Original Article

Cancellous Screw Fixation for Femoral Neck Fractures: One Hundred and Sixteen Patients

KBL Lee,[1] *MBBS, MRCS (Edin), M Med (Ortho)*, TS Howe,[2] *MBBS, FRCS, FAMS*, HC Chang,[3] *FAMS, MBBS, FRCS*

Abstract

Introduction: This paper evaluates the efficacy and safety of the use of cancellous screw fixation in the treatment of intracapsular femoral neck fractures in our local population. Materials and Methods: A retrospective analysis of the results of 116 cases that were performed in Singapore General Hospital and Changi General Hospital over a 2-year period was undertaken. The minimum period of follow-up was 2 years. Results: The median age of the study group was 71 years and approximately two-thirds were females. There were 104 (90%) cases of undisplaced (Garden 1 and 2) fractures and 12 (10%) displaced (Garden 3 and 4) fractures. The specific complication rate was much higher in the displaced group of patients. At 2 years' post-operation, 85% returned to their premorbid level of ambulation and 90% reported good pain relief. The 1-year mortality rate was 7%. Conclusion: Cancellous screw fixation is a relatively safe and useful operation. It achieved our aim of returning most patients to their pre-fracture level of ambulation and providing good pain relief.

Ann Acad Med Singapore 2004;33:248-51

Key words: Cancellous screw fixation, Femoral neck fractures, Intracapsular

Introduction

The incidence of hip fractures rises with increasing age, doubling for each decade beyond 50 years of age.[1] With the increase in life expectancy and the accompanying ageing population, there has been an increase in the incidence of hip fractures from 1.17 per 1000 females >60 years old in 1965 to 1.5 per 1000 in 1985. This paper reviews a common method used in the treatment of a common clinical problem.

In general, we fix undisplaced (Garden 1 and 2) fractures with 3 cancellous screws placed parallel to each other. Displaced (Garden 3 and 4) fractures in the young (<65 years old) and active are similarly treated after closed reduction.

Materials and Methods

This is a retrospective analysis of the results of 116 cases of intracapsular femoral neck fractures that were stabilised with cancellous screws placed parallel to each other between 1 January 1998 and 1 January 2001. Forty-five cases were from Singapore General Hospital and the rest from Changi General Hospital.

The patients were followed up postoperatively for at least 2 years. The casenotes, pre- and postoperative radiographs, and interviews were conducted by a medical officer. Twelve patients who did not turn up for their appointments were interviewed via the telephone. They were asked questions regarding their activities of daily living (ADL) and ambulatory status compared to their pre-fall state. Pain was evaluated using the pain component of the Harris Hip Score (Table 1).

Results

The mean and median ages were 69 years and 71 years, respectively (range, 26 to 98 years). Forty-five (39%) patients were ≤65 years old and the rest (61%) were >65 years old. Ten (9%) patients were ≤50 years old. There were 79 (68%) females and 37 (32%) males in the study.

[1] Registrar, Department of Orthopaedic Surgery
Alexandra Hospital
[2] Senior Consultant, Department of Orthopaedic Surgery
Singapore General Hospital
[3] Associate Consultant, Department of Orthopaedic Surgery
Changi General Hospital
Address for Reprints: Dr Kevin Lee Boon Leng, Department of Orthopaedic Surgery, Alexandra Hospital, 378 Alexandra Road, Singapore 159964.

Table 1. Pain component of the Harris Hip Score

A	None, or ignores it
B	Slight, occasional, no compromise in activities
C	Mild pain, no effect on activities, rarely moderate pain with unusual activity, may take aspirin
D	Moderate pain, tolerable but makes concessions to pain. Some limitation of ordinary activity or work. May require occasional medicine stronger than aspirin
E	Marked pain, serious limitation of activities
F	Totally disabled, crippled, pain in bed, bedridden

All 10 (9%) patients who were ≤50 years old were either involved in a traffic accident or suffered falls from a height of at least 2 m. The rest of the patients sustained the injury from a simple fall.

There were 21 (18%) patients with associated neurological diseases; 12 had a previous cerebrovascular accident, 2 had old poliomyelitis in the same limb and 7 had senile dementia with cognitive impairment.

There were 19 (16%) patients with >2 non-neurological comorbidities and 97 (84%) patients with ≤2 non-neurological comorbidities. The main comorbidities were diabetes mellitus, hypertension, ischaemic heart disease and respiratory diseases.

Ninety patients (78%) were independent in their ambulation, 13 (11%) were independent with assistive devices and 13 (11%) were wheelchair-bound. There were no non-ambulatory patients.

There were 106 (91%) patients who were independent in their ADL and the remaining patients were dependent on others for their ADL.

The number of undisplaced (Garden 1 and 2) and displaced (Garden 3 and 4) fractures was 104 (90%) and 12 (10%), respectively. The majority of cases with displaced fractures were young patients, with 8 (67%) out of 12 patients ≤55 years old (range, 26 to 55 years).

The 1-year mortality rate was 7%. Of the 8 cases that passed away, 6 died at home >6 months post-operation and 2 died in hospital from myocardial events in separate admissions from the first.

There were a total of 17 specific complications, yielding a specific complication rate of 15%. Ten of these complications were in the undisplaced group and the rest were in the displaced group, giving a specific complication rate of 9.6% (10/104) and 58.3% (7/12) in the undisplaced and displaced groups, respectively. There were 11 (9%) cases of non-union and 6 (5%) cases of avascular necrosis (AVN). In our series, the cut-off period for non-union was 6 months from the time of surgery. The non-union and AVN rates were 6% (6/104) and 4% (4/104), respectively, in the undisplaced group and 42% (5/12) and 17% (2/12), respectively, in the displaced group. Two patients in the undisplaced group underwent a second operation, namely, bipolar hemi-arthroplasty for AVN, and the rest refused another surgery. One patient in the displaced group underwent bipolar hemiarthroplasty for AVN and another 3 underwent corrective osteotomy for non-union. The re-operation rates in the undisplaced and displaced groups were 2% (2/104) and 33% (4/12), respectively, and the overall re-operation rate was 5% (6/116). There were no complications in the second operations and all patients returned to their premorbid level of ambulation and ADL. The general complication rate was 3% (4/116). Two patients had postoperative myocardial events and 2 had symptomatic deep venous thrombosis.

There was no initial postoperative displacement or angulation in 104 (90%) patients. Among them, 12 (12%) had complications of either non-union or AVN. There was postoperative varus angulation of approximately 110 degrees in 7 of the 12 displaced cases. Of these, 5 (71%) had complications of either non-union or AVN.

At 2 years' postoperation, 99 (85%) patients had returned to their premorbid level of ambulation. Of these, 6 underwent a second operation as mentioned above. Nine (8%) patients had deteriorated in ambulatory ability and 8 (7%) had passed away. Ninety-seven (90%) of the surviving 108 patients reported good pain relief (Categories A and B), 2 (2%) reported average pain relief (Category C) and 9 (8%) reported poor pain relief (Categories D, E and F).

The mean hospital stay was 13 days; 12 days in patients with ≤2 non-neurological comorbidities and 15 days in patients with >2 comorbidities. This was statistically significant (P <0.05). There was no difference in the duration of hospital stay between patients ≤65 years old and those >65 years old.

Discussion

This paper reviews the results of 116 cases of intracapsular femoral neck fractures that were stabilised with cancellous screws (cannulated or otherwise).

In general, we fixed undisplaced (Garden 1 and 2) fractures with 3 cannulated screws placed parallel to each other, irregardless of the patient's age. Displaced (Garden 3 and 4) fractures in the young (≤65 years old) and active were similarly treated after closed reduction.

It is generally recommended that undisplaced femoral neck fractures should be internally stabilised using multiple lag screws or pins placed parallel[2,3] to each other. Some authors argue that impacted fractures (Garden 1) have some inherent stability secondary to fracture impaction and have recommended non-operative management. However, Bentley[4,5] reported a high disimpaction rate of between 8%

and 15% in a series of patients and we, too, prefer operative management to conservative measures in these fractures.

In our study, the cut-off point for follow-up was 2 years. Alho et al[6] found that after internal fixation with cannulated screws, 3 months were the critical time for planning rehabilitation and most failures occurred within this time. Two years were also a reasonable time for AVN of the femoral head to develop.[7]

Treatment of displaced fractures is based on the patient's age and activity level: young (≤65 years old) and active patients should undergo internal fixation after reduction (open or closed), if required, while older, less active patients should undergo hemiarthroplasty.[8,9] In a large randomised controlled trial comparing hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures, Parker et al[10] found that internal fixation had a shorter length of anaesthesia, lower operative blood loss and transfusion requirements and a tendency for improved survival in the older, less mobile patients. However, the internal fixation group was associated with more second operations. Thus, the authors recommended that displaced intracapsular fractures in the elderly should generally be treated by arthroplasty, but that internal fixation may be appropriate for those who are frail.

Another randomised controlled trial comparing internal fixation with total hip replacement for displaced femoral neck fractures in the elderly (mean age, 80 years) by Tidermark et al[11] strongly suggests that total hip replacement provides a better outcome for elderly, relatively healthy and lucid patients.

The mean and median ages of the study population were 69 years and 71 years, respectively. This is lower than the mean age of 80 years reported in a local paper that reviewed osteoporotic hip fractures (both femoral neck and intertrochanteric).[12] It is a well-known fact that patients with femoral neck fractures are generally younger than those with intertrochanteric fractures, and our study population had 10 patients who were <50 years old and these skewed the mean towards a lower age. The proportion of females to males was approximately 2:1 and that is similar to that quoted in the above paper.

The majority of our patients had good premorbid functional status: 91% were independent in their ADL, 78% were independent in their ambulation and another 11% were independent with assistive devices. The primary aim of surgery was to return them to this high level of function. This objective was achieved with 85% of patients returning to their premorbid ambulatory status and 90% having good pain relief at 2 years post-operation.

The mean duration of hospital stay was 13 days compared to the 17 days cited by Wong et al in their series. There was no difference in the duration of stay between patients ≤65 years old and those >65 years old. However, the duration of stay in patients with ≤2 non-neurological comorbidities was 12 days compared to 15 days in those with >2 comorbidities. This underlines the importance of looking at the patient's physiological age rather than the chronological age.

The 1-year mortality rate was 7%, which is similar to that reported by Asnis and Wanek-Sgaglione.[13] Our non-union and AVN rates were 9% and 5% compared to 4% and 9%, respectively, reported in their series.

As expected, the patients with undisplaced fractures fared significantly better than those with displaced fractures. Initial post-operation varus angulation deformity was an indicator of probable complication, with 5 out of 7 of such cases going into non-union or AVN. This presents a problem as the majority of patients with displaced fractures were young (67% were ≤55 years old) and active. We still prefer internal fixation in this group as the primary procedure as it is relatively quick with minimal blood loss, which is ideal in a polytrauma-type of scenario, and a second operation, if required, to treat the complications of fixation does not preclude a good outcome. The re-operation rate in the displaced group was 33%, and all 4 patients who underwent the second operation returned to their premorbid level of function with no further complications at 2 years.

Conclusion

Cancellous screw fixation for intracapsular femoral neck fractures is a relatively safe and useful operation. It has a relatively low rate of morbidity and mortality. It achieved our aim of returning the majority of patients to their pre-fracture level of ambulation and providing good pain relief. In view of the higher complication rates in the displaced group, we recommend primary hip arthroplasty (hemi or total) in patients >65 years old and cancellous screw fixation in younger patients.

Acknowledgements

We would like to thank Associate Professor Tay Boon Keng and Dr Wong Merng Koon of the Orthopaedic Department, Singapore General Hospital and Dr Low Cheng Ooi of the Orthopaedic Department, Changi General Hospital, for their technical help and expertise.

REFERENCES

1. Cooper C, Melton U. Hip fractures in the elderly: a world-wide projection. Osteoporos Int 1992;2:285-9.
2. Stappaerts KH, Broos PL. Internal fixation of femoral neck fractures. A follow-up study of 118 cases. Acta Chir Belg 1987;87:247-51.

3. Cobb AG, Gibson PH. Screw fixation of sub-capital fractures of the femur: a better method of treatment. Injury 1986;17:259-64.
4. Bentley G. Impacted fractures of the neck of femur. J Bone Joint Surg Br 1968;50:551-61.
5. Bentley G. Treatment of nondisplaced fractures of the femoral neck. Clin Orthop 1980;152:93-101.
6. Alho A, Benterud JG, Solovieva S. Internally fixed femoral neck fractures. Early prediction of failure in 203 elderly patients with displaced fractures. Acta Orthop Scand 1999;70:141-4.
7. Rubinstein RA Jr, Beals RK. The results of treatment of post-traumatic avascular necrosis of the femoral head in young adults: report of 31 patients. Contemp Orthop 1993;27:527-32.
8. Koval KJ, Zuckerman JD. Hip fractures: I. Overview and evaluation of femoral neck fractures. J Am Acad Orthop Surg 1994;2:141-9.
9. Rogmark C, Carlsson A, Johnell O, Sernbo I. A prospective randomised trial of internal fixation versus arthroplasty for displaced fractures of the neck of the femur. Functional outcome for 450 patients at 2 years. J Bone Joint Surg Br 2002;84:183-8.
10. Parker MJ, Khan RJ, Crawford J, Pryor GA. Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures in the elderly. A randomised trial of 455 patients. J Bone Joint Surg Br 2002;84: 1150-5.
11. Tidermark J, Ponzer S, Svensson O, Soderqvist A, Tornkvist H. Internal fixation compared with total hip replacement for displaced femoral neck fractures in the elderly. A randomised, controlled trial. J Bone Joint Surg Br 2003;85:380-8.
12. Wong MK, Arjandas, Ching LK, Lim SL, Lo NN. Osteoporotic hip fractures in Singapore – costs and patient's outcome. Ann Acad Med Singapore 2002;31:3-7.
13. Asnis SE, Wanek-Sgaglione L. Intracapsular fractures of the femoral neck. Results of cannulated screw fixation. J Bone Joint Surg Am 1994;76:1793-803.