



## Effect of surgical approach on the early outcome of total hip replacement for femoral neck fractures

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**We reviewed the short-term outcome of 171 patients treated with total hip replacement for femoral neck fractures using the lateral (94 patients) or posterior approach (77 patients). The Sernbo score and the Abbreviated Mental Test Score were used to assess patients' pre-injury functional and cognitive status respectively. Patients were uniformly treated with regard to the type of prosthesis, size of femoral head and rehabilitation. They were followed up to a mean of 25 months (range : 13-42 months).**

**The dislocation rate in the lateral group was 2.1% versus 0% in the posterior group. There was no difference with regards to leg length discrepancy and the restoration of medial offset. Our results were attributed the standardised patients' selection and adequate soft tissue repair.**

**Keywords :** femoral neck fractures ; total hip replacement ; surgical approach ; dislocation.

proach with regards to the risk of dislocation. When performed for osteoarthritis, a higher risk of dislocation was linked to posterior approach (3.23% for posterior approach and 0.55% for the direct lateral approach).

In the setting of THA for fractures, the choice of approach mainly depends on surgeon's comfort and proficiency with a single approach despite the few reports from small sampled studies (3) showing still a higher risk of dislocation following posterior approach.

In this study we reviewed 171 patients with femoral neck fractures treated with total hip replacements either through a posterior or lateral approach. We compared the onset of early dislocation, mortality, postoperative leg length discrepancy and the restoration of medial offset between the two surgical approaches.

### INTRODUCTION

Total hip arthroplasty (THA) remains the most favourable option for treating displaced intra-capsular femoral neck fractures in the active and mobile patients. However the quoted risk of early dislocation remains around five times higher compared to total hip arthroplasty performed for osteoarthritis (10). The reasons given are the healthy quality of muscles as well as the better range of motion (9). Debate still surrounds the choice of surgical ap-

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## PATIENTS AND METHODS

We retrospectively reviewed 171 patients treated with total hip replacement for displaced intracapsular femoral neck fractures. Patients' pre-injury functional level was assessed using the Sernbo score (13) and a cognitive assessment was carried out using the Abbreviated Mini Mental Test Score (AMTS) (8). At our institution, patients were considered suitable for total hip arthroplasty when Sernbo score was 15 or above and the AMT score 7 or above. Otherwise, a hip hemiarthroplasty was considered. All patients were treated within 48 hours from initial presentation ; those with other associated injuries were excluded from this review.

Patients underwent either a posterior or direct lateral approach depending on the surgeon's individual preference. Consultants with special interest in lower limb arthroplasty were either the primary or the supervising surgeon.

The direct lateral approach consisted of a transgluteal approach (Hardinge) (5). The abductors were divided leaving a tendinous stump on the greater trochanter that permitted a tension free re-attachment. The capsule was opened leaving two flaps, with stay sutures allowing adequate closure.

For the posterior approach, the piriformis tendon was transected and, during closure, it was reattached to the greater trochanter along with the capsule and short external rotators all together using drill holes.

The prosthesis used consisted of an uncemented Trident Acetabular Shell, a cemented Exeter femoral implant, an ultra high density X3 Polyethylene liner and a size 36 mm femoral head (Stryker Orthopaedics, Mahwah, USA) in all patients.

All patients had similar postoperative rehabilitation and early full weight bearing was allowed.

Patients underwent clinical reviews at 6 weeks, 6 months and then at a mean of 25 months (range : 13-42 months).

Subsequently, a telephone survey was conducted by one of the authors to identify any dislocation that might have been dealt with at another institution. Local ethical committee approval was obtained prior to conducting the telephone review.

We evaluated the time of occurrence of dislocation and deaths. The hospital records of those who died were retrieved to identify the cause of death and to check if they had any previous dislocation.

Measurements of the leg length and offset were carried out on postoperative radiographs that were available for all patients, including those who died.

Leg length discrepancy was calculated by measuring the distance between the tip of the lesser trochanter and the acetabular tear drop. The leg length discrepancy was considered insignificant when the difference was within 10 mm.

The medial offset was determined as the distance from the centre of the femoral head to a line through the axis of the femoral shaft. The offset was considered to be restored when the difference between the operated leg and opposite side is less than 5 mm.

The unpaired Student t-test was used to compare continuous data such as the age and AMT score. Fisher's exact test was used for categorical data such as the mortality rate, dislocation rate and offset restoration. All tests were two-tailed and the difference between the two groups was considered statistically significant when  $p < 0.05$ .

## RESULTS

The direct lateral approach was used in 94 patients and the posterior approach in 77 patients. Consultants were the primary operating surgeons in the majority of cases as they were often assisted by junior registrars. Patients' preoperative demographics were similar in both groups with regards to age, grade of

Table I. — Patients' demographics

	Direct lateral approach (N = 94)	Posterior approach (N = 77)	P value
Mean age (SD)	75 (9.3)	73 (9.0)	0.15*
Grade of surgeon Consultant/registrar	81/13	67/10	0.15†
Sernbo score (range)	15-20	15-20	0.9†
AMT (mean)	8.2 (7-10)	8.5 (7-10)	0.9*

\*Unpaired t-test ; † Fisher test ; AMT : Abbreviated Mini Mental Test.

operating surgeon and preoperative functional and cognitive scores.

### Follow-up

All losses to follow-up were due to mortality. One hundred and sixty-nine patients were available for clinical assessment at 6 weeks, 166 patients at 6 months, 160 patients at 12 months and 156 patients at the final review (mean : 25 months, range : 13-42 months).

### Mortality

Two deaths occurred during the same admission (1.1%) of which, one was secondary to pulmonary embolism diagnosed on post mortem examination and one due to myocardial infarction. Five deaths had occurred by 6 months (3%), 11 deaths by 12 months (6.4%) and 15 deaths by the final review (8.7%). Causes of deaths, as retrieved from hospital records, were malignancy (5 cases), cardiovascular (7 cases) and stroke (1 case).

### Dislocation

The overall dislocation rate in our series was 1.2% (two dislocations amongst 156 patients who remained alive by the time of final review).

Both dislocations occurred in the direct lateral approach group. There was no statistically significant difference in the onset of dislocation between the two groups ( $p = 0.5$ , Fisher's exact test).

The mechanism in both dislocations was rising from a low-seated position. They were managed successfully with closed reduction in theatre and found to be stable on screening. There was no recurrence of dislocation in those two patients.

### Leg length and offset

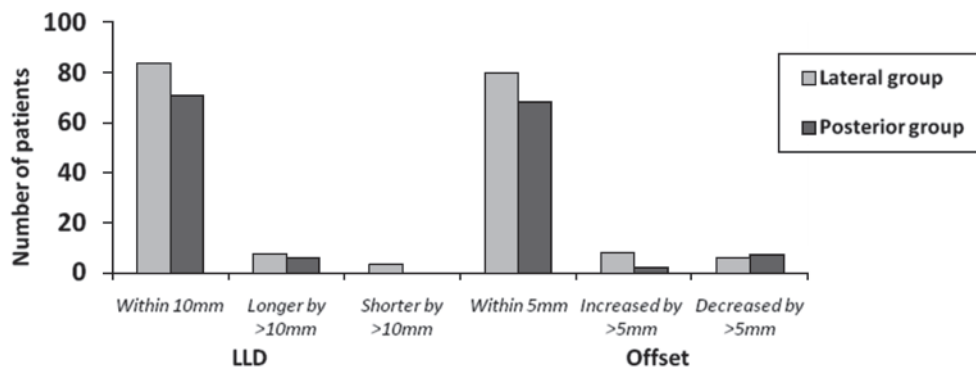
All patients, including those who died, had post-operative radiographs available for measurements. The majority of patients in both groups had no significant leg length discrepancy (within 10 mm of the opposite side) and their offset was restored (within 5 mm of that of the opposite side). The difference between the two groups was not statistically significant ( $p > 0.05$ , Fisher's exact test) (Fig. 1).

### Revision

Two patients underwent revision surgery for infection. There was one revision in each group and this took place within the first year from the primary procedure.

## DISCUSSION

Dislocation following total hip arthroplasty for femoral neck fractures remains an issue with quoted rates as high as 10% (10). Historically, the use of a posterior approach has been linked to a higher dislocation rate when compared to a lateral approach (3). However, posterior transosseous repair has led to a lower dislocation rate (4). Besides, a higher incidence



**Fig. 1.** — Leg length discrepancy (LLD) and medial offset of the operated leg in relation to the opposite leg. There was no difference between both groups in all ranges ( $p > 0.05$ , Fisher's exact test).

Table II. — Number and rate of complications at different postoperative intervals

	All	Direct lateral Approach	Posterior Approach	P value†
Revision	2	1	1	0.9
Dislocation*				
6 weeks	0 (0%)	0	0	
6 months	1 (0.6%)	1	0	
12 months	2 (1.2%)	1	0	
At final review	2 (1.2%)	2	0	0.5
Mortality				
6 weeks	2 (0.6%)	1	1	
6 months	5 (2.9%)	2	3	0.9
12 months	11 (6.4%)	6	5	0.9
At final review	15 (8.7%)	9	6	0.9

† Fisher's exact test.

of dislocation has been promoted by inexperienced surgeons (6), the use of smaller femoral heads (1,7,12) and patients' cognitive dysfunction (11).

In our series the overall dislocation rate was 1.3% and none occurred following posterior approach. Both groups were well matched with regard to age and the preoperative functional and mental scores.

This low rate of dislocation could be attributed to the treatment uniformity that our patients received with regard to the type of prosthesis, size of femoral heads and also to the fact that all cases were operated on by surgeon with a special interest in hip arthroplasty using their preferred surgical approach. Furthermore, the preoperative use of validated functional and mental scores such as the Sernbo and the abbreviated mini mental test has permitted a better selection of patients.

It is worth mentioning also, that the transosseous soft tissue repair used in our posterior approach, has led to no dislocation within this group in particular. It has been demonstrated through a cadaveric study that a transosseous repair was superior to the direct tendinous reattachment (14).

Similarly, the size of femoral head used in all patients was 36 mm. Large femoral head diameter was found to be associated with a lower long-term cumulative risk of dislocation with the effect being greatest in association with the posterior approach (2).

One of the limitations of our study is that 11 patients had died by the end of first year following surgery and it would have been possible that, had

they survived, more dislocations would have occurred.

Other limitations are that the sample size is small and that some cases had short follow-up (13 months). As previous studies have shown that more than 50% of dislocations occur within the first 3 months after total hip arthroplasty (15) we believe that the mean follow-up of our patients was long enough to identify dislocations that could be attributed to the surgical approach, component positioning or failure to restore the hip biomechanics.

We conclude that, in this study, both the posterior and direct lateral approaches showed similarly a low risk of dislocation following hip arthroplasty performed for femoral neck fractures. This could be attributed to the surgeon's expertise, restoration of biomechanics, standardised patient selection using functional and mental validated scores, and finally the thorough soft tissue surgical repair.

## REFERENCES

1. Amstutz HC, Le Duff MJ, Beaulé PE. Prevention and treatment of dislocation after total hip replacement using large diameter balls. *Clin Orthop Relat Res* 2004 ; 429 : 108-116.
2. Berry DJ, von Knoch M, Schleck CD, Harmsen WS. Effect of femoral head diameter and operative approach on risk of dislocation after primary total hip arthroplasty. *J Bone Joint Surg* 2005 ; 87-A : 2456-2463.
3. Enocson A, Hedbeck CJ, Tidermark J *et al.* Dislocation of total hip replacement in patients with fractures of the femoral neck. *Acta Orthop* 2009 ; 80 : 184-189.

4. **Goldstein WM, Gleason TF, Kopplin M, Branson JJ.** Prevalence of dislocation after total hip arthroplasty through a posterolateral approach with partial capsulotomy and capsulorrhaphy. *J Bone Joint Surg* 2001 ; 83-A (Suppl 2) : 2-7.
5. **Hardinge, K.** The direct lateral approach to the hip. *J. Bone Joint Surg* 1982 ; 64-B : 17- 19.
6. **Hedlundh U, Ahnfelt L, Hybbinette CH, Weckstrom J, Fredin H.** Surgical experience related to dislocations after total hip arthroplasty. *J Bone Joint Surg*.1996 ; 78-B : 206-209.
7. **Hedlundh U, Ahnfelt L, Hybbinette C H et al.** Dislocations and the femoral head size in primary total hip arthroplasty. *Clin Orthop Relat Res* 1996 ; 333 : 226-233.
8. **Hodkinson, HM.** "Evaluation of a mental test score for assessment of mental impairment in the elderly." *Age and Ageing* 1972 ; 1 : 233-238.
9. **Hudson JI, Kenzora JE, Hebel JR et al.** Eight-year outcome associated with clinical options in the management of femoral neck fractures. *Clin Orthop Relat Res* 1998 ; 348 : 59-66.
10. **Iorio R, Healy WL, Lemos DW et al.** Displaced femoral neck fractures in the elderly : outcomes and cost effectiveness. *Clin Orthop Relat Res* 2001 ; 383 : 229-242.
11. **Johansson T, Jacobsson S A, Ivarsson I, Knutsson A, Wahlström O.** Internal fixation versus total hip arthroplasty in the treatment of displaced femoral neck fractures : a prospective randomized study of 100 hips. *Acta Orthop Scand* 2000 ; 71 : 597-602.
12. **Leighton RK, Schmidt AH, Collier P, Trask K.** Advances in the treatment of intracapsular hip fractures in the elderly. *Injury* 2007 ; 38 (Suppl 3) : S24-34.
13. **Rogmark C, Carlsson A, Johnell O, Sernbo I.** A prospective randomized trial of internal fixation versus arthroplasty for displaced fractures of the neck of femur. *J Bone Joint Surg* 2002 ; 84-B : 183-188.
14. **Sioen W, Simon JP, Labey L, Van Audekercke R.** Posterior transosseous capsulotendinous repair in total hip arthroplasty : a cadaver study. *J Bone Joint Surg* 2002 ; 84-A : 1793-1798.
15. **Yuan L, Shih C.** Dislocation after total hip arthroplasty. *Arch Orthop Trauma Surg* 1999 ; 119 : 263-266.