



Management of young femoral neck fractures: Is there a consensus?



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ARTICLE INFO

Article history:

Received 11 July 2014

Accepted 17 November 2014

Keywords:

Femoral neck fracture

Survey

Outcomes

Non-geriatric hip fracture

ABSTRACT

Background: Femoral neck fractures in young adults (ages <60) are high-energy injuries that are associated with major fracture healing complications such as avascular necrosis, nonunion, and significant shortening. Historically, evidence from small trials has suggested multiple cannulated screws were the optimal implant; however, newer studies and implant designs warrant reevaluation of screws as the gold standard among surgeons. In addition, controversies surrounding reduction technique and urgency of surgical fixation have been previously identified. We aimed to survey surgeon treatment preferences for these challenging fractures.

Methods: A 17-item survey was developed and tested for validity and reliability prior to administration. The questionnaire characterised surgeon demographics, treatment preferences for displaced and undisplaced fractures, and controversies for future clinical trials. The target population consisted of surgeons from the Canadian Orthopaedic Association, the Orthopaedic Trauma Association, and attendees at an international fracture course.

Results: 540 surgeons completed the survey, exceeding our sample size requirement. There was a similar proportion of respondents from academic and community hospitals. Most surgeons (61%) treat 1–5 young adult femoral neck fractures per year. For undisplaced fractures, 78% of respondents prefer to use multiple cannulated screws. For displaced fractures, equal preference for multiple screws (46%) and the sliding hip screw (SHS, 49%) was reported. The majority of surgeons perform an open reduction in less than 25% of cases, and the time to fixation was typically between 8 and 24 h.

Conclusions: Multiple cannulated screws remain the preferred treatment for most surgeons treating undisplaced fractures; however, there is an equal divide in preference between multiple screws and the SHS for displaced fractures. This increased preference for the SHS contradicts previous survey and small trial data recommending multiple screws for all fracture patterns. The lack of surgeon consensus and the high rates of fracture complications associated with fixation of young femoral neck fractures supports the need for definitive clinical trials to optimise patient important outcomes.

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Introduction

The management of femoral neck fractures in non-geriatric patients (age ≤ 60 years) remains a challenging injury for orthopaedic surgeons. A previous meta-analysis focusing on the outcomes of 564 hip fractures in younger adults reported that major fracture healing complications such as avascular necrosis of the femoral head, early implant failure, and fracture nonunion

occur in approximately 28% of patients [1]. The significance of these injuries is further highlighted when one considers that even patients who do not have difficulties with fracture healing may still experience a poor functional outcome due to fracture shortening and altered hip mechanics [2]. As a result, young femoral neck fracture patients are at high risk for re-operation and lifelong morbidity.

Although the meta-analysis data demonstrate that the young femoral neck fracture population is at risk of significant complications, these pooled analyses combine the results of many different fixation techniques and are, therefore, unable to guide treatment decisions. Currently, the sliding hip screw (SHS) and multiple cannulated screws are two of the more commonly used internal fixation devices for this injury. The current literature

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provides conflicting reports of each implant's superiority. Due to the paucity of comparative clinical studies, we believe an understanding of current surgeon practice variability might identify factors that influence treatment decisions and help resolve controversial treatment issues among orthopaedic surgeons. Therefore, we conducted a large survey of practicing orthopaedic surgeons to determine their management of displaced and undisplaced femoral neck fractures in patients less than 60 years old. Secondly, this survey aimed to determine the need for, and interest in research comparing surgical implants, timing of surgery, and other technical factors that remain controversial.

Methods

Questionnaire development

Item generation

We developed a questionnaire using the previous literature and key informants. Orthopaedic surgeons who specialise in trauma and manage young adult patients with hip fractures participated in the development of the questionnaire. We used a "sample to redundancy" approach by which we contacted new surgeons until no new items for the questionnaire emerged.

Pretesting, validity, and reliability assessments

We initially pretested the questionnaire with an independent group of five orthopaedic surgeons to evaluate whether the questionnaire as a whole appeared to adequately address the question of current practice in treating femoral neck fractures in young adults (face validity) and whether the individual questions adequately address the objectives of the current study (content validity) [3]. These five surgeons also commented on the clarity and comprehensiveness of the questionnaire. The survey was then completed by a larger convenience sample of 39 surgeons to further confirm the validity of the questionnaire. In addition, 30 participants within this sample completed the survey twice to assess the test-retest reliability of the instrument. The retest assessment used the identical survey re-administered two to three weeks later. All surveys were completed using SurveyMonkey®. Agreement of each question was assessed using the Kappa statistic, and the majority of questions had a Kappa value of greater than 0.4 (mean Kappa 0.54, 95% confidence 0.45–0.64). This satisfied our *a priori* criteria for moderate agreement based on the interpretation of Landis and Koch, and, therefore, no further changes to the content of the survey were made [4].

Survey description

The final survey was comprised of 17 questions which consisted of Likert-scale questions, check-boxes, and brief open-ended questions. All of the questions were straightforward and utilised clear and widely recognised terminology to enhance the validity of results. The survey length was kept to a minimum to maximise response rate and to limit barriers that may affect its proper completion. The survey included questions about the location of practice, type of practice (community or academic), and the number of years treating hip fracture patients. It also included questions regarding the number of femoral neck fractures in young patients treated in the past 12 months and asked respondents how they typically manage young patients with displaced and undisplaced femoral neck fractures. Finally, respondents were asked several questions about the direction and the importance of future research on the management of femoral neck fractures in young adults.

Survey administration

We surveyed all surgeons who were active members of the Canadian Orthopaedic Association (COA) and all active, associate, clinical, international, and international clinical members of the Orthopaedic Trauma Association (OTA). Prior to administering the survey, we obtained written permission from the COA and the OTA to survey their membership. We sent each member of the COA a personalised email asking them to complete the survey using Survey Monkey® (www.surveymonkey.com), and we sent the non-responders follow-up emails at two weeks and at four weeks following our initial request. The OTA posted a link to our survey on their website, and OTA members each received an email from the OTA inviting them to complete the survey. In addition, we surveyed attendees at an AO Trauma Update course designed for community based orthopaedic surgeons (Puerto Rico, February 2013). These surgeons each received a cover letter and copy of the survey to complete while attending the trauma course.

No monetary incentives or pre-notification telephone calls were used for this survey. Individual responses were kept confidential, and questionnaire completion was voluntary. This study was approved by the McMaster University Research Ethics Board (REB no. 12-628).

Sample size

In order to determine the number of respondents needed to sufficiently power our analysis, we assumed that approximately 50% of surgeons surveyed would treat displaced fractures with multiple cannulated screws and 50% of surgeons would treat displaced fractures with a SHS. The calculation for appropriate sample size was performed according to the following formula, assuming a 95% confidence interval for the estimate:

$$N = \left(\frac{Z_a}{w} \right)^2 p(1 - p)$$

where: Z = z value (1.96 for 95% confidence interval), w = half of the width of the confidence interval, expressed as decimal (0.05 to give ± 5), p = hypothesised proportion who would treat with multiple cannulated screws, expressed in decimal (50% = 0.50).

According to our calculation, approximately 384 completed questionnaires would facilitate meaningful analysis.

Statistical analysis

We summarised all categorical and dichotomous variables with frequencies and percentages. When appropriate, similar treatment options were collapsed into a single category; for example, non-cannulated screws were coded into the cannulated screw option because both represented similar treatments with multiple cancellous screws. Whenever the distribution of responses for a particular item in the questionnaire had multiple empty cells, we collapsed the categories in that particular item to achieve an even distribution of responses. Univariate and multivariable analysis was performed to explore associations between surgeon demographics and treatment preferences. All analyses were conducted in SPSS Version 20.0 (IBM Corporation, Armonk, NY).

Results

Response

Of the 943 COA members who received the questionnaire, 296 (31.4%) responded, and of the 958 OTA members, 169 (17.6%) completed the survey. Of the 78 participants who were invited to

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