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Does Previous Osteotomy Compromise Total Hip Arthroplasty? A Systematic Review

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ABSTRACT

Hip osteotomy surgery has increased over the past several years, yet the impact of these procedures on subsequent total hip arthroplasty (THA) remains controversial. The purpose of this study was to perform a systematic review of the literature to determine the clinical results, procedure complications, and survivorship of THA following previous hip osteotomy. Ten studies met inclusion criteria. The operative time and estimated blood loss were higher in the post-osteotomy cohorts; while the clinical results and survivorship between groups were similar. THA following previous pelvic and femoral osteotomy provides pain relief and improved function with similar complication rates, clinical outcomes, and survivorship compared to hips undergoing routine primary THA. These procedures can be technically more demanding with increased operative times and intraoperative blood loss.

The management of pre-arthritic and early arthritic hip conditions can be challenging due to young patient age at presentation, highly variable structural deformities, and an increased risk for secondary hip osteoarthritis over time. Acetabular osteotomies such as the Bernese periacetabular osteotomy (PAO) are performed to correct structural deformities, improve the biomechanical environment of the hip, improve pain and function, and potentially delay the need for total hip arthroplasty (THA) [1]. One long-term study indicates that conversion to total hip arthroplasty (THA) following PAO occurs in 38% of hips at twenty years [2]. Performing THA following previous pelvic osteotomy can be technically challenging with the altered anatomy but good results have been reported [3]. Performing total hip arthroplasty (THA) in patients with these complex deformities who did not have previous osteotomies can also be technically challenging and associated with increased complication rates compared to routine primary THA [4].

Proximal femoral osteotomies have also been performed to address a variety of deformities about the hip with decreased pain, improved function, and joint preservation for most patients [5–12]. Performing a THA following femoral osteotomy has been met with mixed results for long-term survival with some showing no difference and others showing poorer results [13–16]. Technically, performing the THA following the osteotomy is challenging, and various rates for intraoperative complications have been reported [13,16–20].

With the number of patients undergoing pelvic or femoral osteotomies as well as those with previous osteotomies aging and potentially requiring conversion to THA, there is a need to better define the efficacy of total hip arthroplasty after previous osteotomy. Such information will facilitate patient and surgeon informed decision-making when contemplating both joint preserving osteotomy surgery and THA after previous osteotomy. Therefore, we performed the present systematic review to provide objective analysis of THA following previous pelvic and/or femoral osteotomy procedures. Our goal was to compare these procedures with standard primary THA's to determine if differences exist in: (1) clinical outcomes; (2) short-term and long-term complications; and (3) the survivorship of the procedures.

Search Strategy and Criteria

We performed an electronic search of PubMed, Scopus, CINAHL®, Cochrane Central Register of Controlled Trials, and ClinicalTrials.gov for articles published between January 1823 and March 2013, and we searched EMBASE™ from 1947 through 2013 for papers appropriate to this study on March 6, 2013. Search strategies were created to cover the concepts of pelvis/femoral/hip osteotomy, time factors, and total hip arthroplasty as thoroughly as possible to optimize recall using terms harvested from standard term indices and on-topic articles. Case Reports and Reviews were excluded using filters constructed in a similar way as the concept hedges though with the goal of precision. To exclude animals, we used the Human filter for PubMed recommended in *Cochrane Handbook for Systematic Reviews of Interventions* and used that as a model to create similar filters for the other databases searched [21]. Some of the database search terms used were "hip arthroplasty," and "pelvic osteotomy," and "femoral osteotomy." A comprehensive list of search terms is available in the appendix. Search

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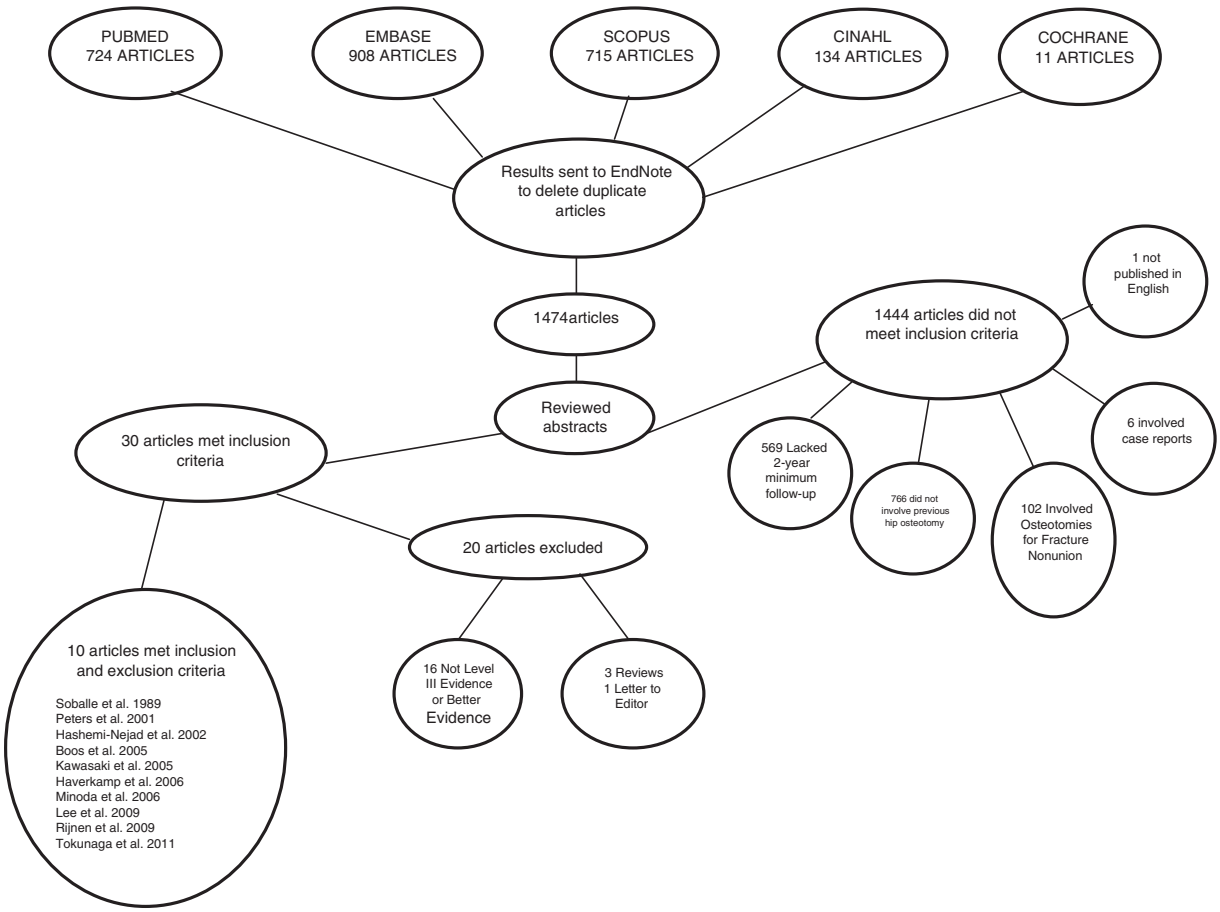

Fig. 1. A flow diagram illustrates the method of article selection for study inclusion.

results were entered in EndNote® to remove duplicate studies. The flowchart (Fig. 1) demonstrates the review process from the original search to those included in the final study. These searches identified 1474 potentially eligible studies. Abstracts of the identified studies were reviewed by two of the authors (STD, SAW) to include only studies that were peer-reviewed, published in English, reporting the clinical and radiographic outcomes of total hip arthroplasty following previous pelvic or femoral osteotomy, and had a minimum of 2 year follow-up (Fig. 1). Of the remaining 1474 articles, 569 were excluded for failure to have a minimum 2-year follow-up, 766 did not involve previous pelvic or femoral osteotomy, 102 involved osteotomies for femoral fracture nonunion, 6 were limited to case reports, and 1 article was published in French. 30 articles met inclusion criteria. The full text of these articles was reviewed independently by two authors (STD, SAW). We excluded articles that did not have a control group (minimum Level III evidence) or were a review or letter to the editor. Risk of potential bias was also performed. Limiting articles to those published in the English literature introduced potential publication bias; however, the resources to translate the single article not in the English language would be too great and it was felt that the effect of language bias minimally impacted the potential conclusions of this review. Potential for additional sources of bias in these articles was also assessed critically (performance, attritional). 10 articles met the inclusion criteria and were analyzed in this review [13,14,20,22–28].

The authors reviewed the study type, level of evidence, groups in the study, demographic information, prostheses used, surgical details, outcome measures, clinical and radiographic findings, survival of the prosthesis and complications, and statistical findings. Pooled results for the Harris Hip Score, the complications, and the survivorship were also performed.

Results

The ten studies included in the review included 1167 patients (Table 1). Of the four studies involving previous pelvic osteotomy, 90 patients with a history of previous pelvic osteotomy that underwent THA were compared to 116 patients who underwent standard THA. Of the six studies involving previous femoral osteotomy, 338 patients with a history of previous femoral osteotomy that underwent THA were compared to 623 patients who underwent THA. The Level of Evidence was Level II for one study and Level III Evidence for nine studies. All of the included studies had a minimum follow-up of at least two years. The duration of follow-up of the individual patients ranged from two to nineteen years and the pooled mean duration of follow-up was 11.2 years. The percentage of patients in the individual reports with adequate follow-up ranged from 57% to 100%, with only one study having less than 70% patient follow-up and the pooled average follow-up was 94.2%. The duration of follow-up in any individual study did not impact our comparisons or conclusions regarding outcome measures.

Potential bias in the included studies was kept to a minimum. In the included studies, performance bias was minimal as the control and study groups from each study were treated by the same surgeon, operative approach, and implants utilized. Attritional bias was minimized as well with few patients being lost to follow-up, helping to ensure the accuracy of the final survivorship and clinical outcomes data.

Not all studies reported information on the patient age and gender distributions. On the basis of available information, the pooled mean age of the patients at the time of THA was 47.3 years and 60% were male.

Cemented fixation was used exclusively in four studies, cementless implants alone were used in five studies, and one study reported on