



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 brake 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.

Table 1

Adapted table 1 from the original paper and complemented it per another review [3].

Autor	Year	[n]	Study design	LOE	Degan classification/ dislocation	Objective outcome	Treatment
Christopher et al. [6]	1931	3	Case series	IV	ND	ND	Conservative: • Non-weightbearing (n = 2) or • Full weightbearing + Crutches (n = 1)
Bradford et al. [7]	1951	17 ^d	Case series	IV	ND	ND	Conservative: • Non-weightbearing (4–6 W) + elastic bandage/cast
Gellman et al. [8]	1951	6	Case series	IV	ND	ND	Conservative: • Non-weightbearing (4 W) + elastic bandage/cast
Backman et al. [9]	1953	20	Case series	IV	ND	ND	Conservative: • Non-weightbearing + ankle tape/cast (duration not stated)
Levine et al. [10]	1954	1	Case report	IV	Degan Type III ^b Slightly displaced	ND	Surgical (<i>symptomatic non-union</i>): • Excision
Garvin et al. [11]	1957	12	Case series	IV	ND	ND	Conservative: • Non-weightbearing (3–10 W) + Cast
Dell et al. [12]	1958	12	Case series	IV	ND	ND	Conservative: • Non-weightbearing (4–6 W) + Cast
Hellpap et al. [13]	1962	47	Case series	IV	ND	ND	Conservative: • Non-weightbearing (4 W) + Cast
Carey et al. [14]	1965	31 ^e	Case series ^e	IV	ND	ND	Conservative: • Non-weightbearing (1–8 W) + cast (n = 24) or • Non-weightbearing (1–8 W) elast. Bandage (n = 6) Surgical (<i>Indication not documented</i>): • ORIF (n = 1)
Hunt et al. [15]	1970	1	Case report	IV	ND	ND	Surgical (<i>acute fracture</i>): • ORIF
Norfray et al. [16]	1980	10	Case series	IV	ND	ND	Conservative: • Full weightbearing + elastic bandage (n = 9) Surgical (<i>large fragment</i>): • Excision (n = 1)
Degan et al. [2]	1982	25	Case series	IV	ND	ND	Conservative: • Non-weightbearing (2–10 W) + cast (n = 18) Surgical (<i>non-union n = 6; not stated n = 1</i>): • Excision (n = 7)
Renfrew et al. [17]	1985	7	Case series	IV	ND	ND	Conservative: • Non-weightbearing + ankle tape/cast
Howie et al. [18]	1986	7	Case series	IV	ND	ND	Conservative: • Non-weightbearing (4–6 W) + ankle tape/cast
Harburn et al. [19]	1987	1	Case report	IV	Dislocated	ND	Surgical (<i>prolonged healing > 7 W</i>): • Excision
Hodge et al. [20]	1998	1	Case report	IV	Degan Type III ^b Displaced	ND	No treatment/full weightbearing
Trnka et al. [21]	1998	1	Case report	IV	Degan Type III Displaced	ND	Surgical (<i>symptomatic non-union after 10 M</i>): • Excision
Robbins et al. [22]	1999	5	Case series	IV	Undisplaced (n = 3) Slightly displaced (n = 2)	ND	Conservative: • Immobilization (n = 4) Surgical (<i>symptomatic non-union after 9 M</i>): • Excision (n = 1)
Frey et al. [23]	2005	1	Case report	IV	ND	ND	Surgical (<i>prolonged healing > 10 W</i>): • Arthroscopic Excision
Pillai et al. [24]	2005	1	Case report	IV	Degan Type III ^b Displaced	ND	Surgical (<i>acute fracture</i>): • ORIF + Cast
Nilsson et al. ^a [25]	2006	1	Case report	IV	Not documented Calcaneonavicular Coalition	ND	Conservative: • Full weightbearing, nonimpact and low-impact training
Pearce et al. ^a [26]	2011	1	Case report	IV	Degan Type III ^b Undisplaced stress fracture Calcaneonavicular Coalition	ND	Surgical (<i>persistent pain > 5 weeks</i>): • ORIF/Excision of Calcaneonavicular Coalition
Lui et al. [27]	2011	1	Case report	IV	Displaced	ND	Surgical (<i>symptomatic non-union after 2 Y</i>): • Arthroscopic Excision
Ochman et al. [28]	2013	5	Case series	IV	Degan Type III Displaced	AOFAS Ø 91.4	Surgical (<i>acute fracture n = 4; symptomatic non-union n = 1</i>): • ORIF
Kim et al. ^c [29]	2012	12	Case series	IV			

Table 1 (Continued)

Author	Year	[n]	Study design	LOE	Degan classification/ dislocation	Objective outcome	Treatment
Taketomi et al. ^a [30]	2013	1	Case report	IV	Degan Type I n = 1 Degan Type II n = 6 Degan Type III n = 5 ND Calcaneonavicular coalition	AOFAS \emptyset 90.1 RTS 83.3% VAS \emptyset 2.2 ND	Surgical (<i>calcaneocuboid pain and disability</i>): • Excision Surgical (<i>symptomatic non-union after 6M</i>): • Drilling Surgical (<i>persistent pain >10M</i>): • Excision
Halm et al. [31]	2016	6	Case series	IV	ND	ND	Conservative: • Non-weightbearing + cast (4W)
Graham et al. [32]	2016	1	Case report	IV	Degan Type III ^b Slightly displaced	ND	Conservative: • Non-weightbearing + Walker (4W) followed by Full weightbearing + Walker (2W) followed by Ankle brace (6W)
Gibbons et al. [33]	2017	1	Case report	IV	Slightly displaced	ND	Conservative: • Non-weightbearing + Walker (4W) followed by Full weightbearing + Walker (2W) followed by Ankle brace (6W)
Fadl et al. [34]	2017	1	Case report	IV	Degan Type II ^b Slightly displaced	ND	Conservative: • Cast (4W)

LOE = Level of Evidence [35], ND = not documented, W = weeks, M = months, Y = years, ORIF = open reduction and internal fixation, RTS = Return to sports, A 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].

^a Paper presenting stress fractures or association with calcaneonavicular coalition and therefore a different entity.

^b Classified according to the radiographs provided within the paper.

^c Abstract only – paper only available in Korean.

^d 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].

^e 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].

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S.F. Baumbach
F.K. Massen
H. Polzer*

Munich University Hospital, Department of General, Trauma and
Reconstructive Surgery, Ludwig-Maximilians-University,
Nussbaumstr. 20, 80336 Munich, Germany

* Corresponding author.

E-mail address: hans.polzer@med.uni-muenchen.de (H. Polzer).

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