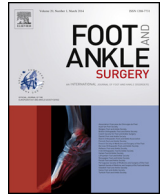




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Effect of joint pathology, surface preparation and fixation methods on union frequency after first metatarsophalangeal joint arthrodesis: A systematic review of the English literature

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ABSTRACT

Background: The aim of this systematic review was to perform a qualitative synthesis of the current literature to determine the union frequencies for first metatarsophalangeal joint arthrodesis as well as the influence of pathology, joint preparation and fixation methods on union.

Methods: MEDLINE and EMBASE were searched to identify relevant studies reporting on first metatarsophalangeal joint union frequencies.

Results: 26 studies with 2059 feet met our inclusion criteria. The mean age was 60 years (range 18–84) and the mean follow-up was 32.6 months (range 1.5–156). The union frequency was 93.5% (1923/2059). The union frequencies were significantly higher when low velocity joint preparation methods were used ($P < 0.0001$, Chi Square 22.5) and the pathology was hallux rigidus ($P = 0.002$, Chi square 9.3). There were similarly high union frequencies with crossed screws, locking plate and non-locking plates.

Conclusions: High union frequency can be expected following first metatarsophalangeal arthrodesis, especially when low velocity joint preparation methods are used in patients with hallux rigidus.

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1. Introduction

First metatarsophalangeal joint (MP) arthrodesis is a reliable treatment for symptomatic hallux rigidus, severe hallux valgus, and salvage of failed hallux valgus correction as well as being a key part of forefoot reconstruction in inflammatory arthropathies [1–3]. The reported union frequencies from multiple case series range from 88% to 100%. However, these are often heterogeneous series employing a myriad of joint preparation and fixation methods in patients with a variety of diagnoses [1,3–6].

The joint surfaces can be prepared with hand instruments such as rongeurs and curettes or power tools to achieve a flat on flat or convex/concave surfaces. The arthrodesis can be held with screw(s), Kirschner wires, staples, locking or non-locking plates. The best joint preparation or fixation method remains unclear [3–5,7,8].

We performed a systematic review of the English language literature to determine how pathology, joint preparation and joint fixation methods influence union frequencies. We also reviewed the need for further surgery and complications from first MP joint arthrodesis. This study will enable clinicians to accurately inform patients on the expected outcome of MP joint arthrodesis as well as choose the most effective surgical technique.

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2. Material and methods

2.1. Search strategy

MEDLINE and EMBASE were searched on 25/9/2014 to identify relevant studies reporting on first MP union frequencies. The database search was restricted to articles from 1990 onwards reporting on MP joint arthrodeses performed on humans in the English literature.

Keyword searches were ‘metatarsophalangeal joint arthrodesis’ and ‘metatarsophalangeal joint fusion’. Related articles link in the PUBMED interface was further explored to find more papers. The reference lists of the relevant papers were also scrutinised for additional papers.

2.2. Eligibility criteria

Inclusion criteria were all published studies in the English language describing a first MP joint arthrodesis with more than 30 feet, aiming to get about 2000 MP arthrodeses for analysis. We excluded studies where the pre-operative diagnosis or the joint fixation methods were not clear or studies primarily describing the results of revision first MP joint arthrodesis. The diagnosis of union had to be made from radiological methods and/or supplemented by

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clinical evaluation. We also strived to identify duplicate of follow up series published in different journals and only counted the more up to date study once.

2.3. Data extraction

Two authors (MTK and DM) independently reviewed the titles and abstracts of identified articles. If both observers agreed that a study did not meet the eligibility criteria, it was excluded. After initial screening of titles and abstracts, the full text of the remaining articles was obtained and reviewed by the same two observers independently and subsequently reviewed and confirmed by all authors

Data on patient demographics, pre-operative diagnosis, joint preparation and fixation methods, patient reported outcome measures, rehabilitation regimes and further surgery required was entered in a database.

2.4. Outcome measures

The primary outcome measure was union frequencies and the need for further surgery to achieve bony union. We performed subgroup analysis to determine how pathology, joint preparation and joint fixation methods influenced union frequencies.

Secondary outcome measures were patient reported outcome measures (PROMs) and reported complications such as infection.

3. Results

3.1. Search results

A total of 584 article titles relating to first MP joint arthrodesis were identified. The abstracts were reviewed initially. A total of 26 studies satisfied our eligibility criteria and the search strategy is illustrated in Fig. 1.

3.2. Quality assessments

There were 24 retrospective case series and 2 prospective cohort studies. The follow-up periods ranged from 2 months to 9 years. There were 172 feet lost to follow-up that were acknowledged by the authors. 12 studies had PROMs data, but only 7 of them had pre and post-operative scores. We used the Coleman Methodology Score (CMS) to assess the quality of the included papers. This is an accurate and reproducible 10 item scoring system assessing the study methodological quality. The score ranges from 0 to 100 with a score of 100 representing a well-designed study with no chance of bias, chance or confounding variables [9]. The scores of the included papers are illustrated in Table 1.

3.3. Cohort characteristics

The studies included 2054 feet in 1955 patients who underwent a first MP joint arthrodesis. The follow-up period averaged

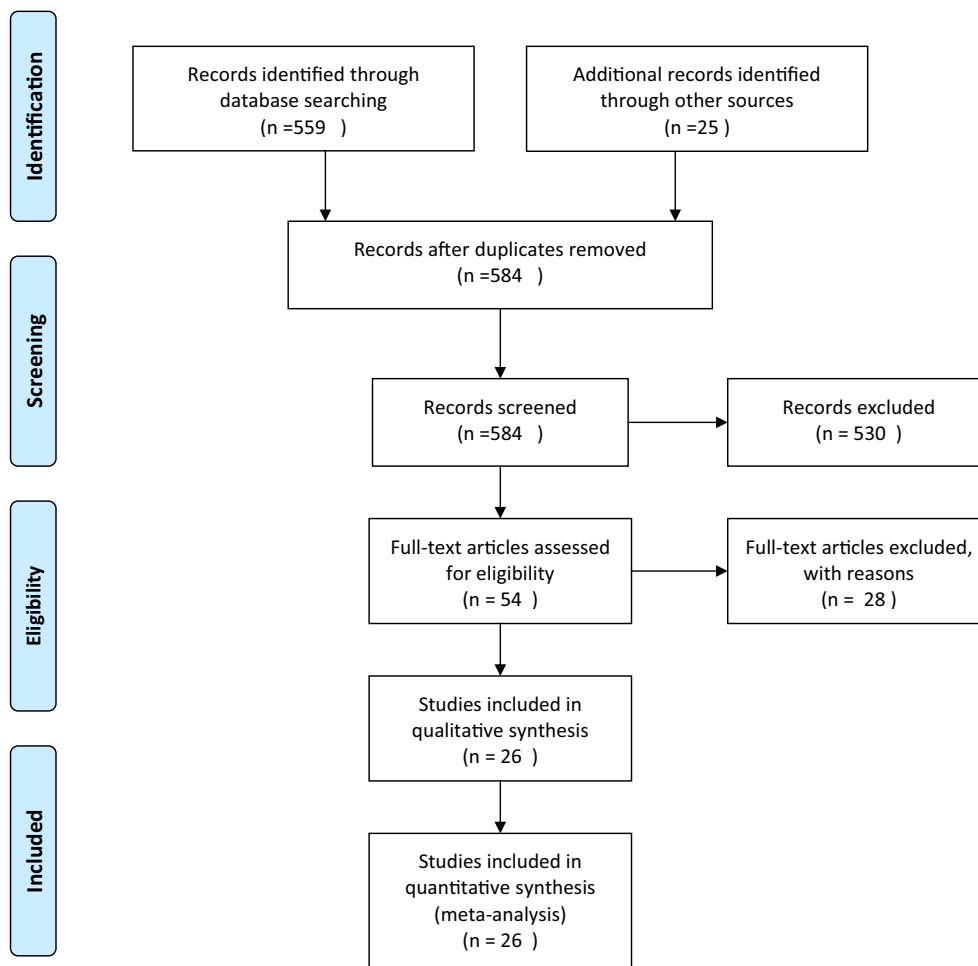


Fig. 1. PRISMA flow chart illustrating search strategy and number of records screened and included. PRISMA – preferred reporting items for systematic reviews and meta-analyses.

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