Letter to the Editor

Fractures of the anterior process of the calcaneum: A review and proposed treatment algorithm

We would like to thank Dhinsa et al. for pointing their finger at a highly underrepresented injury in current foot and ankle literature. They published a review and proposed a treatment algorithm for fractures to the anterior process of the calcaneus (APC) [1]. According to their methodology, they conducted a “comprehensive literature search [...] conforming to the PRISMA statement”. Based on the 23 studies finally included, the authors then proposed a treatment algorithm. They suggested conservative treatment (6 weeks immobilization and non-weightbearing) for acute undisplaced fractures classified type I and II according to Degan et al. [2] and surgical treatment for displaced Degan type III fractures as well as for type I and II fractures with persistent symptoms for 12 months.

APC fractures are often misinterpreted as lateral ankle sprains (ATFL-ruptures) and most likely occur more often than thought for the past years [3]. Consequently, the paper of Dhinsa et al. is of great importance to raise further awareness for APC fractures. Although the authors' state the limited level of evidence in their limitations section, the way the methodology and result section are presented might lead to misinterpretation of the conclusion drawn.

First, the authors state, that the “comprehensive literature search” was conducted “conforming to the PRISMA statement”. The PRISMA statement was published 2009 and evolved from the QUOROM Statement [4,5]. It is a common reporting guideline defining a minimum set of items in the methods and results section for reporting in systematic reviews and meta-analysis. Amongst others, the PRISMA statement advises to provide the eligibility criteria, search strategy, risk of bias of each study and a summary of evidence. Still, in the present study, most of these essential PRISMA key points were not met. Although Dhinsa et al. did not refer to their literature search as systematic, referencing the PRISMA statement might mislead the reader. We hereby would like to sensitize for the correct use of predefined terms, such as the PRISMA statement.

Second, Dhinsa et al. presented a comprised summary of their literature search, i.e. studies included, in a table. We took the liberty to adapt this table per the level of evidence, Degan classification, and outcome measures and complemented it based on another review [3] (Table 1). This resulted in a total of 30 studies, with a median of 4 (IQR: 1–12; range: 1–47) patients. All studies were case reports or case series with a level of evidence of 4 per “The Oxford 2011 Levels of Evidence”. The vast majority of studies did not perform CT-scans. Consequently, most studies did neither classify nor characterize the fractures included. Most of the summative study population has been treated by a broad range of conservative treatment approaches (unrestricted full weight-bearing to immobilization and non-weight bearing for up to 10 weeks). Even within the same study the treatment regime sometimes varied. Seventeen studies report on surgery in, most often, a subpopulation of their patients. In 12 (71%) of those studies, surgery was conducted due to prolonged pain or non-union. Only 4 studies with a total of 7 patients reported on the surgical outcome of acute fractures to the APC. Additionally, only one study reported validated outcome measures. All the rest did only report a subjective outcome as assessed either by the surgeon or the patient.

Consequently, the studies currently available, suffer major limitations, do not exceed the level of evidence of IV, comprise of a very limited sample size, broadly miss defined treatment approaches, and the comparison of different treatment approaches for the same fracture type. It therefore remains questionable to us, whether the data available allows the definition of a treatment algorithm, as presented in Fig. 3 by Dhinsa et al.

Due to this lack of evidence, we treat all patients suffering an APC fracture (without Chopart dislocation) by unrestricted full weight-bearing as tolerated, independent of the Degan type. Per a chart review (03/2011 and 03/2016), 27 patients were available with a current PROM at a median current follow up of 24 months (IQR: 16–41). In our population, an unrestricted conservative treatment of any APC fracture resulted in a median return to work of 14 days (IQR: 10–42) and a median current overall VAS-FA score of 95 (IQR: 89–98) points. These results were not influenced by the Degan classification (p = 0.922/p = 0.737).

Until today there is no sufficient broad body of evidence to define an evidence-based treatment regime. Per our interpretation of the literature, acute APC fractures without Chopart dislocation may in general be treated conservatively. Prolonged symptomatic patients most likely benefit from surgery. We would like to use this letter to the editor to brace a spear for the correct application of reporting guidelines, such as the PRISMA, CONSORT, or STROBE statement as they provide us with guidelines for the design and interpretation of research.

The authors of “Fractures of the anterior process of the calcaneum: a review and proposed treatment algorithm,” were invited to respond to this letter, but did not provide any comments.

https://doi.org/10.1016/j.fas.2018.11.006
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Table 1
Adapted table 1 from the original paper and complemented it per another review [3].

<table>
<thead>
<tr>
<th>Autor</th>
<th>Year</th>
<th>[n]</th>
<th>Study design</th>
<th>LOE</th>
<th>Degan classification/dislocation</th>
<th>Objective outcome</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| Christopher et al. [6] | 1931 | 3   | Case series  | IV  | ND                             | ND                | Conservative:  
- Non-weightbearing (n = 2) or  
- Full weightbearing + Crutches (n = 1) | Conservative:  
- Non-weightbearing (4–6 W) + elastic bandage/cast  
- Non-weightbearing (4 W) + Cast  
- Non-weightbearing + ankle tape/cast (duration not stated) |
| Bradford et al. [7]  | 1951 | 17^a| Case series  | IV  | ND                             | ND                | Surgical (symptomatic non-union):  
- Excision Conservative:  
- Non-weightbearing (3–10 W) + Cast  
- Non-weightbearing (4–6 W) + Cast  
- Non-weightbearing (4 W) + Cast  
- Non-weightbearing (1–8 W) + cast (n = 24) or  
- Non-weightbearing (1–8 W) elast. Bandage (n = 6) |
| Dell et al. [12]  | 1958 | 12  | Case series  | IV  | ND                             | ND                | Surgical (acute fracture):  
- ORIF (n = 1) Conservative:  
- Full weightbearing + elastic bandage (n = 9)  
Surgical (large fragment):  
- Excision (n = 1) Conservative:  
- Non-weightbearing (2–10 W) + cast (n = 18)  
Surgical (non-union n = 6; not stated n = 1):  
- Excision (n = 7) Conservative:  
- Non-weightbearing + ankle tape/cast  
Conservative:  
- Non-weightbearing (4–6 W) + ankle tape/cast  
Surgical (prolonged healing > 7 W):  
- Excision No treatment/full weightbearing  
Surgical (symptomatic non-union after 10M):  
- Excision Conservative:  
- Immobilization (n = 4)  
Surgical (symptomatic non-union after 9M):  
- Excision (n = 1) Surgical (prolonged healing > 10W):  
- Arthroscopic Excision Surgical (acute fracture):  
- ORIF + Cast Conservative:  
Full weightbearing, nonimpact and low-impact training  
Surgical (persistent pain > 5 weeks):  
- ORIF/Excision of Calcaneonavicular Coalition Surgical (symptomatic non-union after 2 Y):  
- Arthroscopic Excision Surgical (acute fracture n = 4; symptomatic non-union n = 1):  
- ORIF |
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Design</th>
<th>LOE</th>
<th>Degan classification</th>
<th>Objective</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taketomi et al.</td>
<td>2013</td>
<td>Case report</td>
<td>IV</td>
<td>Degan Type I n=1</td>
<td>AOFAS 90.1</td>
<td>Surgical (calcaneocuboid pain and disability):</td>
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<td></td>
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<td>Degan Type II n=6</td>
<td>RTS 83.3%</td>
<td>• Excision</td>
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<td></td>
<td></td>
<td>Degan Type III n=5</td>
<td>VAS 2.2</td>
<td>Surgical (symptomatic non-union after 6M):</td>
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<td>ND</td>
<td>ND</td>
<td>• Drilling</td>
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<td></td>
<td>Calcaneonavicular coalition</td>
<td></td>
<td>Surgical (persistent pain &gt;10M):</td>
</tr>
<tr>
<td>Halm et al.</td>
<td>2016</td>
<td>Case series</td>
<td>IV</td>
<td>ND</td>
<td>ND</td>
<td>• Excision</td>
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<tr>
<td>Graham et al.</td>
<td>2016</td>
<td>Case report</td>
<td>IV</td>
<td>Degan Type IIIb</td>
<td>ND</td>
<td>Conservative:</td>
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<td>Slightly displaced</td>
<td></td>
<td>• Non-weightbearing + cast (4W)</td>
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<td></td>
<td>Slightly displaced</td>
<td></td>
<td>Conservative:</td>
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<td>ND</td>
<td></td>
<td>• Non-weightbearing + Walker (4W) followed by Full weightbearing + Walker (2W) followed by Ankle brace (6W)</td>
</tr>
<tr>
<td>Gibbons et al.</td>
<td>2017</td>
<td>Case report</td>
<td>IV</td>
<td>Degan Type IIb</td>
<td>ND</td>
<td>Cast (4W)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Slightly displaced</td>
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</table>

LOE = Level of Evidence [25], ND = not documented, W = weeks, M = months, Y = years, ORIF = open reduction and internal fixation, RTS = Return to sports, AOFAS = American Orthopaedic Foot and Ankle Society Ankle-Hindfoot Score, VAS = Visual Analogue Scale. Highlights in grey: additional studies not included in the review by Dhinsa et al. [1].

- Paper presenting stress fractures or association with calcaneonavicular coalition and therefore a different entity.
- Only included if the study was conducted on patients with a specific type of calcaneal fracture.
- Only included if the study was available in Korean.
- Differing numbers to Dhinsa et al. [1] as we only included patients who “who received adequate treatment at the start” according to Bradford et al. [7].
- Differing numbers to Dhinsa et al. [1] as only 31 of the 47 patients were available for follow-up according to Carey et al. [14].

References


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Received 30 October 2018
Accepted 5 November 2018