Discrepancies in diagnoses and treatment of type B ankle fractures

Leeuwen, C.A.T. van

4

Outcomes of treatment of foot and ankle fractures: which are important to the patient?

Van Leeuwen CAT, van der Geest T, Krijnen P, van Bodegom-Vos L, Termaat MF, Hoogendoorn JM, Schipper IB.

Eur Journal for Person Centered Healthcare 2019; 7(1)

Chapter 4. Outcomes of treatment of foot and ankle fractures: which are important to the patient?

Abstract

Background

Fractures of the ankle and foot are common and may be associated with long-term disabilities. Previous studies have examined function as an important patient-reported outcome, but little is known about patient expectations and satisfaction after their treatment. Aim of this study was to assess which outcomes are important to patients with an ankle or calcaneus fracture, and to assess which background and fracture characteristics might be associated with these outcomes.

Methods

A cross-sectional survey among 335 patients (response rate: 58%, n = 194) treated for a Weber B/C or calcaneus fracture, was performed. Patients were asked to identify and rank five treatment outcomes (out of 22 outcomes) that were the most important to them. The weighted importance of each outcome was calculated and averaged on group level. Stepwise multivariable regression analyses were performed to assess patient characteristics that are associated with patients' preferences for the most important outcomes.

Results

"Self-sufficiency" was reported most frequently (in 50/194; 25.8%) as the most important outcome, followed by "walking" and "complete recovery". The top five of most important outcomes differed somewhat between patient subgroups. The weighted importance of the outcomes was associated with various patient characteristics.

Conclusions

Self-sufficiency, walking and complete recovery are generally valued most by patients with an ankle or calcaneal fracture. The surgeon should be aware of this in order to manage any preoperative discrepancies between surgeons' and patients' expectations. Furthermore, evaluation of care should become more focussed on the outcome parameters that matter to the patient.

Introduction

Ankle fractures comprise 9% of all fractures, affecting mainly young men and older women. [1] The calcaneal fracture is less common (1-2% of all fractures).

Both ankle and calcaneal fractures are invalidating injuries. Nonoperative as well as operative treatment of these fractures are followed by long-term rehabilitation and potential disability when performing daily activities. [2,3] While functional outcomes are increasingly monitored using patient-reported outcome measures (PROMs), other outcomes that are relevant to the patient are still overlooked. During the rehabilitation process, patients experience physical and psychological problems such as pain, reduced muscle power, anxiety, frustration and even depression. They face, often unexpectedly, problems with recreational and leisure activities in their daily social life.[4,5] To be able to manage patients' expectations, it is important for the clinician to be aware of the most important problems that patients experience during their recovery.

The success of any medical intervention is often based on measurement of technical parameters.[6,7,8] However, other outcomes may be relevant for clinical decision making or for the evaluation of the outcome of fracture care, depending on the perspective that is taken.[9]From a socio-economical perspective, the trade-off between costs and benefits plays a prominent role.[10] From a clinical perspective, the focus is mainly on an optimal recovery and the prevention of complications. From the perspective of the patient, other outcomes may be important, such as quick return to work, the ultimate functional or cosmetic result or to be free from pain as soon as possible.

Little is known about what patients consider as relevant outcomes after fracture treatment [11] and if these preferences are related to specific patient or fracture characteristics.[9]
The aim of this study was to assess which outcomes are important to patients with a Weber B/C or calcaneus fracture, and to assess what factors are associated with these outcomes.

Study design and participants

The present cross-sectional study was conducted at two level one trauma centres in the Netherlands: the Leiden University Medical Centre (LUMC) in Leiden and the Haaglanden Medical Centre (HMC) in The Hague. The study was for both hospitals approved by the institutional

medical ethics review board of the LUMC (protocol no. P16.138). All patients participating in each phase of the study provided written informed consent.

Questionnaire development

In October 2016, one author (TvdG)) performed semi-structured interviews with eight patients who had sustained an ankle or foot fracture between July 2015 and September 2016, to identify the important outcomes for patients with these types of fractures. Purposive sampling was applied to select patients with contrasting views from the above described population, taking into account the following characteristics of patients during the sampling process: gender (male/female), age (20-74 years), follow-up duration since fracture (8 weeks-1 year), type of fracture (Weber B/C or calcaneus) and work (student, paid work, retired). The eight interviews were audiotaped and word for word transcribed. They were analysed using open coding by two independent authors (TvdG, PK). In the last two interviews no new information was obtained, so that data saturation was considered to be reached and no more interviews were held. A total of 22 outcomes relevant to the patients were identified during the interviews.

The questionnaire was developed based on the results of the interviews, and consisted of three parts. The first part focused on the characteristics of the patient: age, gender, comorbidities, educational level (low: no education, lower education and preparatory education; middle: secondary education and intermediate education; high: senior general secondary and pre-university education, university), support at home (no: living alone and living alone with child(ren); yes: living with partner, living with partner and child(ren) and living with others) and social participation (yes: being a student, having paid work or voluntary work; no: unemployed, disabled or retired).

The second part included questions about the characteristics of the fracture (fracture type, treatment, affected side) and the number of sport hours per week before the fracture took place. A visual analogue scale (VAS) was included to score the current pain level experienced in rest and in movement on a scale from 0 (no pain) to 10 (worst pain imaginable). Furthermore, patients were asked to report their use of pain medication related to pain due to the fracture.

The third part consisted of two questions covering the 22 identified relevant outcomes. In the first question, patients were asked to select the five out of 22 outcomes that were most important to them. In the second question, they were asked to rank these selected five outcomes from most (1) to least (5) important.

Survey

The questionnaire was sent to a consecutive cohort selected from the trauma registries of the two participating trauma centres. Patients aged ≥ 18 years and diagnosed with a Weber B/C or calcaneus fracture in the period July 2015 till September 2016 were eligible for inclusion (n=338). One reminder was sent after two weeks to the patients who had not responded. Patients who had not responded to the first reminder were contacted by phone after two weeks.

Analysis

All received questionnaires were included in the analysis. The questionnaires were filled in almost completely, with no more than 2% of the answers missing in total. Participant characteristics and outcomes were reported using descriptive statistics. To calculate the weighted importance of every outcome in the "top five" for each patient, we assigned a score of 1 to the outcome that was reported as most important by the patient; a score of 0.8 to the outcome in second place; a score of 0.6 to the outcome in third place; 0.4 to the outcome in fourth place and, a score of 0.2 to fifth, least important outcome. The outcomes not listed in the top 5 were assigned a score of 0. To identify the expected outcomes for the total group of patients, the average score for each outcome in the questionnaire was calculated. For specific subgroups a sub-analysis was performed: Weber B/C fractures or calcaneus fracture; age <70 or age ≥ 70 years; social participation yes or no; conservative treatment or operative treatment; male or female. Stepwise multi-variable linear regression analyses were performed to assess which background and fracture characteristics were associated with the patient reported outcomes. Potential factors of influence included patient (gender, age, comorbidity, sport, educational level, societal participation and support at home) and fracture (pain during rest, type of fracture and type of treatment) characteristics, as well as the length of follow-up since fracture (time between date of filling in the questionnaire and date of the trauma). Pain in motion was not included due to the high correlation with pain in rest.
The questionnaire were analysed using IBM SPSS Statistics for Windows, version 23.0. The level of statistical significance was set at $p < 0.05$.

Results

Of the 338 recruited patients, two patients had died and one patient had difficulties with walking for a different reason. As a result, they were excluded. 194 of the remaining 335 (58%) patients completed the questionnaire. The reason for non-response was not verified. In the non-respondent group, 77/141 patients (54,6%) were male and the mean age was 41.7 years.

In the respondent group, 104/194 patients (53.6%) were male and the mean age was 51.6 years. Mean followup time since fracture of these patients was 272,5 days (SD 109). 116/170 (68,6%) of the patients with a Weber B/C fracture were operated, while in the calcaneus fracture group only 5/24 (20,8%) were treated surgically. Mean pain scores in motion, either loaded or unloaded, in patients with a Weber B/C and in those with a calcaneus fracture were respectively 2.3 and 3.7. Patient characteristics of all included patients are presented in Table 1.

Table 1. Patient characteristics of the responding group, by fracture type.

Patient characteristic	Weber B/C fracture n=170	Calcaneus fracture n=24	Total n=194
Gender, n (%)			
Male	89 (52.4)	15 (62.5)	104 (53.6)
Female	81 (47.6)	9 (37.7)	90 (46.4)
Age (years), mean (SD)	51.6 (17.4)	50.9 (15.4)	51.5 (17.2)
Comorbidity, n (%)			
Yes	58 (34.1)	9 (37.5)	67 (34.5)
No	112 (65.9)	15 (62.5)	127 (65.5)
Weekly hours of sport, mean (SD)	3.4 (4.0)	3.5 (3.8)	3.4 (3.9)
Educational level, n (%)			
Low	32 (18.9)	5 (20.8)	37 (19.2)
Middle	49 (29.0)	10 (41.7)	59 (30.6)
High	88 (52.1)	9 (37.5)	97 (50.3)
Societal participation, n (%)			
Yes	111 (65.7)	11 (47.8)	123 (64.1)
No	58 (34.3)	12 (52.2)	67 (35.9)
Support at home, n (%)			
Yes	117 (68.8)	16 (66.7)	133 (68.6)
No	53 (31.2)	8 (33.3)	61 (31.4)
Pain score, mean (SD)			
In rest	1.3 (1.8)	1.8 (2.3)	1.4 (1.9)
In motion	2.3 (2.3)	3.7 (2.7)	2.5 (2.4)

Pain medication, n (%)			
Yes	26 (15.3)	4 (16.7)	30 (15.5)
No	144 (84.7)	20 (83.3)	164 (84.5)
Treatment, n (%)			
Operative	116 (68.6)	5 (20.8)	121 (62.7)
Conservative	53 (31.4)	19 (79.2)	72 (37.3)
Length of followup since fracture (days), mean (SD)	273.9 (106.8)	261.6 (126.8)	272.5 (109.0)
Hospital, n (%)			
University hospital	44 (25.9)	13 (54.2)	57 (29.4)
Non-university teaching hospital	126 (74.1)	11 (45.8)	137 (70.6)

Table 2 shows the 22 outcomes listed in the questionnaire, with the mean weighted scores for importance per outcome for the total group and separately for the patients with an ankle or calcaneus fracture. 'Self-sufficiency' was reported most frequently (by 50/194 patients, 25,8%) as the most important outcome (with mean weighted score for importance of 0.44), followed by "walking" and "complete recovery" (mean score 0.28), "being independent of other people" (mean score 0.24) and "self-reliance outside of the house" (mean 0.21). For patients with calcaneus fracture, the top five was similar, although the ranking was different. In the ankle fracture group, sport (mean score 0.20) was listed in the top five instead of self-reliance outside the house.

Table 2. The 22 identified patient-reported outcomes, ranked by the patients based on importance

	Weighted importance (top-five ranking)		
Outcomes	Total group (n=194)	Weber B/C (n=170)	Calcaneus (n=24)
A. Self-sufficiency (showering, going to the toilet, cooking)	0.44 (1)	0.44 (1)	0.43 (2)
B. Walking	0.28 (2)	0.25 (3)	0.47 (1)
C. Complete recovery	0.28 (3)	0.27 (2)	0.33 (3)
D. Being independent of other people	0.24 (4)	0.24 (4)	0.21 (5)
E. Self-reliance outside the house (shopping, going for a walk, going on vacation)	0.21 (5)	0.20	0.30 (4)
F. Sport	0.19	0.20 (5)	0.11

G. Performing household chores (vacuuming, washing, cleaning)	0.18	0.19	0.10
H. Driving	0.15	0.15	0.15
I. Going to work	0.14	0.14	0.11
J. Having no pain or irritating feeling in the ankle or foot	0.09	0.10	0.07
K. Having no fear of falling	0.09	0.10	0.02
L. Sleeping well at night	0.08	0.08	0.06
M. Knowing what to expect of my recovery	0.07	0.05	0.18
N. Bicycling	0.07	0.07	0.07
O. Having no additional complains (backache, neck pain or pain in the other leg)	0.06	0.06	0.08
P. Having a stable weight	0.06	0.06	0.03
Q. Posing no burden for others	0.06	0.06	0.04
R. Having social interaction, seeing family and friends	0.05	0.06	0.00
S. Staying physically fit	0.05	0.05	0.03
T. Not being physically tired	0.04	0.04	0.03
U. Exercise hobbies	0.03	0.03	0.04
V. Having no fear of undertaking activities	0.03	0.03	0.02

Table 3 shows that the top five outcomes relevant to the patient varied only slightly between patient subgroups. Again, the outcome 'self-sufficiency' was the most important outcome for each subgroup except for the calcaneus fracture group; walking was the most important outcome for these patients. In the group of responders without societal participation, 'performing household chores' was listed in third place (mean score 0.27). And for the male responders 'driving' and 'sport' were important and ranked equally in fourth place (mean score 0.21).

Table 3. Weighted scores for importance of the outcomes reported by all patients and by subgroups.

	N	1st place	2nd place	3rd place	4th place	5th place
Total Group	194	A (0.44)	B (0.28)	C (0.28)	D (0.24)	E (0.21)
Fracture: Weber B/C	170	A (0.44)	C (0.27)	B (0.25)	D (0.24)	F (0.20)
Fracture: calcaneus	24	B (0.47)	A (0.43)	C (0.33)	E (0.30)	D (0.21)
Age < 70	162	A (0.42)	C (0.30)	B (0.28)	D (0.24)	F (0.21)
Age ≥ 70	32	A (0.57)	B (0.28)	D (0.25)	E (0.23)	G (0.22)
Societal participation: yes	123	A (0.40)	C (0.33)	B (0.26)	D (0.26)	F (0.24)
Societal participation: no	69	A (0.50)	B (0.32)	G (0.27)	E (0.22)	D (0.21)
Treatment: conservative	72	A (0.49)	B (0.32)	E (0.25)	C (0.24)	D (0.22)
Treatment: operative	121	A (0.41)	C (0.29)	B (0.25)	D (0.25)	F (0.21)
Gender: male	104	A (0.45)	B (0.28)	C (0.28)	H/F (0.21)	E (0.20)
Gender: female	90	A (0.43)	D (0.31)	C (0.27)	B (0.27)	E (0.22)

A= Self-sufficiency; B=Walking; C=Complete recovery; D=Being independent of other people; E=Self-reliance outside the house; F=Sport; G=Performing household chores; H=Driving.

The results of the multivariable analyses are shown in table 4. Patients who exercised more regularly, ranked the outcome self-sufficiency as less important (regression coefficient B=-0.016, p=0.04). Patients participating in society considered the complete recovery outcome more important than patients who did not participate in society (B=0.140, p=0.03). Being independent of other people was considered more important by female patients (B=0.157, p = 0.003), and less important by patients with a longer follow-up (B=-0.001, p=0.02) and patients with higher pain scores in rest (B=-0.029, p=0.03). Patients with support at home ranked self-reliance outside as less important (B=-0.101, p=0.03). Sport was ranked as less important by older patients (B=-0.003, p=0.03) whereas patients who exercised more regularly ranked the outcome sport as more important (B=0.021, p<0.0001).

Table 4. Patient and fracture characteristics, related to the level of importance, that patients assign to outcomes after foot and ankle fractures, expressed as linear regression coefficient (beta) and corresponding 95% confidence interval (CI).

Outcome	Characteristic	Beta	95% CI	*p value*
A. Self-sufficiency				
	Sport (hours)	-0.016	-0.032;-0.001	0.037
B. Walking				
	Calcaneus vs Weber B/C	-0.253	-0.422;-0.083	0.004
C. Complete recovery				
	Societal participation	0.140	0.017;0.264	0.026
D. Independent of other				
people	**Female gender**	0.157	0.055;0.259	0.003
	Length of followup since	-0.001	-0.001;-0.0002	0.015
	fracture			
	Pain in rest	-0.029	-0.056;-0.002	0.033
E. Self-reliance outside				
	Support at home	-0.101	-0.192;-0.010	0.030
F. Sport				
	Sport (hours)	0.021	0.011;0.032	<0.0001
	Age (years)	-0.003	-0.005;-0.0004	0.025

Discussion

This study reveals the outcome parameters after treatment for patients with a Weber B/C or calcaneus fracture that are important to patients. It also addresses factors that may be of influence on the importance that patients assign to those outcomes. Most of the outcomes reported as important by patients reflect aspects of the self-reliance of the patient. The other important outcomes for patients, "walking", "complete recovery" and "sport", reflect aspects of physical functionality. Between subgroups of patients there were some differences regarding the top five of most important outcomes. For instance, male responders scored the outcome "driving" as important. However, the outcome "self-sufficiency" still was the most important outcome in most subgroups. Patient characteristics, like age or gender, have little impact on the ranking of outcomes

by patients so that almost the same outcomes are important for all patient subgroups. For the most important outcomes there were factors associated with the level of importance.

This study demonstrates that "self-sufficiency" is more important to patients, whereas the clinical perspective is focused on an optimal recovery and the prevention of complications. One other study [3] has also investigated outcomes important to patients with ankle fractures. This study, however, had a list of seven patient-reported outcomes, like "complete functioning", having no pain", "complete mobility of my ankle", "having no complications" and "time till recovery", from which patients chose their top three of most important outcomes. The current study had a list of twenty-two outcomes, conducted by the patients themselves, from which patients chose their own top five. With more (self-conducted) options for the patient to choose from, the outcome will be more extensive and possibly more reliable.

"Self-sufficiency" was the most important outcome in our study, whereas the study of the Dutch Patient Federation [12] found "optimal functioning" as most important outcome. Outcomes including "complete recovery" were listed in the top three of this study. In the study of the Dutch Patient Federation the mean follow-up time since fracture was between two and three years, which may be of influence for the outcome "optimal functioning" on the first place. Furthermore, our study population - with 194 completed questionnaires - is much larger than the 97 respondents who participated in the previous study. The current study gives more detailed information on the most important outcomes for patients and reveals new information of factors influencing these preferences of patients.

This study has some limitations. First, the number of patients with a calcaneus fracture was small, which made it difficult to evaluate whether the outcomes for the patients with a calcaneus fracture differed from those with an ankle fracture. However, the rehabilitation process of Weber B/C and calcaneus patients is roughly the same [1,4,12] which renders it less likely that relevant differences in outcomes between these fracture groups do exist. Second, the use of a paper-based questionnaire may have induced response bias. Elderly people are more likely to take the trouble to post the questionnaire in a mailbox because they generally have more time than younger people. Indeed, the mean age of patients who filled out the questionnaire (51.6 years) was higher than the mean age of patients who did not respond (41.7 years). Furthermore, patients who experience more pain and discomfort may be more likely to respond, which may also have induced response bias.

A strength of this study is that the outcomes used in the questionnaire were identified during interviews with patients who were diagnosed with a Weber B/C or calcaneus fracture, and who differed in follow-up duration since fracture, age, gender and type of work. This ensures that the

list of outcomes in the questionnaire was not based on the beliefs of the researchers, but based on the opinion of patients themselves. Consequently, a rather complete set of outcomes covering various aspects of both physical and mental well being were included in the questionnaire. Another strength of this study is the high response rate (58%), which enables us to draw firm conclusions. Furthermore, this study is one of the first that investigated the importance of treatment outcomes in patients with a Weber B/C or calcaneus fracture, and the first study that gives insight in possible factors influencing outcomes that are perceived as important by patients.

Understanding what is important for patients can be helpful in daily practice. For instance, clinicians can improve the self-reliance of their patients by discussing the limitations that patients are to expect during their recovery and by giving advice and information about aids that may help them to be less dependent on others in and around the house, especially during the early period of recovery and immobilization. The chosen outcomes are dependent of various factors (gender, age, hours of exercise) and therefore it remains important to realise that every patient is different and that the clinician must take into account the individual patient's preferences.

In conclusion, this study revealed that there are two groups of important outcomes as indicated by the patients with a Weber B/C or calcaneus fracture: "self-reliance" and "complete recovery". Furthermore, this study identified multiple patient related factors, like sport activities, female sex, type of fracture and support at home, that influence the level of relevance of the outcomes. The surgeon should be aware of these phenomena in order to manage any preoperative discrepancies between surgeons' and patients' expectations. Furthermore, evaluation of care should be focused on the outcome parameters that matter to the individual patient.

References

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures: a review. *Injury*. 2006;37(8):691–697.

2. Mitchell MJ, McKinley JC, Robinson CM. The epidemiology of calcaneal fractures. *Foot (Edinb)*. 2009; 19:197.

3. Ali MS, McLaren CA, Rouholamin E, O'Connor BT. Ankle fractures in the elderly: nonoperative or operative treatment. *J Orthop Trauma*. 1987;1(4):275-280.

4. Friesgaard K.D., Gromov K., Knudsen L.F., Brix M., Troelsen A., Nikolajsen L.. Persistent pain is common 1 year after ankle and wrist fracture surgery: a register-based questionnaire study. *Br J Anaesth*. 2006; 116:655-661.

5. McPhail S.M., Dunstan J., Canning J., Haines T.P.. Life impact of ankle fractures: Qualitative analysis of patient and clinician experiences. *BMC Musculoskelet Disord*. 2012; 13:224.

6. Anakwe R, Khan LL, Cook R, McEachan J.. Locked volar plating for complex distal radius fractures: Patient reported outcomes and satisfaction. *J Orthop Surg Res*. 2010;5:51

7. Leonardsson O., Rolfson O., Hommel A., Garellick G., Akesson K., Rogmark C.. Patient-reported outcome after displaced femoral neck fracture: a national survey of 4467 patients. *J Bone Joint Surg Am*. 2013; 95:1693-9.

8. Randsborg P.H., Fuglesang H.F„ Rotterud J.H., Hammer O.L., Sivertsen E.A. Long-term Patient-reported Outcome After Fractures of the Clavicle in Patients Aged 10 to 18 Years. *J Pediatr Orthop*. 2014; 34:393-9.

9 Lateef F. Patient expectations and the paradigm shift of care in emergency medicine. *J. Emerg Trauma Shock* 2011; 4: 163-167.

10. Hoang-Kim A., Miclau T., Goldhahn J., Nijman T.H., Poolman R.W. Patient-important outcome for the assessment of fracture repair. *Injury*. 2014; 45:2:S44-

11.. Morshed S., Corrales L., Genant H., Miclau T. 3rd. Outcome assessment in clinical trials of fracture-healing. *J Bone Joint Surg Am. 2008;* 90:1:62-7.

12. Van Harten C, Lammers R. Report 'The broken ankle.' Dutch Patient Federation; Utrecht, https://richtlijnendatabase.nl/gerelateerde_documenten/f/15357/Enquete%20enkelfracturen%20Patientenfederatie%20Nederland.pdf