



Young femoral neck fractures: Are we measuring outcomes that matter?



Sheila Sprague^{a,b}, Gerard P. Slobogean^{a,c}, Taryn Scott^b, Manraj Chahal^a,
Mohit Bhandari^{a,b,*}

^a Division of Orthopaedic Surgery, McMaster University, Hamilton, ON, Canada

^b Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, ON, Canada

^c Department of Orthopaedics, University of British Columbia, Vancouver, BC, Canada

ARTICLE INFO

Article history:

Received 7 July 2014

Accepted 17 November 2014

Keywords:

Femoral neck fracture

Hip fracture

Outcomes

Non-geriatric

ABSTRACT

Introduction: Femoral neck fractures in younger aged patients are particularly devastating injuries with profound impairments of quality of life and function. As there are multiple differences in patient and injury characteristics between young and elderly femoral neck fracture patients, the geriatric hip fracture literature is unlikely to be generalisable to patients under age 60. We conducted a systematic review to determine if clinically relevant outcome measures have been used in previously published clinical studies of internal fixation in young adults with femoral neck fractures.

Methods: We conducted a comprehensive literature search using multiple electronic databases and conference proceedings to identify studies which used internal fixation for the management of femoral neck fractures in patients between the ages of 15 to 60. Eligibility screening and data abstraction were performed in duplicate. We classified the reported outcomes into the following categories: operative and hospital outcomes, radiographic outcomes, clinical outcomes, and functional outcomes and health-related quality of life. We calculated the frequencies of reported outcomes.

Results: Forty-two studies met our inclusion criteria. Operative and hospital outcomes were poorly reported with less than one-quarter of studies reporting relevant data. Important radiographic outcomes were also inadequately reported with only one-third of studies reporting the quality of the fracture reduction, and methods for assessment were highly variable. The assessment of avascular necrosis was reported in almost all the included studies (95.2%); however, the assessment of nonunion was only reported in three-quarters of the studies. Re-operations were reported in 73.8% of the included studies and the assessment of fracture healing was only reported in two-thirds of the studies. Less than half of the studies reported functional outcomes or health-related quality of life (overall patient evaluation scales and systems (45.2%), patient functional outcomes (30.9%), and health-related quality of life (4.8%).

Discussion: Our systematic review found that the assessment of clinically relevant outcomes in the young femoral neck fracture literature is lacking, which makes utilising the literature to guide clinical practice challenging. Future studies should aim to include important radiographic measures, fracture-healing complications, functional outcomes, and health-related quality of life during any assessment of young femoral neck fracture treatment.

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Introduction

Internal fixation of femoral neck fractures is frequently associated with high complication rates and poor functional

outcomes. For elderly patients, displaced fractures are typically treated with arthroplasty to avoid these major fracture healing complications; however, in younger adults internal fixation is performed for nearly all femoral neck fractures to preserve the native hip joint, to facilitate increased functional demands, and to avoid concerns of arthroplasty longevity. As a result, young femoral neck fracture patients are particularly at risk for experiencing significant fracture healing complications, re-operations, and lifelong morbidity.

* Corresponding author at: Division of Orthopaedic Surgery, 293 Wellington St. No. 110, Hamilton, Canada L8L 8E7. Tel.: +1 905 527 4322x44490; fax: +1 905 523 8781.
E-mail address: bhandam@mcmaster.ca (M. Bhandari).

While there is large body of literature pertaining to the treatment of femoral neck fractures in geriatric populations, the generalisability of these findings to younger adults may be limited due to key differences in terms of the physiological condition of patients, the injury mechanism, the goal of treatment, and the method of treatment [1–4]. These differences demonstrate the importance of identifying separate and distinct clinical guidance for treating femoral neck fractures in young adults. Reporting outcome measures that are relevant to the younger population is crucial to facilitate comparisons of treatment efficacy, to identify the incidence of complications, and to properly inform patients of their expected outcomes.

The objective of this systematic review is to describe the characteristics of the young femoral neck fracture literature and to determine if clinically relevant outcome measures have been used when reporting the results of internal fixation in younger hip fracture patients. Specifically, we aimed to determine how previous authors have quantified the following outcomes in our target population: operative and hospital outcomes, radiographic outcomes, clinical outcomes, and functional outcomes and health-related quality of life.

Methods

Literature search

We conducted a systematic review of the published literature to identify clinical studies that used internal fixation for the management of femoral neck fractures in patients age ≤ 60 years. In consultation with a research librarian, we conducted systematic literature searches of the Medline, Embase, CINAHL, and Cochrane databases using the search terms contained in [Appendix A](#). We hand searched the abstracts from the past five annual meetings (2008 to 2012) from the Orthopaedic Trauma Association (OTA), the Canadian Orthopaedic Association (COA), and the European Federation of National Associations of Orthopaedics and Traumatology (EFORT). In addition, we hand searched abstracts from the past two annual meetings (2011 and 2012) of the American Academy of Orthopaedic Surgeons (AAOS). Following the literature searches, two of the authors independently reviewed the reference lists of all included articles for further eligible articles.

Eligibility criteria

We included published studies that met the following eligibility criteria: (1) the population was comprised of young adults (ages 15 to 60 years) with a femoral neck fracture, (2) patients were treated with internal fixation, (3) the study type was “therapeutic” or “prognostic” and falls within evidence levels I, II, III, or IV (case series with more than 10 patients), and (4) the study reported any outcome measure following fracture fixation. Studies that included patients with femoral neck fractures and ipsilateral femoral shaft injuries, and/or femoral neck fracture-dislocations were also eligible. We excluded studies that focused on: (1) stress fractures; (2) treatment of delayed fractures (greater than 14 days from injury); (3) management of femoral neck fracture nonunions; and (4) management of osteonecrosis following femoral neck fractures. We also excluded studies that were published in languages other than English, review articles, and meta-analyses.

Article selection

Two authors independently reviewed the titles, abstracts, and full-text articles for inclusion. The authors began by

screening the article titles identified in the literature searches to determine whether the articles should be considered for inclusion. Since the screening process needed to distinguish between elderly and young femoral neck fractures, any title that mentioned fixation of femoral neck fractures or hip fractures was selected for further review. The titles identified as potentially eligible were then screened at the abstract level. Again, the authors erred on the side of inclusivity. Any conflicts identified at the title and abstract screening stages were discussed, and if consensus was not reached, the reference proceeded to the next level of screening. The full-text of all articles identified as potentially eligible at the abstract screening level were then reviewed. Any disagreements at the full-text stage were resolved with input from a third author. Articles that met the inclusion criteria were selected for data abstraction. We used the Distiller Systematic Review software (<http://systematic-review.net/>) to facilitate our article selection process. Level of agreement between the two authors was assessed with the kappa statistic. We adopted an a priori criterion of $k \geq 0.65$ for adequate agreement.

Data abstraction

Two authors independently abstracted all relevant information from each included article on study specific case report forms. Briefly, we abstracted study characteristics, patient demographics, fracture characteristics, surgical details, and the outcomes reported from each included study. Any disagreements between the two authors were reconciled through a consensus meeting; if agreement could not be reached, a third author resolved the disagreement.

Reported outcomes were then classified into themes, including: operative and hospital outcomes, radiographic outcomes, clinical outcomes (i.e. re-operations, fracture healing, fracture-related complications, general medical complications), functional outcomes, and health-related quality of life.

Data analysis

Descriptive statistics were used to summarise the study and patient characteristics. Frequency data (proportions and percentages) describe the use of reported outcomes, and qualitative descriptions characterise the outcomes used in each of the included studies.

Results

Literature search results

The electronic database search identified 1182 articles that were potentially eligible for inclusion in this review ([Fig. 1](#)). Of these studies, 1012 were excluded after review of titles, 30 after reviewing the abstracts, and 107 after full-text review. Therefore, 33 articles were identified for inclusion in this review. A search of the meeting abstracts identified 3804 titles, with 3513 excluded after review of titles and 286 after review of abstracts. One additional abstract was excluded as it had duplicate data to a full publication that had been identified in the literature search. This left four abstracts for inclusion in the review. The hand search of the reference lists of the included articles identified five additional studies that met the eligibility criteria for this review. In summary, 42 articles are included in this review [5–46]. The two authors had acceptable agreement regarding which studies should be included or excluded (percent of overall agreement = 86.90; unweighted kappa = 0.68).

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