Foot and Ankle Surgery 22 (2016) 146–151

Contents lists available at ScienceDirect

Foot and Ankle Surgery

journal homepage: www.elsevier.com/locate/fas

Review

Does external fixation result in superior ankle function than open reduction internal fixation in the management of adult distal tibial plafond fractures?

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ARTICLE INFO

Article history:
Received 25 April 2014
Accepted 10 July 2015

Keywords:
Tibial
Plafond
Pilon
External fixation
Internal fixation
Ankle function

ABSTRACT

Background: Traditionally distal tibial plafond fractures were managed with open reduction internal fixation however, high complication rates have prompted the use of external fixation as an alternative. No definitive review has been conducted and the issue of superior treatment method remains contentious. This review assesses the comparative effectiveness of both with regards ankle function.
Method: A search strategy was formulated with keywords ensuring full use of Medical Subject Headings terms for maximum sensitivity with Boolean combinations. Multiple databases were used.
Results: All papers had limitations, hence results and conclusions must be considered conservatively. Paper-1 demonstrated an association between ORIF and superior ankle function ($P < 0.05$). Papers-2 and -3 demonstrated no significant difference ($P > 0.05$) between treatment techniques.
Conclusions: Neither method can yet be widely advocated as superior with the treatment method chosen remaining primarily on surgeon preference and experience. This review highlights the requirement for further, high-quality research in this area.

Contents

1. Introduction

1.1. Aim

To use evidence-based literature to ascertain whether external fixation (EF) or open reduction internal fixation (ORIF) result in

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http://dx.doi.org/10.1016/j.fas.2015.07.002
1268-7731/

superior ankle function in the management of adult distal tibial plafond fractures (DTPF).

1.2. Objectives

Table 1 displays the review paper objectives.

1.3. Research question

Produced using the Population, Intervention, Comparator and Outcome (PICO) process [1]:

In adults with distal tibial plafond fractures, is external fixation superior to open reduction and internal fixation with regards ankle function?

2. Background

The terms plafond and pilon are synonymously used to describe intra-articular distal tibial fractures. Plafond, from the French *plat* (flat) and *fond* (bottom), adapted to English meaning "elaborate ceiling", is appropriate given the tibia's flat bottom providing the ankle joint ceiling [2,3]. DTPF produce complex fractures of the lower extremity [4] with a prevalence between 1% and 10% [3]. Due to the associated articular-surface disruption, deceased ankle function and post-traumatic osteoarthritis are recognised complications [5], as is soft-tissue injury [6].

Traditionally DTPF were managed by ORIF, with accurate articular-surface reduction minimising joint disruption and maintaining ankle function [7]. However, high complication rates, particularly infection, wound breakdown and amputation [6], prompted the use of EF as an alternative with reduced wound complication rates, but inferior fracture reduction, higher post-traumatic osteoarthritis incidences and inferior ankle function [6,8,9].

A proposed Cochrane review on DTPF management was withdrawn due to lack of completion [10], hence no definitive review has yet been conducted and the issue of superior treatment method remains contentious. Evidence-based medicine is defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about patient care" [1]. Therefore, to ascertain the comparative effectiveness of EF and ORIF in DTPF with regards ankle function, analysis of the relevant evidence is required. This paper achieves that, focusing on relevant, randomised control trials (RCTs) and has been divided into four further parts, see Table 2.

3. Methods

Having identified a focussed research question, a search-strategy was formulated with key-concepts and keywords identified using the PICO process [1]. This identified essential search-terms [11] then exploded ensuring inclusion of relevant synonyms, alternative spellings and related terms then combined using Boolean technique [12,13].

Initial search-keywords were broad, exploded terms to ensure use of MeSH (Medical Subject Headings) terms for maximum sensitivity [14,15]. More specific terms and limitations were subsequently introduced and combined to refine the search [16], see Table 3.

Table 4 displays the eligibility criteria.

Multiple databases were used ensuring a thorough search was performed [14]. These were: Medline, EMBASE and The Cochrane Library. Reference lists of RCT's identified were scrutinised and hand-searched.

The search identified three papers for critical appraisal; the "process of systematically examining research evidence to assess its validity, results and relevance, before using it to inform a decision" [18]. To ensure a systematic, logical and standardised appraisal approach, the CASP reviewer checklist was used [19] with the review structured as such.

Table 1
Review objectives.

Objective 1	To search the available literature for evidence of whether EF is a superior management technique than ORIF in adult DTPF with regards to the primary outcome of ankle function
Objective 2	To critically appraise the relevant papers identified in the literature search
Objective 3	To ascertain whether EF is a superior management technique than ORIF in adult DTPF with regards to primary outcome of ankle function
Objective 4	To answer the research question, identifying implications for future practice and research

Table 2
Detailing the layout of the following paper.

Section	Description
1: Methods	Defining the search methods used to identify the selected trials
2: Results	Describing the results of the search and identifying the three papers for appraisal
3: Critical appraisal	Critically appraising the identified studies and summarising the salient results
4: Discussion and conclusion	Discussing the implications of the findings for future practice and research

4. Search results

The results of the database search example are displayed in Table 3.

The aforementioned search criteria identified 11 papers, with 8 excluded, detailed in Table 5.

This left three papers for critical appraisal, see Table 6, hereon referred to as Papers' 1–3.

5. Critical appraisal

5.1. Paper-1

This single-centre study compared EF with ORIF for adult DTPF. The paper lacked a clearly-focused, PICO-adherent, research

Table 3
Literature search strategy example – Medline (OVID) ® 1948 to date. The search strategies for the remaining databases can be found in Appendix 1. Search performed 6th December, 2012.

#	Searches	Results	Search type
1	Exp external fixators/or external fixation.mp.	6953	Advanced
2	Exp fracture fixation, internal/or exp bone plates/or internal fixation.mp.	38994	Advanced
3	Fracture.mp.	120293	Advanced
4	Distal tibial.mp.	842	Advanced
5	Pilon.mp.	318	Advanced
6	Pylon.mp	147	Advanced
7	Plafond.mp.	246	Advanced
8	4 or 5 or 6 or 7	1455	Advanced
9	1 and 2 and 3 and 8	115	Advanced
10	Limit 9 to English language	88	Advanced
11	Limit 10 to humans	88	Advanced
12	Limit 11 to randomised controlled trial	4	Advanced