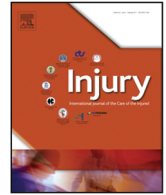




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Injury

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Is endoprosthesis safer than internal fixation for metastatic disease of the proximal femur? A systematic review

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KEYWORDS

Endoprosthesis
Internal fixation
Bone metastasis
Proximal femur

ABSTRACT

Introduction: Metastases to the proximal femur are usually managed surgically by tumor resection and reconstruction with an endoprosthesis, or by fixation with osteosynthesis. Still controversy remains regarding the most appropriate surgical treatment. We posed the following questions: (1) Is the frequency of surgical revision greater in patients treated with internal fixation than endoprosthetic reconstruction, and (2) Do complications that do not require surgery occur more frequently in patients treated with internal fixation rather than in those with endoprosthetic reconstruction?

Materials and Methods: A systematic review was performed of those studies reporting on surgical revision and complication rates comparing the two surgical methods. Ten studies including 1107 patients met the inclusion criteria, three with high methodological quality, three intermediate, and four with low quality, according to the STROBE guidelines.

Results: At present, prosthetic dislocation is the most common complication observed in patients managed by prosthesis replacement of the proximal femur, while loosening was the main cause of reoperation in the fixation group. Time to reintervention ranged from 3 to 11.6 months for the prosthetic replacement and from 7.8 to 22.3 months for the fixation group. Non surgical complications, (mainly dislocations and infections) were more commonly observed in patients operated on by prosthetic replacement.

Conclusions: Implant related complications and surgery-related morbidity should be taken into account in the decision-making process for the surgical management of these patients. These data can improve the surgeon-patient communication and guide further studies on patients' survival and complications with respect to surgery.

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Introduction

Due to the increased life expectancy of patients with metastatic cancer, the incidence of pathological fractures or impending fractures is increasing [1]. This occurs because bone metastatic tumors are the most common skeletal neoplasms, since the skeleton represents the third most common site of metastatic disease after lung and liver; within the skeleton, the most frequent site of metastatic disease is the spine, followed by the femur and humerus [2].

The bone segment at higher risk of pathological fracture is the femur because of the significant mechanical stresses in bending and

torsion applied during loading and walking. More than half of the femoral metastases affect the proximal femur and the first clinical manifestation in this segment is often a pathological fracture [3]. Therefore, the identification of the best management of metastatic lesions of the proximal femur continues to be a matter of study for the international orthopedic oncology societies.

The aims of the surgical management of bone metastases are: the prevention and treatment of pathological fractures, pain relief, increasing the quality of life, maintaining or restoring joint function and segmental stability, obtaining local control of metastatic lesions [1]. Furthermore, given the increasing longevity of patients with known skeletal metastases, surgical treatment should provide longest-lasting relief of symptoms based on patient's life expectancy.

Given the large number of factors that must be taken into account, it is not surprising that the clinical and surgical variables are weighted differently among orthopedic surgeons [4], above all considering that

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surgery for bone metastases represents an event that adversely affects the prognosis of cancer patients [5].

Currently, the management of the proximal femur metastatic disease consists mainly of two different surgical strategies, namely tumor resection and reconstruction with prosthesis, or fixation with osteosynthesis, with or without local curettage or the use of bone cement. Both approaches can be performed with different implants, including total hip replacement, hemiarthroplasty and megaprosthesis, or intramedullary nailing and plates, with different complication and mechanical failure rates. However, there is no evidence to support one of these strategies over the others [6]. The best management of the proximal femur metastatic disease has not been identified yet, and the surgeon's experience plays a critical role in the decision process for the surgical approach in these patients.

The present study aimed to perform a systematic review of the literature about the surgical management of the proximal femur metastatic disease to compare tumor resection and prosthetic replacement with fixation. We posed the following questions: (1) Is the frequency of surgical revision greater in patients treated with internal fixation than endoprosthetic reconstruction, and (2) Do complications that do not require surgery occur more frequently in patients treated with internal fixation rather than in those with endoprosthetic reconstruction?

Materials and methods

The systematic review was conducted following the Meta-Analyses and Systematic Reviews of Observational Studies (MOOSE) guidelines [7]. Two reviewers (NM, ADM) independently performed a review of the literature, using electronic searches of PubMed (1966 to December 2014), EMBASE (1974 to December 2014), and Cochrane Controlled Trial Register databases (The Cochrane Library 2014). We conducted a comprehensive literature search with the following medical subject headings: "proximal femur," "metastases," "surgery," "endoprostheses," "nailing," "plate fixation," "pathological fractures." The search was limited to the English language and to studies conducted in humans.

Studies were included if they met the following criteria: (1) adult patients over 18 years of age of both genders with proximal femur

metastasis (including pathological fractures); (2) randomized or non-randomized controlled clinical studies; (3) studies comparing endoprostheses with fixation (achieved with any device) as surgical treatment; and (4) outcome assessment based on the primary and secondary outcomes. The primary outcome was defined as revision surgery including mechanical failure, aseptic/septic loosening, implant dislocation, fractures, residual pain, symptomatic non-union. The secondary outcome included complications not requiring surgery, such as deep vein thrombosis, infections, systemic complications (e.g. pneumonia, cardiovascular events). In contrast, exclusion criteria included studies where: (1) the overall number of patients with proximal femur metastasis did not exceed six for each treatment group, (2) an uncontrolled case series study was performed, and/or (3) it was impossible to extrapolate or calculate the data of surgical revisions or complications from the published results. After application of these criteria, the reviewers independently selected relevant studies, and discussed any discrepancies to reach a consensus (Figure 1). Additionally, the references from the retrieved studies were manually checked to identify any potentially relevant studies. Finally, an e-mail has been sent to all the authors of the selected articles to get as much detailed information as possible about the primary and secondary outcomes.

The following information/data were extracted, when possible, from studies that met the inclusion criteria: the name of the first author, year of publication, study design, number of participants in each treatment group, participants' age and gender, surgical treatment, revision surgery and complication rates. The risk of bias in the included studies was assessed independently by the two reviewers using the 22-item checklist from the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) Statement [8]. In this systematic review, studies were categorized as either poor, moderate, or good based on the percentage of fulfilled items from the STROBE Statement checklist, that is, <50%, 50% to 80%, and >80%, respectively [9]. The reviewers also independently evaluated the quality of selected studies using the Methodological Index for Nonrandomized Studies (MINORS) scale [10]. Given the lack of prospective randomized trials and heterogeneity in the studies' inclusion criteria, data pooling was not performed.

The literature search initially yielded 182 relevant trials, of these, only ten retrospective cohort studies met the inclusion criteria and

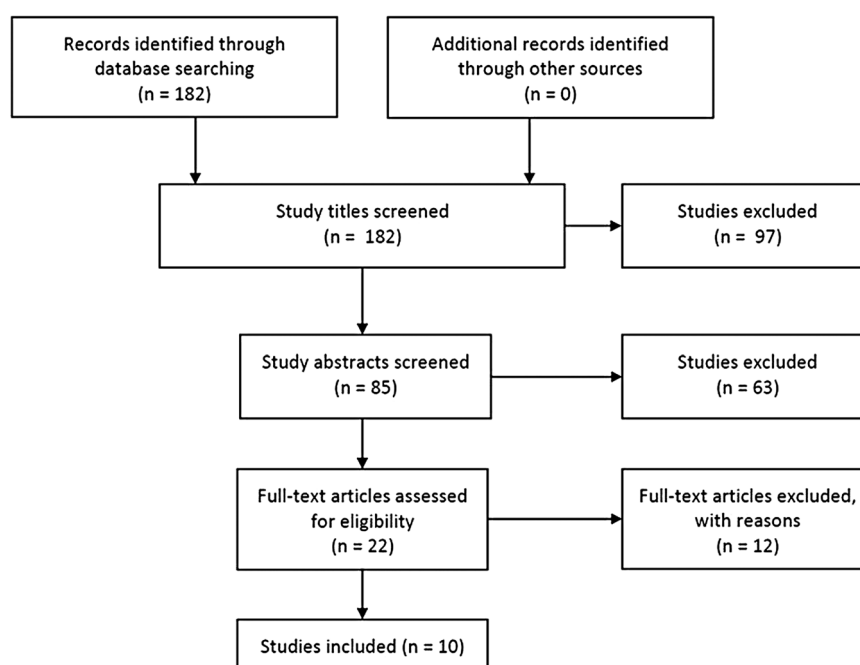


Fig. 1. Selection of studies for inclusion in the systematic review.

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