemented operations has dropped over the same time period. The NHFD demonstrates a large scope for increasing the number of THAs as only 26.9% of those who meet NICE guidelines standards undergo the operation.⁵⁰ It is worrying that NHS Digital data demonstrates that the uptake THA has slowed since 2013. Causation is difficult to establish and requires further study. Possible factors could include the publication of individual surgeon's outcome data in 2013, increased subspecialism with some surgeons become less competent with THA and an increased pressure to meet best practice tariffs on operating with 36 hours resulting in a hemiarthroplasty being performed rather than a delayed THA.

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Box 1 Differences in outcome between elective total hip arthroplasty for osteoarthritis compared with total hip arthroplasty in fractured neck of femur.^{13,34,35}

- > Longer inpatient stay
- > Higher rate of non-homebound discharge
- > Higher rate of readmission
- > Inpatient death
- > Higher risk of major postoperative complications
- > High admission rate to intensive care
- > Implant dislocation

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