Foot and Ankle Surgery 21 (2015) 286–289

Contents lists available at ScienceDirect

Foot and Ankle Surgery

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

Surgery for adult acquired flatfoot due to posterior tibial tendon dysfunction reduces pain, improves function and health related quality of life

M.C. Cöster [a,*], B.E. Rosengren [a], A. Bremander [b], M.K. Karlsson [a]

[a] Departments of Orthopedics and Clinical Sciences, Lund University, Skåne University Hospital Malmö, Sweden
[b] Departments of Rheumatology and Clinical Sciences Lund, Lund University, Lund, Sweden

ARTICLE INFO

Article history:
Received 1 December 2014
Received in revised form 4 February 2015
Accepted 13 April 2015

Keywords:
Adult acquired flatfoot deformity
Function
Outcome
Pain
Patient-reported outcome
Posterior tibial tendon dysfunction
SEFAS
Self-Reported Foot and Ankle Score
Surgery

ABSTRACT

Background: Patients with adult acquired flatfoot deformity (AAFD) due to posterior tibial tendon dysfunction (PTTD) may require surgery but few reports have evaluated the outcome.
Methods: We evaluated 21 patients with a median age of 60 (range 37–72) years who underwent different surgical reconstructions due to stage II AAFD before and 6 and 24 months after surgery by the validated Self-Reported Foot and Ankle Score (SEFAS), Short Form 36 (SF-36) and Euroqol 5 Dimensions (EQ-5D).
Results: The improvement from before to 24 months after surgery was in SEFAS mean 12 (95% confidence interval 8–15), SF-36 physical function 21 (10–22), SF-36 bodily pain 28 (17–38), EQ-5D 0.2 (0.1–0.3) and EQ-VAS 11 (2–21).
Conclusion: Surgery for AFFD due to PTTD results in reduced pain and improved function and health related quality of life. The outcome scores have been demonstrated as useful. It has also been shown, since there is a further improvement between 6 and 24 months after surgery, that a minimum follow-up of 2 years is needed.
Level of clinical evidence: III – prospective observational cohort study.

1. Introduction

Adult acquired flatfoot deformity (AAFD) could result in a painful progressive plano-valgus deformity characterized by collapsed medial arch, hindfoot valgus, midfoot varus and forefoot abduction [1–3]. The most common cause of AAFD is posterior tibial tendon dysfunction (PTTD), which involves pathology of the posterior tibial tendon (PTT) and the spring ligament [1]. AAFD was initially graded in three stages [4] later modified to four [5,6]. Stage II dysfunction of PTT includes a flexible deformity, where forefoot, midfoot and hindfoot may be involved. Recently Haddad et al. suggested that stage II should be further classified in five separate sub-categories as to better fathom the complexity of AAFD and facilitate individualized surgery; IIA no forefoot/midfoot deformity; IIB flexible forefoot supination; IIC fixed forefoot supination; IID forefoot abduction; and IIE medial ray instability [7,8]. That is, the hindfoot valgus is reducible in all sub-categories, but the forefoot/midfoot deformities differ.

The initial treatment of stage II AAFD includes shoe modifications, orthosis and physical therapy [9,10]. Surgery becomes an option after failed non-surgical treatment. There are less than 20 published studies that evaluate the outcome of this type of surgery, most are small retrospective investigations [11–19] with only postoperative data presented [23–26] and only few use a prospective design [20–22]. The aim of this study was to prospectively evaluate surgery for stage II AAFD. We asked: (i) does surgery in stage II AAFD lead to improvement? (ii) could PROMs capture any improvement? and (iii) how long does the improvement proceed?

2. Materials and methods

In this prospective study we invited all patients, except those with rheumatic or other inflammatory disease, scheduled for surgery due to stage II AAFD at two orthopedic departments in the same region in Sweden from first of January 2011 to last of

* Corresponding author at: Departments of Orthopedics and Clinical Sciences, Skåne University Hospital in Malmö, S-20522 Malmö, Sweden.
Tel.: +46 70 5851478; fax: +46 40336200.
E-mail address: maria.coster@med.lu.se (M.C. Cöster).

http://dx.doi.org/10.1016/j.fas.2015.04.003
1268-7731/

December 2012. All patients had before surgery failed non-surgical treatment including shoe modification, foot orthosis and physical therapy. All invited patients accepted to participate and there were no drop-outs during the study period. With the strategy described above, we included 15 women with a median age of 62 (range 37–72) years and 6 men with a median age of 59 (range 47–68) years. The specific surgical procedures were chosen by the surgeon based on grade and type of deformity (Table 1), in this study not specified in the individual case. The hindfoot valgus deformity was addressed with a medial displacement calcaneal osteotomy (MDCO) fixed with cannulated screws, mostly in combination with a transfer of the flexor digitorum longus (FDL) tendon to the navicular bone. The spring ligament was sutured or reconstructed in cases where the authors per-operatively found the ligament ruptured or substantially elongated. An opening wedge osteotomy of the anterior process of calcaneus [Evans lateral column lengthening (LCL)] was performed in patients with a higher degree of deformity including forefoot abduction. For the LCL the authors used bone graft from the iliac crest and the osteotomy was fixed with a staple. In patients with flexible or rigid forefoot supination we performed a first tarso-metatarsal (TMT) fusion fixated with cannulated screws or plates. In three patients with severe flexible deformities without arthritis in the hindfoot joints we added hindfoot fusions. In patients with equinus contracture we usually performed a gastrocnemius muscle recession (Strayer), but in one case the equinus deformity was too severe and we had to openly lengthen the achilles tendon (AT) instead. All participants followed a standardized postoperative routine with cast immobilization for 6–10 weeks, progressive weight bearing in cast from week 2 to 6 and removal of the cast after 6–10 weeks immediately followed by physical therapy.

We measured body weight and body height by standard equipment and calculated body mass index (BMI) as weight/height squared (kg/m^2). We asked all participants about their smoking habits and we scrutinized the complication registries of the two orthopedic departments as to identify wound infections, delayed wound healing, urinary tract infections, pneumonias and thromboembolic events. From medical records we also registered length of hospital stays, sick leave and if osteosynthesis material was removed postoperatively.

Immediate before and 6 (range 5–9) and 24 (range 20–32) months after surgery, the participants completed the Self-Reported Foot and Ankle Score (SEFAS), a validated region-specific score for foot and ankle disorders [24,25] and the generic scores Short Form 36 (SF-36) [26,27], Euroquol 5 Dimensions (EQ-5D) and Euroquol Visual Analogue Scale (EQ-VAS) [28]. In this study we report the results from two of the subscales in SF-36, physical function (PF) and bodily pain (BP). After 24 months the participants also responded to two specific questions (i) would you, with the same disability as preoperatively, once again choose to undergo the surgical procedure (yes/no) and (ii) have you improved after surgery (no disability with no symptoms/much improved/improved/unchanged/worse/)?

The study was approved by the regional ethical review board, Lund, Sweden (2009/698) and was performed according to the Declaration of Helsinki. Informed written consent was obtained from all participants prior to study start. Statistical calculations were performed with Statistical Package of Social Science (SPSS) software version 17.0 (IBM Software Statistics® 2009, US). Data are presented as numbers with proportions (%), mean ± standard deviations (SD) or as means with 95% confidence intervals (95% CI). We present absolute score values and absolute changes between the different evaluations and used paired *t*-test to estimate temporal differences. Responsiveness, the ability of a score to detect changes after for example surgery, was calculated for each PROM as effect size (ES), i.e., the score change divided by the standard deviation of the

Table 1
Surgical procedure in 21 participants with adult acquired flatfoot deformity (AAFD) due to posterior tibial tendon dysfunction (PTTD) stage II.

Participant (number)	Surgical procedures				
	Calcaneal osteotomies	Tendon transfer	Ligament repair	Fusions	Additional procedures
1				TMT I[d] Triple[e]	
2	MCO[a]	FDL[c]			
3	MCO, LCL[b]	FDL		TMT I	
4	MCO	FDL			
5	MCO	FDL	Spring ligament	TMT I	
6	–			TMT I, Triple	
7	MCO	FDL	Spring ligament	TMT I	
8	MCO				PL repair[h]
9				TMT I, TC[f], TN[g]	
10	MCO	FDL			
11	MCO	FDL	Spring ligament		Strayer[i]
12	MCO	FDL	Spring ligament	TMT I	
13	MCO, LCL	FDL	Spring ligament	TMT I	Strayer
14	MCO	FDL	Spring ligament		
15	MCO	FDL	Spring ligament	TMT I	AT lengthening [j]
16	MCO, LCL	FDL	Spring ligament	TMT I	
17	MCO	FDL	Spring ligament		
18	MCO	FDL	Spring ligament		
19	MCO, LCL	FDL	Spring ligament	TMT I	Strayer
20	MCO	FDL	Spring ligament	TMT I	
21	MCO	FDL			

[a] Medial displacement calcaneal osteotomy.
[b] Lateral column lengthening osteotomy.
[c] Flexor digitorum longus.
[d] First metatarsal-tarsal fusion.
[e] Triple fusion including talo-calcaneal, talo-navicular and calcaneo-cuboid joint.
[f] Talo-calcaneal joint.
[g] Talo-navicular joint.
[h] Repair of the peroneus longus tendon.
[i] Gastrocnemius recession.
[j] Achilles tendon lengthening.