Short Intramedullary Nailing of Intertrochanteric Hip Fractures in the Very Elderly

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Background: The use of short intramedullary devices in the management of elderly patients with intertrochanteric fractures of the hip is controversial. The purpose of the present investigation is to evaluate function, morbidity, and mortality in very elderly patients who have undergone short cephalomedullary nailing for the treatment of both stable and unstable intertrochanteric hip fractures.

Patients and Methods: Between the years 2006 and 2008, 34 patients over the age of 80 with displaced intertrochanteric hip fractures were treated with short cephalomedullary nails at a single institution. The series included 7 men and 27 women with a mean age of 87.6 years. Patients were evaluated for operative time, length of hospital stay, transfusion requirement, readmission to the hospital, decline in functional status, and complications (two-year minimum follow-up).

Results: Twenty-nine patients had sufficient data for analysis. The average operative time was 21 minutes, the average length of hospital stay was 5.06 days, and the average transfusion requirement was 1.31 units. Five patients were re-admitted within one month of their initial injury (2 for respiratory failure, 1 for failure to thrive, 1 for osteoporotic spine fracture, and 1 for contralateral hip fracture). Of the 18 patients who were living independently prior to their injuries, 11 remained independent post-operatively. There were no mortalities during the first 90 days. Furthermore, there were no infections, non-unions, malunions, peri-prosthetic fractures, or device complications during the study period.

Conclusions: In very elderly patients with both stable and unstable intertrochanteric hip fractures, short intramedullary devices achieved good outcomes at two years with no device-related complications.

Introduction

Hip fractures occur in approximately 280,000 Americans per year and represent the second leading cause of hospitalization in the geriatric population [1]. In many cases, a hip fracture is the sentinel event triggering the decline of a patient's overall health. Potential complications following hip fracture surgery include myocardial infarction, congestive heart failure, arrhythmias, acute renal failure, bowel obstruction, gastrointestinal bleed, deep venous thrombosis, pulmonary embolism, and death. Despite these risks, surgical fixation remains the definitive treatment for almost all hip fractures with the goal of returning patients back to their optimal health and mobility while limiting peri-operative complications.

One-half of all hip fractures are intertrochanteric fractures [1]. Operative treatment options for intertrochanteric fractures include sliding hip screws (SHS) and intramedullary nails (IMN). The optimal choice of stabilization remains controversial. Despite a lack of randomized trials to support their use, intramedullary devices have become increasingly popular, particularly amongst teaching institutions and younger surgeons [1, 5]. Proponents of the sliding hip screw (SHS) argue that it provides a lower risk of subsequent femoral fracture, referring to meta-analyses that found an increased total failure rate and re-operation rate with the IMN compared to the SHS [7, 8]. Surgeons who prefer IMN counter that the increased risk of subsequent femoral fracture associated with IMN is dramatically reduced with increasing surgeon experience and newer implant designs. A recent meta-analysis suggests that previous concerns about increased femoral shaft fracture risk with IMN have been resolved with improved implant designs and surgeon experience and that further studies should be conducted in light of this new data [3]. In addition, IMN can be inserted through smaller incisions and have the biomechanical advantage of a shorter moment arm when compared to SHS [8]. Even within the realm of treatment with IMN, controversy exists as to whether a long nail or a short nail is the best method of treatment. Few studies have demonstrated advantages or disadvantages of these various nail lengths when used to treat intertrochanteric hip fractures [4]. Advantages of short nails include less operative time (and hence, radiation) and relative ease of insertion, while theoretical disadvantages of short nails include the possibility of periprosthetic fracture distal to the tip of the nail in compromised, osteoporotic bone [4].

The fragile nature of very elderly patients (i.e. those greater than 80 years of age) requires a quick and safe procedure to minimize the potential peri-operative complications following hip fracture surgery. Therefore, the purpose of the present investigation is to evaluate function, morbidity, and mortality in very elderly patients who have undergone short cephalomedullary nailing for the treatment of both stable and unstable intertrochanteric hip fractures.

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Patients and Methods

A retrospective case series was conducted for all patients over the age of 80 treated with short cephalomedullary devices for the treatment of intertrochanteric hip fractures (Figure 1) at a single institution between the years 2006 and 2008. All surgeries were performed by a single surgeon (FPT) using the same implant (Synthes TFN) with standardization of the neck-shaft angle and nail diameter (Figure 2). The operations were all performed on a traction table in the supine position under spinal anesthesia with the use of an image intensifier. Full weight-bearing was allowed immediately post-operatively. Two-year minimum follow-up data was obtained for all patients in this series, except in the case of death. Follow-up was obtained by chart review, review of hospital records, and patient/family contact.

Thirty-four patients who met the aforementioned inclusion criteria were identified. This represents all patients over the age of 80 treated by the senior author for intertrochanteric hip fractures between 2006 and 2008. No other method of fixation was performed for this fracture pattern. One patient was excluded from this investigation because a long implant was used for a pathologic fracture (breast cancer metastasis) with skip lesions in the diaphysis of the femur. A retrospective chart review of all available documentation for these patients was conducted beginning in 2010 (allowing for a minimum two-year follow-up from surgery for all patients). Each patient was evaluated for intra-operative and post-operative complications, operative time, transfusion requirement, overall length of stay, readmission to the hospital, and decline in functional status since injury. Mortality data was obtained from hospital and patient records, interviews with family and nursing homes, and county death records. No patients in the present series were lost to follow-up.

Figure 1. An AP radiograph of the right hip demonstrating an intertrochanteric hip fracture is shown.

Figure 2. An AP radiograph of the right hip status-post open reduction and internal fixation with a short intramedullary nail is shown.

Results

The study population consisted of thirty-four patients: 7 males and 27 females with an average age of 87.6 years. Of these 34 patients, 29 patients had sufficient follow-up for final analysis. The other 4 patients had died prior to the two-year follow-up time point; however, none of these deaths were related to peri-operative complications.

For the 29 patients studied, the average operative time was 21 minutes and the average length of hospital stay was 5.06 days. Fourteen patients required blood transfusions post-operatively with an average transfusion requirement of 1.31 units. Five patients were re-admitted within one month of their injury (2 for respiratory failure, 1 for failure to thrive, 1 for osteoporotic spine fracture, and 1 for contralateral hip fracture). Of the 18 patients who were living independently prior to their injuries, 11 remained independent post-operatively. There were no mortalities during the first 90 days after surgery. Furthermore, there were no infections, non-unions, malunions, peri-prosthetic fractures, or complications from the intramedullary device during the study period (Table 1).

Table 1. Results of short intramedullary nailing of intertrochanteric hip fractures in the very elderly

Variable	Outcome
Total Number of Patients	29
Average Operative Time	21 mins
Number of Blood Transfusions	14/29 (48%)
Average Transfusion Requirement	1.31 units
Average Length of Hospital Stay	5.06 days
Return to Independence	11/18 (61%)
Readmission Rate	5/29 (17%)
90-day mortality	0/29
Infections	0/29
Nonunions	0/29
Malunions	0/29
Implant complications	0/29

Discussion

The use of short intramedullary devices in the management of elderly patients with intertrochanteric fractures of the hip is controversial. We found that in very elderly patients with both stable and unstable intertrochanteric hip fractures, a short intramedullary device achieved good outcomes at two years with no device-related complications. A recent Cochrane Database meta-analysis comparing IMN to SHS for the treatment of extracapsular proximal femoral fractures found no statistically significant differences between the implants with regard to wound infection, mortality, or medical complications [8]. The authors did find an increased rate of femur fracture (both intra-operative and subsequent fractures) and of re-operation in the IMN group as compared to the SHS group. Their pooled results demonstrated that the IMN results in one extra subsequent femur fracture and one extra re-operation for every 50 trial participants versus the SHS. Indeed, femoral fracture is the most commonly cited disadvantage of the IMN, with inadequate reaming and the use of excessive force on nail insertion being implicated as potential causes of this complication. Unfortunately, this Cochrane review was unable to determine which intramedullary device (long nail versus short nail) was used for each patient in the study population. Certainly, the length of the nail influences the risk of femoral fracture. Shorter devices do not traverse the complete anterior bow of the femur and are less reliant on reaming and starting position for optimal placement. This may reduce the risk of femoral fracture during insertion, but may increase the risk of subsequent femoral fracture distal to the tip of the implant [4].

While studies have identified increased rates of femoral fracture with IMN, it is important to take into account two variables: 1) surgeon experience and 2) improvements in implant design. As with any new implant, initial reports of the IMN are likely to identify complications secondary to surgeon inexperience, especially when compared to the more familiar and well-established SHS. Several studies have found that there is in fact a steep learning curve associated with the IMN, with more experienced surgeons having improved results and decreased complication rates [2, 6, 9]. In light of this, meta-analyses that assess pooled data may suffer from bias related to surgeon inexperience. Improvements in implant design must also be considered when comparing IMN to SHS. A recent meta-analysis identified 25 randomized controlled studies published between 1991 and 2005 comparing IMN to SHS in the treatment of intertrochanteric fractures [3]. The authors found that if they pooled the data from all studies, the risk of femoral shaft fracture was 4.5 times greater in the IMN group than in the SHS group. However, among just those studies published after 2000, there was no significant difference in femoral fracture rates between the two groups, presumably due to improved implant design. The authors concluded that improved implant design and improved surgeon learning curves have resolved previous concerns about the increased femoral shaft fracture risk with IMN. Caution must therefore be used when interpreting meta-analyses that incorporate data from older implant designs. Many of these studies use the Medicare database, which only lists patients by CPT codes and not by implants. Hence, no differentiation is made between long and short nails or between older and newer implant designs.

Our results show that, in experienced hands, the newest generation short IMN can provide excellent results with limited complications in the treatment of stable and unstable intertrochanteric hip fractures in the very elderly population. To our knowledge, this is the first study to investigate the results of short cephalomedullary nailing for the treatment of intertrochanteric hip fractures in the very elderly – the population most likely to suffer from complications after surgery.

The present study is limited by design as a retrospective case series with a small cohort and no control group and using a single implant device. However, we hope that it will serve as a stimulus for continued research into the use of short nails in the treatment of intertrochanteric hip fractures. As we move toward protocol-driven care from evidence-based medicine, our surgical goals are to perform standardized procedures that achieve good outcomes, require a skill set that can be easily acquired, and solve problems that are of major consequence. As our population ages, there is an increasing demand for standardization of hip fracture surgery. Further research will help define the role that short intramedullary devices play. Newer data that takes into account surgeon learning curves and implant modifications should provide greater insight into the use of short IMN for the treatment of intertrochanteric hip fractures.

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