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Long-Term Outcome of Open Plantar Fascia Release

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Abstract

Background: Plantar fasciitis is thought to be a self-limiting condition best treated by conservative measures, but despite this many patients have a prolonged duration of symptoms and surgery may be indicated. Partial plantar fascial release is reported to have a short-term success rate of up to 80%, but anecdotally this was not thought to represent our local experience.

Methods: An audit of long-term patient-reported outcomes following open partial plantar fascia release was performed. A total of 30 patients (33 feet) were identified over a 10-year period and case notes were reviewed. Patients were contacted by letter and invited to complete 2 validated patient-reported outcome score questionnaires (Visual Analog Scale–Foot and Ankle [VAS-FA] and Manchester Oxford Foot Questionnaire [MOXFQ]). Responses were received from 24 patients (26 feet). The average ages were 42.4 (range 24-61) for male and 46.2 (range 33-60) for female patients, with a female/male ratio of 2.7:1. The average duration of treatment prior to operative intervention was 3.1 years (range 1-5). Preoperatively, our cohort underwent a range of conservative measures. All patients were reviewed postoperatively, and average time from surgery to completion of questionnaires was 80 months (range 14-130).

Results: The outcomes were worse in patients who had received preoperative steroid injections and this was found to be statistically significant. The mean MOXFQ score was 33.6 ± 3.9 (0-64). Mean VAS-FA score was 57.8 ± 4.9 (24-100).

Conclusion: This study found a negative correlation between duration of follow-up and outcome, in both MOXFQ and VAS-FA, showing that patients continued to improve many years postoperatively. The authors also found worse outcomes with preoperative steroid injections, better outcomes in older patients, and a weak gender bias, suggesting results in men were better than those in women. A prolonged recovery period and generally poor outcomes leads the authors to suggest that open plantar fascia release is of questionable clinical value and that patients may improve in the natural course of the disease, in spite of surgery.

Level of Evidence: Level III, comparative study.

Keywords: plantar fascia, release, outcome

Introduction

Plantar fasciitis is a common condition with a lifetime incidence of up to 10%. It is thought that between 1 and 2 million outpatient appointments in the United States every year are due to symptoms associated with the condition.[25,30] Although the exact etiology is unknown, it is thought that repetitive microtrauma within the insertion of the plantar fascia is implicated.[6,28,33] The term fasciitis is a misnomer as it implies an underlying inflammatory process within the fibers of the plantar fascia. Histological studies instead find fascial microtears, collagen necrosis, myxoid degeneration, and angiofibroblastic hyperplasia indicating a chronic degenerative process in which inflammation is not implicated.[1,16] Risk factors associated with the development of plantar fasciitis include obesity, reduced ankle dorsiflexion, and prolonged weight bearing.[28] Plantar fasciitis tends to affect people between the ages of 40 and 60 years and shows a higher prevalence in females. However, it is also common among athletes and military personnel.[29] It has been reported as occurring bilaterally in as many as one-third of cases.[6]

Classic symptoms are heel pain that is worst on rising first thing in the morning and after periods of inactivity.

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Patients often experience palpable tenderness over the medial hindfoot, in the region of the medial calcaneal tuberosity. Diagnosis is made on the basis of patient history and clinical examination. The initial management of plantar fasciitis is with conservative measures, including analgesia, nonsteroidal anti-inflammatory drugs, orthotics (such as night splints, CAM boots or AFO splints), immobilization in a cast, and physical therapy. Corticosteroid injection, often combined with a local anesthetic, extra-corporeal shock wave therapy and therapeutic ultrasound are also recognized treatments. All these measures fail to control symptoms in 5% of patients,[18,36] for whom operative intervention is then considered.

Open plantar fascial release is a procedure that has been utilized for many years in the treatment of recalcitrant plantar fasciitis. The literature has reported success rates of up to 80% postoperatively[3]; however, it was felt that our local experience did not reflect such figures.

Methods

Patients were identified retrospectively from electronic records of all 3 hospitals offering orthopedic services within the region. A total of 37 patients (40 feet) were identified to have had a plantar fascial procedure. A case note review was then performed to ensure accuracy of the data, which identified 30 consecutive patients (33 feet) over a 10-year period between January 2001 and September 2011 who had undergone an open partial plantar fascial release for recalcitrant plantar fasciitis. The information collected retrospectively from the case notes were the presence of preoperative symptoms, as well as preoperative function including ability to work, sleep disturbance, and ability to exercise. In addition, any other conservative treatment that had been attempted were documented, along with surgeon information and postoperative treatment.

The majority of cases were performed as outpatient surgery or single overnight stay. Depending on the surgeon, either a transverse or a longitudinal incision was utilized and all patients underwent a partial release from the medial attachment; however, data regarding the extent of release were incomplete.

All of these subjects were then contacted by mail and invited to complete 2 patient-reported outcome questionnaires: the Manchester Oxford Foot Questionnaire (MOXFQ)[8-10] and the Visual Analog Scale–Foot and Ankle (VAS-FA).[27,34] Both of these are validated scores for various foot and ankle conditions, and both of these scores are split into 3 separate components as well as a combined overall score. The 3 MOXFQ domains are: walking/standing, foot pain and social interaction, while the 3 VAS-FA components are pain, function, and other, the latter being similar to the social interaction domain of the MOXFQ score. Both scores have a scale ranging from 0 to 100, with higher MOXFQ scores indicating a worse outcome, whereas the opposite is true for the VAS-FA. Those subjects who failed to respond initially were contacted by telephone. In total, 24 patients (26 feet) completed and returned the questionnaires and 6 patients were unable to be contacted. There were 17 (19 feet) female and 7 (7 feet) males. Participants were between the ages of 24 and 61 years (mean = 46.3 ± 1.8). All patients experienced pain as their predominant symptom. Other preoperative physical symptoms included gait abnormalities (30.7%) and neurologic symptoms (11.5%). Patients also had psychosocial problems including poor sleep (30.8%), inability to exercise (42.3%), and inability to work (19.2%). Preoperatively, there were several conservative treatments attempted. Every patient received orthotics (100%), more than half of the patients received physical therapy stretching exercises (57.7%), and about a quarter of patients had a below knee cast applied for a minimum of 6 weeks (26.9%). A large proportion of patients also received steroids (80.8%) as a preoperative conservative measure. None of the patients in this data set received therapeutic ultrasound, or extracorporeal shock wave therapy. Diagnosis was made initially on a clinical basis of history and examination for all patients. Consultant surgeons carried out the majority of the procedures (80.8%), with a minority performed by trainee surgeons (19.2%). Postoperatively, every patient received an ankle-level plaster bootee for 6 weeks. The follow-up duration to completion of the questionnaire ranged between 14 and 130 months (mean = 80.0 ± 7.4).

Results

Postoperative questionnaire scores revealed that mean MOXFQ total score (higher score indicates a worse outcome) was 33.6 ± 3.9, with a range of 64 (0 to 64). The breakdown of scores showed that patients had highest scores for walking (mean = 15.1 ± 1.8), then pain (mean = 10.6 ± 1.2) and then social (mean = 7.9 ± 1.1). The mean VAS-FA score (higher score indicates a better outcome) was 57.8 ± 4.9% with a range of 76% (24 to 100%). The mean scores showed that patients received the highest mean scores for function (mean = 60.4 ± 4.9%), then "other" (mean = 56.4 ± 4.9%) and lastly pain (mean = 52.9 ± 5.8%). The data were all normally distributed for each of the questionnaire categories with minimal skew or kurtosis, thus meeting parametric assumptions. Physical therapy was needed by about a quarter of patients postoperatively (23.1%).

There was no overall effect of gender on MOXFQ scores on multivariate analysis, Wilks Lambda $F(3, 22) = 16.3$, $P = .275$. However, the univariate tests showed that there was a significant difference in scores for male and female participants for social scores, $F(1, 24) = 4.6$, $P = .045$.

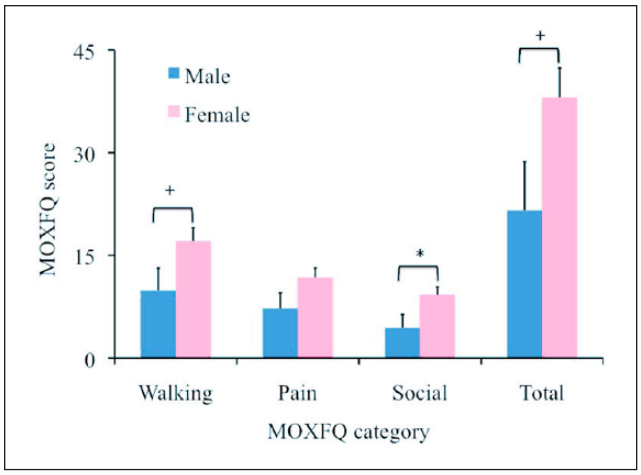

Figure 1. Graph showing the scores of the Manchester Oxford Foot Questionnaire when divided into male and female subjects, through the 3 categories. $^{\dagger}P < .1$, $^{*}P < .05$.

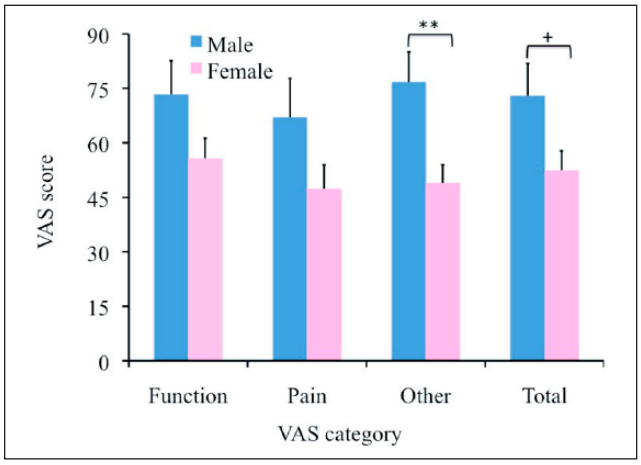

Figure 2. Graph showing the results of the Visual Analog Scale–Foot and Ankle when divided into male and female subjects, through the 3 categories. $^{+}P < .1$, $^{*}P < .01$.

Female participants had greater scores for the social component of the questionnaire compared to their male counterparts, and there was also a nearly significant effect of gender on the total MOXFQ score, F(1, 24) = 3.9, $P = .060$, with females achieving greater mean total scores (38.1 ± 4.3) compared with male participants (21.6 ± 7.1) (Figure 1).

There was a trend to suggest a gender influence on the VAS-FA scores using multivariate analysis: Wilks Lambda F(4, 21) = 2.6, $P = .064$. In general, women tended to have lower scores than men: function (male mean = 73.4 ± 9.2, female mean = 55.7 ± 5.6), pain (male mean = 67.0 ± 10.8, female mean = 47.7 ± 6.6), other (male mean = 76.7 ± 8.3, female mean = 48.9 ± 5.1), and total score (male mean = 72.9 ± 8.9, female mean = 52.4 ± 5.4). (Figure 2).

The influence of orthotics on MOXFQ and VAS-FA questionnaire scores could not be analyzed as all patients received this treatment. The results showed that there were no significant influences of preoperative physical therapy on postoperative MOXFQ or VAS-FA questionnaire scores. Patients treated preoperatively in a cast tended to have lower scores for the VAS-FA questionnaire, although these results did not achieve significance. There was a trend for VAS-FA-pain F(1, 24) = 3.5, $P = .075$, which indicated that patients who received a cast had lower VAS-FA scores (mean = 36.0 ± 10.6) compared with patients who did not receive a cast (mean = 59.1 ± 6.4). MOXFQ scores showed a similar association but did not reach significance.

The administration of steroids significantly influenced MOXFQ questionnaire scores. Patients who received steroids had significantly greater scores for social and total MOXFQ scores compared to patients who did not. There was also a trend to suggest that administration of steroids was associated with greater scores for walking (Table 1, Figure 3). Likewise, VAS-FA scores tended to be lower in patients who received steroids compared to patients who did not receive steroids (Table 2, Figure 4).

Although there was no significant difference in the grade of surgeon performing the surgery and the MOXFQ or VAS-FA scores, in general, the trends suggest that MOXFQ scores were lower if a consultant performed the procedure compared to a trainee surgeon (total MOXFQ score mean for consultants = 33.0 ± 4.4 and for trainee 36.2 ± 9.1, Wilks Lambda F[3, 22] = 0.3, $P = .854$). No association between postoperative physical therapy and MOXFQ or VAS-FA scores could be demonstrated.

Correlation analyses were performed using percentage scores from questionnaires, bivariate correlation analysis, and 2-tailed Pearson correlations (Table 3). Age correlation analysis showed a generally weak negative correlation between patient age and the score they obtained in the MOXFQ questionnaire, indicating better outcomes in older patients. This trend was significant for patient age and MOXFQ pain scores: Pearson r = −0.4, $P = .046$. There was a generally weak positive correlation between patient age and VAS score. This was also significant between patient age and VAS-pain score: Pearson r = 0.4, $P = .045$.

Correlation between questionnaire scores and duration of follow-up showed a negative correlation between patient follow-up time and MOXFQ score. This negative correlation was significant between follow-up time and MOXFQ social score (Pearson r = −0.5, $P = .015$) and also total MOXFQ score (Pearson r = −0.4, $P = .046$). A longer follow-up time was positively correlated with a greater VAS score. This positive association was significant between follow-up time and all of the VAS components except function: VAS–pain (Pearson r = 0.4, $P = .024$), VAS–other

Table 1. Table showing a breakdown of the analysis of Manchester Oxford Foot Questionnaire scores across the categories.

		Univariate results			
	Multivariate results[a]	Walking	Pain	Social	Total
Sex	F(3, 22) = 1.4, *P* = .275	F(1, 24) = 3.5, *P* = .073†	F(1, 24) = 2.9, *P* = .102	F(1, 24) = 4.4, *P* = .045*	F(1, 24) = 3.9, *P* = .060†
Preoperative symptoms					
Pain		Not applicable, 100% affected			
Gait disturbance	F(3, 22) = 1.6, *P* = .209	F(1, 24) = 0.2, *P* = .681	F(1, 24) = 0.0, *P* = .980	F(1, 24) = 0.4, *P* = .525	F(1, 24) = 0.0, *P* = .982
Neurologic symptoms	F(3, 22) = 0.5, *P* = .685	F(1, 24) = 0.3, *P* = .585	F(1, 24) = 0.0, *P* = .944	F(1, 24) = 0.0, *P* = .847	F(1, 24) = 0.1, *P* = .746
Preoperative function					
Ability to work	F(3, 22) = 1.2, *P* = .333	F(1, 24) = 2.1, *P* = .153	F(1, 24) = 3.5, *P* = .076†	F(1, 24) = 1.3, *P* = .268	F(1, 24) = 2.5, *P* = .131
Sleep disturbed	F(3, 22) = 2.1, *P* = .134	F(1, 24) = 0.6, *P* = .437	F(1, 24) = 2.5, *P* = .128	F(1, 24) = 2.0, *P* = .175	F(1, 24) = 1.5, *P* = .231
Ability to exercise	F(3, 22) = 0.8, *P* = .502	F(1, 24) = 0.6, *P* = .451	F(1, 24) = 1.6, *P* = .216	F(1, 24) = 0.4, *P* = .531	F(1, 24) = 0.8, *P* = .368
Preoperative treatment					
Orthotics		Not applicable, 100% received			
Physiotherapy	F(3, 22) = 0.7, *P* = .587	F(1, 24) = 0.0, *P* = .991	F(1, 24) = 0.4, *P* = .561	F(1, 24) = 0.1, *P* = .824	F(1, 24) = 0.1, *P* = .805
Therapeutic ultrasound		Not applicable, 0% received			
Steroid injection	F(3, 22) = 3.6, *P* = .029*	F(1, 24) = 3.2, *P* = .085†	F(1, 24) = 2.4, *P* = .133	F(1, 24) = 9.0, *P* = .006**	F(1, 24) = 4.4, *P* = .046*
Cast immobilization	F(3, 22) = 1.5, *P* = .239	F(1, 24) = 1.2, *P* = .291	F(1, 24) = 3.2, *P* = .088†	F(1, 24) = 1.4, *P* = .247	F(1, 24) = 1.9, *P* = .183

[a]Multivariate results reported using Wilks Lambda.
†Trend $P < .1$.
*Significant to $P < .05$.
**Significant to $P < .01$.

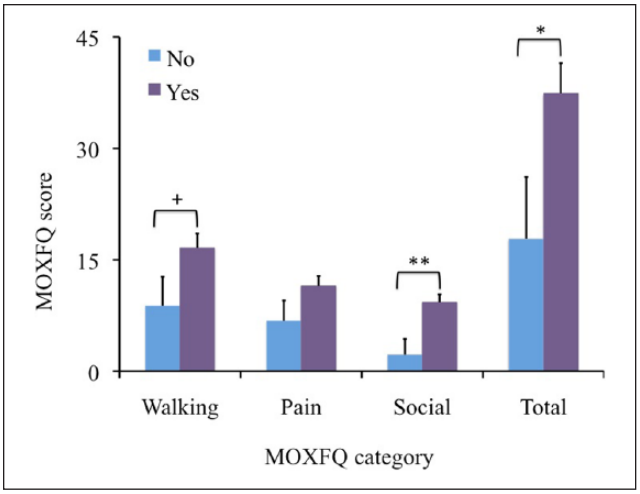

Figure 3. Graph comparing Manchester Oxford Foot Questionnaire scores of patients who underwent preoperative steriod injection against patients who did not. (†Trend $P < .1$, *significant to $P < .05$, **significant to $P < .01$).

(Pearson r = 0.5, $P = .016$) and VAS–total (Pearson r = 0.4, $P = .029$).

Discussion

The results from open partial plantar fascia release in this study were poor, and this is similar to other studies.[5,7,12] However, good results following operative intervention have previously been documented in the literature. A 1999 study by Davies et al[7] reported improvements in the mean VAS from 8.5 of 10 preoperatively to 2.5 of 10 postoperatively, with 75.6% of patients either pain-free or with only mild pain at follow-up. These results are significantly better than those achieved in the current study.

This study is a retrospective cohort study looking at the outcomes following partial plantar fascial release for recalcitrant plantar fasciitis at an average of 80 months postoperatively. Unfortunately, as it is a retrospective study, we have no preoperative scoring of patients to compare to, and thus are not able to give an objective assessment of preoperative

Table 2. Table showing a breakdown of the analysis of VAS-FA results across the categories.

	Multivariate Results[a]	Univariate Results			
		VAS-FA–Function	VAS-FA–Pain	VAS-FA–Other	VAS-FA–Total
Preoperative symptoms					
Pain					
Gait disturbance	F(4, 21) = 2.0, P = .137	F(1, 24) = 0.0, P = .979	F(4, 24) = 0.0, P = .946	F(4, 24) = 1.0, P = .326	F(4, 24) = 0.1, P = .807
Neurologic symptoms	F(4, 21) = 1.9, P = .152	F(1, 24) = 0.0, P = .921	F(1, 24) = 0.1, P = .706	F(1, 24) = 0.2, P = .286	F(1, 24) = 0.0, P = .904
Preoperative function					
Ability to work	F(4, 21) = 1.1, P = .348	F(1, 24) = 1.8, P = .197	F(1, 24) = 1.9, P = .179	F(1, 24) = 2.0, P = .168	F(1, 24) = 2.0, P = .166
Sleep disturbed	F(4, 21) = 2.2, P = .109	F(1, 24) = 0.5, P = .483	F(1, 24) = 2.0, P = .174	F(1, 24) = 2.4, P = .132	F(1, 24) = 1.2, P = .278
Ability to exercise	F(4, 21) = 1.4, P = .257	F(1, 24) = 0.5, P = .487	F(1, 24) = 2.0, P = .172	F(1, 24) = 0.6, P = .454	F(1, 24) = 0.8, P = .372
Conservative treatment					
Orthotics		Not applicable, all patients			
Physiotherapy	F(4, 21) = 2.2, P = .102	F(1, 24) = 0.0, P = .952	F(1, 24) = 0.2, P = .648	F(1, 24) = 0.8, P = .393	F(1, 24) = 0.0, P = .945
Therapeutic ultrasound		Not applicable, 100% received			
Steroid injection	F(4, 21) = 2.0, P = .138	F(1, 24) = 4.2, P = .049*	F(1, 24) = 5.9, P = .023*	F(1, 24) = 5.9, P = .023*	F(1, 24) = 5.5, P = .027*
Cast immobilization	F(4, 21) = 2.3, P = .087†	F(1, 24) = 2.2, P = .152	F(1, 24) = 3.5, P = .075†	F(1, 24) = 1.5, P = .237	F(1, 24) = 2.5, P = .129

[a]Multivariate results reported using Wilks Lambda.
†Trend P < .1.
*Significant to P < .05.

Table 3. Table Showing the Correlation Analysis of All Categories of MOXFQ and VAS-FA Scores.

	MOXFQ–Walk	MOXFQ–Pain	MOXFQ–Social	MOXFQ–Total	VAS–Function	VAS–Pain	VAS–Other	VAS–Total
Patient age	−0.3	−0.4*	−0.3	−0.3	0.3	0.4*	0.2	0.3
Follow-up time	−0.3	−0.4	−0.5*	−0.4*	0.4	0.4*	0.5*	0.4*

Abbreviations: MOXFQ, Manchester Oxford Foot Questionnaire; VAS-FA, Visual Analog Scale–Foot and Ankle.
*P < .05.

function or severity of symptoms. Despite this, the length of follow-up in this study is significantly greater than much of the current literature.[3,7,17,36] In our cohort of patients the average time before operative treatment was in excess of a year. However, we have no information about the numbers of patients successfully treated with nonoperative measures, or those that had a poor response to conservative treatment and did not wish to undergo surgery.

On reviewing the literature, there are very few recent articles pertaining to open partial plantar fascial release. However, there are multiple articles about other forms of treatment, including endoscopic release,[4,14,19,20,21] platelet-rich plasma injections,[13,22,32] botulinum toxin A injection,[11,24] percutaneous frequency coblation,[31,35] extracorporeal shock wave therapy,[23,26] and radiotherapy.[2,15] One has to ask the question, If there are so many different modalities described, do any of them actually work? Furthermore, if open partial plantar fascial release had good results, then it is unlikely that so many alternative treatments would be researched. Anecdotally, this would suggest the outcomes from plantar fascia surgery are poor.

This view is supported by a recent study by DiGiovanni et al,[12] who surveyed 84 committee members of the American Orthopaedic Foot & Ankle Society in order to measure the consensus regarding management of recalcitrant plantar fasciitis. They concluded, as supported by the

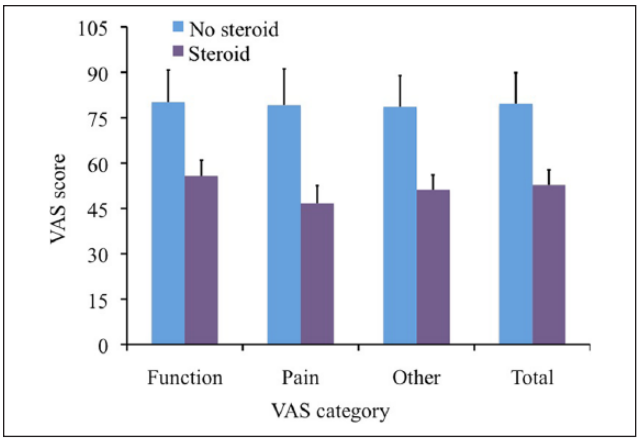

Figure 4. Graph comparing Visual Analog Scale–Foot and Ankle scores of patients who underwent preoperative steriod injection against patients who did not.

literature, that for shorter-duration symptoms, nonoperative management is favored. However, when asked the question of management of persistent symptoms at 10 months, only 55% of respondents reported that surgery would be their choice of treatment, and only 23% would elect to carry out open plantar fascial release. The heterogeneity in the responses to this survey, particularly as the participants form a group of subspecialty trained foot and ankle experts with an appreciation of the current literature, points to a lack of quality evidence to aid in the planning of operative management of recalcitrant plantar fasciitis. The length of attempted conservative management in our study (mean 30.4 months), and the negative correlation found between duration of follow-up and outcome, strengthens this conclusion and suggests that any long term effects of surgery may be negated by the natural course of the disease.

Lateral column pain was reported to be a significant complication of plantar fascia release in a 2002 study by Brugh et al.[5] They found that 30% of their patient cohort had ongoing lateral column pain postoperatively and suggested a link between a release of more than 50% and an increased incidence of postoperative pain. Although no recording of the extent of plantar fascia release was undertaken in our study, the poor results may be related to the extent of the release that was performed.

The other reason for the poor outcome may be related to the location within the plantar fascia of the disease. A study by Leong et al has reported that a significant proportion of patients presenting with recalcitrant plantar fasciitis have atypical disease characteristics on ultrasound.[17] They found that 34% of patients undergoing ultrasound investigation for recalcitrant plantar fasciitis had either mixed proximal insertion and distal disease (22%) or purely distal disease with no insertional pathology (12%). Although the majority of patients were found to have insertional disease (66%), those with more distal pathology represent a significant proportion, which is in contrast with the generally accepted premise of plantar fasciitis being an insertional disorder.

Conclusion

This study represents the longest mean longitudinal follow-up for open release and provides a number of interesting observations. There was a trend toward a difference in outcomes between genders, with females achieving poorer outcomes than males, but this did not reach statistical significance for MOXFQ or VAS-FA. However, there were statistical differences in outcomes in the mean social score for MOXFQ and in the "other" domain for VAS-FA. There was no correlation between either the MOXFQ or VAS-FA and the use of physiotherapy and casting preoperatively. There was also no significant difference in the postoperative MOXFQ and VAS-FA scores and preoperative level of function (ability to work, to sleep, or perform exercise), which means it is difficult to predict outcomes from surgery based on the patients' reported level of severity of symptoms. However, a significant difference was noted between the treatment with steroids and postoperative MOXFQ scores showing poorer outcomes in patients who had received plantar fascial injections. This is potentially an important finding as steroid injections are frequently employed with the belief that the risks of administration are extremely low. Perhaps the most important finding of this study is the negative correlation between the duration of follow-up and outcome as patients continued to improve many years after surgery, which raises the question whether this operative intervention was the cause of the improvement or whether the improvement is related to the natural history of the disease. Overall, the results from open plantar fascia release were generally poor.

Declaration of Conflicting Interests

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