The effect of time to surgery on outcomes and complication rates following total hip arthroplasty for fractured neck of femur

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ABSTRACT

INTRODUCTION Total hip arthroplasty is recommended for elderly patients with fractured neck of femur who are independently mobile, have few co-morbidities and are not cognitively impaired. Providing a daily total hip arthroplasty service is challenging for some units in the UK and considering that these patients may be physiologically distinct from the average hip fracture patient, loss of the best practice tariff as a result of surgical delay may be unjustified. The aim of this study was to determine whether time to surgical intervention for patients eligible for total hip arthroplasty had a negative impact on patient complications, length of stay and functional outcomes.

METHODS All patients undergoing total hip arthroplasty for fractured neck of femur at our institution over a ten-year period were identified. Complications and functional outcomes were compared between patients receiving total hip arthroplasty before and after 36 hours.

RESULTS Of 112 consecutive patients undergoing total hip arthroplasty, 70 responded to a questionnaire or telephone consultation. Four patients were excluded owing to delayed presentation, the presence of advanced rheumatoid arthritis or a pathological fracture. Two-thirds (64%) of the remaining 66 patients underwent surgery within 36 hours of presentation. There were no significant differences between the groups of patients receiving surgery before or after 36 hours with regard to postoperative length of stay, complications, Oxford hip scores or visual analogue scale scores for state of health.

CONCLUSIONS Delaying surgery for patients eligible for total hip arthroplasty as per the National Institute for Health and Care Excellence guidelines is justified and should not incur loss of the best practice tariff.

KEYWORDS

Hip fracture – Total hip arthroplasty – Hemiarthroplasty – Complications – Length of stay

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By 2020 the UK incidence of fractured neck of femur (NOF) will be 101,000 patients per year,¹ with a treatment cost of £2.1 billion.² Worldwide, the projected annual incidence is estimated to be as much as 21 million per year by 2050.³ Hemiarthroplasty in patients with a high level of function is associated with acetabular erosion, pain and a higher rate of revision surgery than for total hip arthroplasty.^{4–7} Several studies have also demonstrated superior functional outcomes with total hip arthroplasty over hemiarthroplasty.^{6–9} The National Institute for Health and Care Excellence (NICE) guidelines for hip fracture therefore recommend offering total hip arthroplasty to patients presenting with displaced intracapsular NOF fractures who are independently mobile, are not cognitively impaired and who are medically fit for the procedure.¹⁰

The National Health Service best practice tariff for hip fracture patients was introduced as an incentive for trusts to improve patient care and outcomes.¹¹ Among other targets, the best practice tariff stipulates that patients must

receive their surgical treatment within 36 hours of presentation. However, providing a daily total hip arthroplasty service may be challenging for many units in the UK and many patients who qualify for total hip arthroplasty may have their surgery delayed while an appropriate surgeon becomes available. Such delays can lead to loss of the best practice tariff despite offering patients the most appropriate surgical intervention. The aim of this study was to determine whether time from admission to surgical intervention for patients with fractured NOF who are eligible for total hip arthroplasty has a significant effect on patient complications, length of stay and functional outcomes.

Methods

All patients undergoing total hip arthroplasty for fractured NOF over ten years at a district general hospital in south-west London were identified. Data on age, sex, medical co-morbidities, perioperative level of independence, time

from admission to surgery, cause for delay if greater than 36 hours and length of stay were collected from the hospital records. Data regarding postoperative level of independence, pre-injury and postoperative Oxford hip score, visual analogue scale score for state of health, development of postoperative complications and requirement for revision surgery were collected from both the patients' notes and by means of a follow-up questionnaire or telephone consultation. Complications recorded included requirement for blood transfusion, urinary or respiratory tract infections, acute kidney injury, superficial and deep wound infections, thromboembolic events, nerve injury, dislocation, myocardial infarction, cerebrovascular accident and death. The minimum time to follow-up was 6 months. The maximum follow-up duration was 11 years and 3 months.

Complications and functional outcomes for patients receiving total hip arthroplasty within 36 hours were compared with those for patients treated after 36 hours. Data analysis was performed using Excel® (Microsoft, Redmond, WA, US). A p -value of <0.05 was considered statistically significant.

Finally, National Hip Fracture Database (NHFD) records from June 2011 to February 2016 were analysed to identify patients who were eligible for total hip arthroplasty at the time of admission but who subsequently underwent hemiarthroplasty. These data were used to determine whether the development of complications owing to surgical delay had an influence on the surgical treatment received.

Results

Overall, 112 consecutive patients treated with total hip arthroplasty for fractured NOF between February 2007 and March 2016 were identified from the hospital records. The average number of patients admitted with fractured NOF during this period was 336 per year, with a gradual increase in the proportion of patients receiving total hip arthroplasty from 0.6% in 2007 to 6.3% in 2016 (Fig 1).

Of the 112 patients treated with total hip arthroplasty over the study period, 9 had died at the time of follow-up of causes unrelated to their hip fracture treatment. Of the remaining 103 patients, 70 (68%) responded to a questionnaire or telephone consultation. Four of these patients were excluded from further analysis owing to delayed presentation of their hip fracture, presence of advanced rheumatoid arthritis or a pathological fracture. Two-thirds of the remaining 66 patients ($n=42$, 64%) received surgery within 36 hours of presentation. For the other 24 patients, surgery was delayed in 14 (58%) owing to lack of availability of a hip arthroplasty surgeon. The mean time to surgery for those treated within 36 hours was 20 hours, compared with 70 hours in the delayed surgery group.

There were no significant differences between the groups of patients receiving surgery before or after 36 hours with regard to age, ASA (American Society of Anesthesiologists) grade, abbreviated mental test score, level of independence or time to follow-up (Table 1). On the other hand, there was a significantly higher proportion

of men in the delayed surgery group than among patients receiving surgery within 36 hours (46% vs 19%, $p=0.02$). There were no significant differences in postoperative length of stay or complications (Tables 2 and 3). There was a small reduction in the postoperative mean Oxford hip scores and visual analogue scale scores compared with the pre-injury scores. This is likely to be a reflection of the lasting impact of the trauma, surgery and rehabilitation. However, the change in scores was not significantly different between the groups (Fig 2).

Analysis of NHFD records between June 2011 and February 2016 identified 24 patients who were eligible for total hip arthroplasty at the time of admission but who subsequently received hemiarthroplasty. For none of these patients was the decision to proceed with hemiarthroplasty due to the development of complications owing to surgical delay.

Discussion

Patients presenting with fractured NOF are often frail with multiple co-morbidities, culminating in one-year mortality

Table 1 Baseline demographics for patients receiving surgery before and after 36 hours

	<36 hours ($n=42$)	>36 hours ($n=24$)	p -value
Mean age	71 years	74 years	0.17
Female	81%	54%	0.02
Median ASA grade	2	2	0.45
Mean abbreviated mental test score	9.9	9.9	0.74
Mobility (independent / 1 stick)	100%	100%	
Mean time to follow-up	40 months	42 months	0.83

ASA = American Society of Anesthesiologists

Table 2 Postoperative length of stay and number of complications for patients receiving surgery before and after 36 hours			
	<36 hours (n=42)	>36 hours (n=24)	p-value
Mean length of stay	6 days	8 days	0.07
Complications	7 (16%)	5 (21%)	0.67

rates of between 14% and 36%.¹² Surgery in this patient group aims to alleviate pain and reduce the complications of immobility. For displaced intracapsular fractures in the elderly, internal fixation is associated with a high rate of non-union, avascular necrosis and, for displaced fractures, a risk of reoperation of 47%.¹³ As a result, hip arthroplasty is the preferred treatment option.⁶

Hemiarthroplasty holds advantages over total hip arthroplasty in terms of reduced operative time, lower blood loss^{6,9,14,15} and lower operative costs.^{16,17} Total hip arthroplasty is more technically demanding and may be associated with a higher rate of dislocation.^{4,14,15,18} In contrast, hemiarthroplasty has been associated with acetabular wear and increased postoperative pain, particularly in active patients.^{4,7,14} Several studies have demonstrated better postoperative function and level of independence after total hip arthroplasty.^{4-9,14} Furthermore, lower revision rates are seen in total hip arthroplasty patients, with this treatment option being more cost effective in the long term.^{16,17} As a consequence, the NICE guidelines for hip fracture state that patients with displaced intracapsular fractured NOF should receive total hip arthroplasty if they are deemed ASA grade 1 or 2, have an abbreviated mental test score of more than 7 and have previously been able to walk outside using no more than one stick.¹⁰

Delay in surgery for fractured NOF has been associated with an increased risk of death, an effect that may be exacerbated with increased patient co-morbidities.¹⁹ However, the studies analysed to determine the effect of surgical delay on patient mortality and complications, as part of the

Table 3 Complications encountered by patients receiving surgery either before or after 36 hours		
	<36 hours (n=42)	>36 hours (n=24)
Blood transfusion	1	3
Urinary or respiratory tract infection	1	1
Acute kidney injury	1	0
Superficial or deep wound infection	1	0
Thromboembolic event	1	1
Nerve injury	1	0
Dislocation	1	0
MI / CVA / death	0	0
CVA = cerebrovascular accident; MI = myocardial infarction		

NICE guidance on hip fracture management, were generally of low quality, and this finding was not unanimous.¹⁰ Nevertheless, from a health economics and humanitarian perspective, the notion of preventing surgical delay was supported by all members of the NICE guideline development group.

The NICE guidelines are aligned with the Department of Health introduction of the best practice tariff initiative to provide surgical treatment within 36 hours.¹¹ In light of the selection criteria for offering total hip arthroplasty, one could argue that this subgroup of patients is physiologically distinct from other hip fracture patients. Owing to the technical demands of performing total hip arthroplasty, the availability of a specialist surgeon within 36 hours of admission may not be feasible. This adds pressure as a decision must be made to either offer suboptimal treatment (by means of a hemiarthroplasty) or risk losing the best practice tariff.

Although the effect of this problem on National Health Service hip fracture services as a whole is unknown, it is interesting to note that according to the 2017 NHFD annual report, only 30.4% of eligible patients received total hip

Figure 2 Mean Oxford hip scores and visual analogue scale scores prior to injury and following total hip arthroplasty for patients receiving surgery either before or after 36 hours

arthroplasty.²⁰ The results of our study indicate that delaying surgery for patients who are eligible for total hip arthroplasty as per the NICE guidelines is justified and that doing so should not incur loss of the best practice tariff. As well as the financial implications, these results have important ramifications for departmental hip fracture management pathways and workforce distribution of hip arthroplasty surgeons.

Study limitations

One important limitation of this study is that the data were collected retrospectively. Consequently, it is not possible to account for all patients who may have met the criteria for total hip arthroplasty on admission but who subsequently underwent hemiarthroplasty for reasons owing to surgical delay. However, our analysis of data from the NHFD for the period June 2011 to February 2016 did not identify any patients who were treated with hemiarthroplasty because of complications arising from surgical delay. In addition, although there were no differences in the pre-injury and postoperative level of independence between the groups, data were not collected regarding individual rehabilitation regimens, discharge destination or additional supportive postoperative care. As a result, it is not possible to comment on any differences in requirements for extended rehabilitation.

Conclusions

Delaying surgery for patients who are eligible for total hip arthroplasty as per the NICE guidelines should not incur loss of the best practice tariff. We suggest that the best practice tariff recommendations are amended so that those patients who meet the eligibility criteria for total hip arthroplasty at admission (and who remain medically stable) receive surgery at the earliest available opportunity but without this being subject to a specific timeframe.

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