

Outcomes of plantar fasciotomy to treat plantar fasciitis

Resultados da cirurgia de fasciotomia plantar no tratamento da fasciíte plantar

Rodrigo Guimarães Huyer¹, Cíntia Kelly Bittar^{1,2}, Carlos Daniel Cândido de Castro Filho¹, Carlos Augusto de Mattos¹, Mário Sérgio Paulillo de Cillo¹, João Henrique Tavares Ribeiro¹

1. Pontifícia Universidade Católica de Campinas, Campinas, SP, Brazil.

2. Instituto Wilson Mello, Campinas, SP, Brazil.

ABSTRACT

Objective: This study sought to evaluate the effectiveness of a surgery (plantar fasciotomy) to treat plantar fasciitis using the American Orthopedic Foot and Ankle Society (AOFAS) questionnaire.

Methods: Patients were retrospectively identified using their postoperative orthopedic (medical) records after receiving medial plantar fasciotomy for plantar fasciitis between 1997 and 2009.

Results: A significant difference was observed between the pre- and postoperative AOFAS score; this result indicates that patient health improved after the fasciotomy to treat plantar fasciitis.

Conclusions: A strength of this study was its long follow-up time of patients undergoing plantar fasciotomy to treat plantar fasciitis. This surgery is indicated for patients with chronic plantar fasciitis after 6 months without response to conservative treatment.

Level of Evidence IV; Therapeutic Studies; Case Series.

Keywords: Fasciitis, plantar; Fasciitis, plantar/surgery; Fasciotomy.

RESUMO

Objetivo: Avaliar a efetividade do tratamento cirúrgico (fasciotomia plantar) para fasciíte plantar por meio do questionário AOFAS.

Métodos: Pacientes foram identificados retrospectivamente nos arquivos ortopédicos (prontuários) pós-operatórios de fasciotomia plantar medial para fasciíte plantar entre os anos de 1997 e 2009.

Resultados: Houve diferença estatisticamente significativa entre os valores do escore AOFAS pré e pós-operatório e esse resultado reflete que os pacientes obtiveram um melhor estado de saúde após a realização da fasciotomia para tratamento da fasciíte plantar.

Conclusão: Este estudo tem como principal característica o longo tempo de acompanhamento dos pacientes submetidos à fasciotomia plantar para tratamento da doença. O procedimento cirúrgico está bem indicado nos pacientes crônicos com fasciíte plantar após seis meses sem resposta ao tratamento conservador.

Nível de Evidência IV; Estudos Terapêuticos; Série de Casos.

Descritores: Fasciíte plantar; Fasciíte plantar/cirurgia; Fasciotomia.

How to cite this article: Huyer RG, Bittar CK, Castro Filho CDC, Mattos CA, Cillo MSP, Ribeiro JHT. Outcomes of plantar fasciotomy to treat plantar fasciitis. *Sci J Foot Ankle*. 2019;13(1):42-8.

Work performed at the Pontifícia Universidade Católica de Campinas, Campinas, SP, Brazil.

Correspondence: Carlos Daniel Cândido de Castro Filho. Avenida John Boyd Dunlop, S/N, Jardim Londres, CEP: 13034-685, Campinas, SP, Brazil.

E-mail: cdccfilho@hotmail.com

Conflicts of interest: none. **Source of funding:** none.

Date received: December 18, 2018. **Date accepted:** February 13, 2019. **Online:** March 31, 2019



Copyright © 2019 SciJFootAnkle

INTRODUCTION

Plantar fasciitis is a common disease with annual incidence of 10%. In the United States, between 1 and 2 billion outpatient visits occur annually due to complaints related to this condition^(1,2). The etiology of this disease is unknown; however, repetitive microtraumas at the origin of the plantar fascia are most likely responsible for the condition⁽³⁻⁵⁾. Although the term “plantar fasciitis” is used to describe this disease, histological studies have identified microinjuries in the fascia, collagen necrosis, myxoid degeneration, and angiofibroblastic hyperplasia, indicating a chronic degenerative process in which the inflammatory process is not involved^(6,7).

The risk factors associated with the development of plantar fasciitis include obesity, decreased ankle dorsiflexion, and prolonged orthostatism. Plantar fasciitis primarily occurs between 40 and 60 years old, with a higher prevalence among women. In addition, it commonly affects professional athletes and military personnel⁽⁸⁾.

Plantar fasciitis occurs bilaterally in up to 1/3 of all cases, and its classic symptoms include pain in the calcaneus and stabbing pain during the early morning and after periods of inactivity. Patients often report spontaneous pain and/or pain to palpation in the medial plantar tuberosity of the calcaneus. A diagnosis is made based on a medical interview and physical examination; if necessary, imaging tests complement the exam.

The initial treatment of plantar fasciitis is conservative and includes the use of analgesics, anti-inflammatories, orthoses, splints, and physical therapy. Corticosteroid injections combined with local anesthesia, shock wave therapy, and ultrasound therapy are also recognized treatment options. None of these options control the symptoms of 5% of patients⁽⁹⁻¹¹⁾ for whom surgery should be considered.

Open plantar fasciotomy has been used for many years to treat patients with plantar fasciitis who are unresponsive to conservative treatment.

This study evaluated the effectiveness of plantar fasciotomy to treat plantar fasciitis. Previous studies⁽¹²⁾ have shown an approximate treatment success of 80%; our study corroborated this rate after a long follow-up period of patients undergoing this type of treatment.

METHODS

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 03035118.1.0000.8021.

This study met all of the ethical requirements for human research. A total of 14 patients who were treated with medial plantar fasciotomy for plantar fasciitis were retrospectively identified based on their postoperative orthopedic records. A review of these cases was performed to determine the accuracy of the data, identifying 18 feet with plantar fasciitis surgically treated over 12 years between 1997 and 2009.

Patients who did not show symptom improvement after at least 6 months of clinical follow up and who underwent conservative treatment were included in this study. All patients who showed symptom improvement with conservative treatment (i.e., physical therapy, stretching exercises, NSAIDs, and corticosteroid injections) were excluded.

Based on the review of medical records, a clinical evaluation of the patients determined the onset of pain associated with plantar fasciitis and the time between the onset of symptoms and the surgery indicated. It also evaluated the associated neurological symptoms because many patients diagnosed with plantar fasciitis have symptoms of compression of the first branch of the associated lateral plantar nerve⁽¹³⁾.

In addition, changes in gait, ability to exercise, ability to work, and the sleep quality of the patients were scored in this review; all of these items were evaluated based on their association with the symptoms of plantar fasciitis. All patients presented with pain as the main complaint, and half of the patients reported at least one neurological symptom; 94.4% were unable to perform physical activity, and 38.8% were not able to work.

After indication for surgery, the following data were individually scored to characterize each patient: age at the time of surgery, sex, duration of preoperative clinical treatment, postoperative follow-up time, operated side, and the postoperative score of the American Orthopedic Foot and Ankle Society (AOFAS).

Surgical Description

All patients were placed in the dorsal decubitus position. An oblique 3-4 cm incision was made along the plantar aspect of the calcaneus along the transition between the hindfoot and midfoot following the first lateral branch of the plantar nerve proximal to the abductor hallucis muscle belly (Figure 1).

Plane dissection was performed, and the subcutaneous fatty tissue and the superficial fascia of the abductor hallucis muscle were identified and retracted using Farabeuf

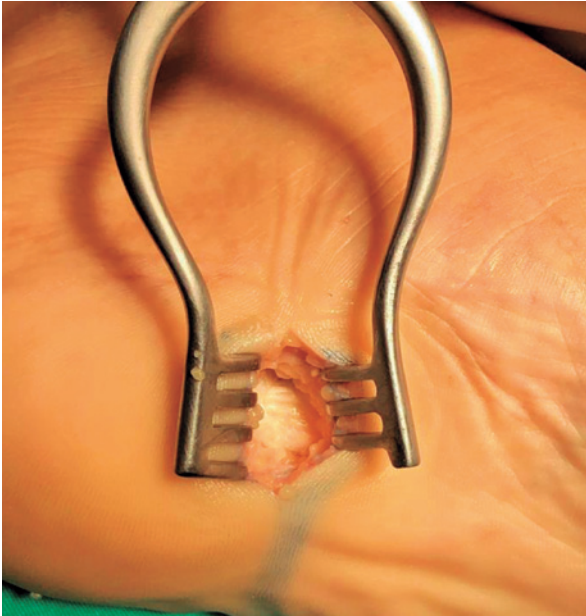


Figure 1. Oblique incision along the midfoot-hindfoot transition.
Source: Author's personal archive.

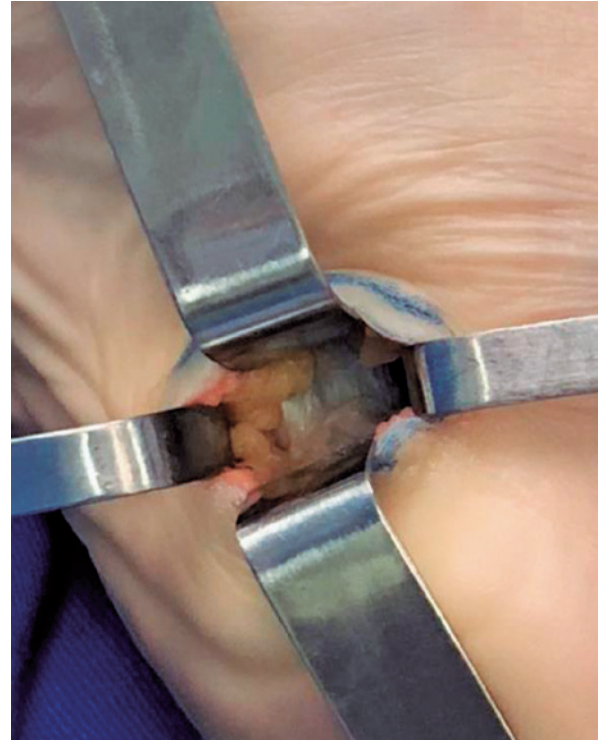


Figure 2. After deep dissection, retraction of the fatty tissue using Farabeuf retractors to identify the superficial fascia of the abductor hallucis.
Source: Author's personal archive.

retractors (Figure 2). After exposure, the superficial fascia of the abductor hallucis was released. The deep fascia of the abductor hallucis was identified and released. Upon the release of the deep fascia, the structures were moved to the side. In the plantar region of the surgical wound, the medial plantar fascia was identified in the inferior aspect of the wound, and then the medial plantar fascia was sectioned with a scalpel or scissors (Figure 3), followed by hemostasis and surgical cleaning. Subsequently, the surgical wound was sutured, and a sterile dressing was applied.

RESULTS

Given that the authors did not categorize the numerical values of the scale as excellent, good, fair, or poor⁽¹⁴⁾, it was necessary to validate the scale using a generic quality of life questionnaire (the 36-item short-form health survey [SF-36])⁽¹⁵⁻¹⁷⁾ and perform this categorization separately so that the final score ranged from 0 to 100 points, with 0 being the worst health status and 100 denoting the best health status (see Table 1). Based on previous studies comparing scales (after the translation and validation of the AOFAS score), we obtained a valid and reproducible score that enabled us to assess our patients based on clinical and functional aspects^(14,18).

SPSS 23 for macOS was used for all statistical analyses. The Wilcoxon test, a nonparametric paired-difference test,

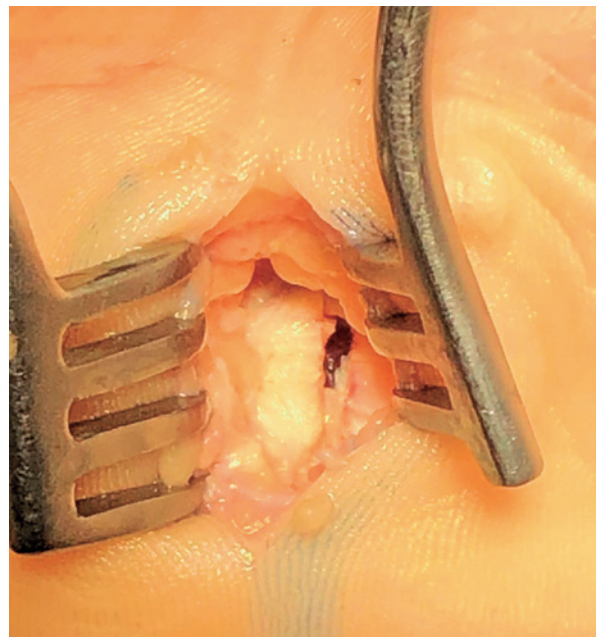


Figure 3. Visualization of the sectioned plantar fascia.
Source: Author's personal archive.

was used to compare the pre- and postoperative outcomes. The chi-square test was used to analyze the categorical data. A significant difference was defined as a p-value of less than the probability of making a type I error (5%); in this case, a p-value of 0.0003 was obtained, which is below 0.001.

Based on the p-value of <0.001, the pre and postoperative AOFAS scores significantly differed ($p < 0.001$).

In our study, the mean postoperative AOFAS score was 83.33, which indicates that patient health improved after the fasciotomy to treat plantar fasciitis (Tables 2 and 3).

The retrospective evaluation of the patients' AOFAS score revealed a mean score of 83.3 (range 26 – 100; Table 3).

On average, the patients were 47 years old at the time of surgery. Conservative treatment was applied for approximately 1 year and 7 months; the shortest interval between the beginning of treatment and the surgical indication was 6 months, and the longest was 3 years (Table 4).

However, the statistical results were not significant with regard to the pre- versus postoperative analysis because of the reduced number of patients enrolled in this study (conservative treatment is successful for most patients with this condition). Therefore, these data are not addressed in the discussion or conclusion sections of this paper. Thus, although the classification of function changed from fair to good and from good to excellent between the preoperative and postoperative periods, the association between the intervention and the outcome was weak. Thus, the outcome occurred by chance, with a value of approximately 20% ($p > 0.001$).

DISCUSSION

One of the strengths of this study is its long follow-up time of patients undergoing open plantar fasciotomy to treat plantar fasciitis to investigate the functional clinical outcomes obtained through the application of the AOFAS score.

Fasciotomy has shown positive results when used to treat plantar fasciitis according to the literature⁽¹⁹⁾. Davies et al.⁽⁷⁾ demonstrated that 75.6% of evaluated heels were painless or only slightly painful. The mean visual analog pain score decreased from 8.5 out of 10 during the preoperative period to 2.5 out of 10 during the postoperative period. Four patients did not report improvements in their physical restrictions, and those who presented the lowest scores had failed surgeries, most likely because of incorrect surgical indications and continued to experience pain and functional limitations. One patient walked less than 100 meters after surgery. Overall, 20 of the 41 patients were completely satisfied with the outcome (48.8%). In that study, patients who did not respond to conservative treatment were advised to consider surgery.

The current cross-sectional study evaluated AOFAS scores by comparing the preoperative outcomes with the postoperative outcomes of patients who underwent fasciotomy to treat plantar fasciitis. In addition, the long postoperative follow-up time adopted here is significantly greater than those of most published studies^(11,12,19,20), which range between 12- and 49-month postoperative follow ups. In addition, few studies have addressed open fasciotomy to treat plantar fasciitis. On the other hand, many articles have addressed

Table 1. Cross tabulation of preoperative and postoperative functions

		Postoperative function			Total	
		Fair	Good	Excellent		
Preoperative function	Poor	Count	0	1	0	1
		% in preop function	0.0%	100.0%	0.0%	100.0%
		% in postop function	0.0%	12.5%	0.0%	5.6%
	Fair	Count	2	2	6	10
		% in preop function	20.0%	20.0%	60.0%	100.0%
		% in postop function	100.0%	25.0%	75.0%	55.6%
	Good	Count	0	5	2	7
		% in preop function	0.0%	71.4%	28.6%	100.0%
		% in postop function	0.0%	62.5%	25.0%	38.9%
Total		Count	2	8	8	18
		% in preop function	11.1%	44.4%	44.4%	100.0%
		% in postop function	100.0%	100.0%	100.0%	100.0%

Preoperative function: 0 (poor); 1 (fair); 2 (good).

Postoperative function: 0 (poor); 1 (fair); 2 (good); 3 (excellent).

Source: Prepared by the author based on the results of the research.

Table 2. Pre and postoperative AOFAS results

AOFAS		Test statistic
Preoperative	Mean	43.56
	Standard deviation	6.723
Postoperative	Mean	83.33
	Standard deviation	21.933

Source: Prepared by the author based on the results of the research.

Table 3. Comparison between pre and postoperative AOFAS scores

Patient	Preoperative	Postoperative
1	45	36
2	37	100
3	35	26
4	35	63
5	48	100
6	42	72
7	38	100
8	46	87
9	46	87
10	52	100
11	43	100
12	55	87
13	55	90
14	43	77
15	49	89
16	35	100
17	35	100
18	45	86

Source: Prepared by the author based on the results of the research.

Table 4. Follow-up data

Age at time of surgery *	Follow-up time *	Sex	Duration of pre-operative treatment
57	12	F	3 years
69	13	F	1 year 6 months
40	12	M	3 years
40	12	M	3 years
51	10	M	6 months
56	11	M	2 years
58	15	M	9 months
39	17	M	2 years
39	17	M	2 years
28	11	M	6 months
59	12	F	3 years
42	9	F	2 years
42	9	F	2 years

* in years

Source: Prepared by the author based on the results of the research.

the treatment of plantar fasciitis with endoscopic plantar fascia release⁽²¹⁻²⁵⁾, platelet-rich plasma injections⁽²⁶⁻²⁸⁾, botulinum toxin injections^(29,30), percutaneous radiofrequency ablation^(31,32), shock wave therapy^(33,34), and radiotherapy^(35,36).

In their study of endoscopic plantar fascia release, Bazzaz and Ferrel⁽⁴⁾ showed an improvement in the mean AOFAS score from 66 to 88 (p<0.05). Franceschi et al.⁽¹⁰⁾ showed promising results regarding the use of platelet-rich plasma injections to treat plantar fasciitis; however, they concluded that the number of available studies evaluating the use of this therapy is limited, and randomized placebo-controlled studies are needed to support its use as a treatment for plantar fasciitis. Othman et al.⁽²⁰⁾ demonstrated better results for endoscopic release compared with shock wave therapy and recommended the former procedure over the latter for treating plantar fasciitis.

Considering the studies presented in this discussion, which are related to less invasive approaches in patients with plantar fasciitis, we chose to evaluate patients undergoing open surgery because it is easy to perform, cost-effective, and does not require the use of industrially manufactured surgical material. Because of the positive results obtained, the low cost, and the reproducibility of the technique, open fasciotomy is a viable alternative to treat plantar fasciitis.

Therefore, plantar fasciitis surgery is indicated after conservative treatment fails. On the other hand, no agreement exists among foot and ankle surgeons concerning the appropriate time for surgical indication^(12,37,38); according to Baxter et al.⁽³⁾, at least 6 months of conservative treatment should be attempted. The present study observed the postoperative results of recurrent plantar fasciitis surgery, with a minimum follow-up time of 7 years, with surgical indications after 6 months of conservative treatment.

Given the mean AOFAS score and the significant difference between the pre- and postoperative AOFAS scores for open fasciotomy, we infer that open plantar fasciotomy to treat plantar fasciitis plays an important role in the management of this disease, especially among patients with chronic symptoms.

CONCLUSIONS

Open plantar fasciotomy is a safe procedure with low complication rates. It is indicated in patients with chronic pain or refractory pain after 6 months of conservative treatment failure because it significantly improves the pain and function of the affected limb as demonstrated by the postoperative AOFAS score.

Authors' contributions: Each author contributed individually and significantly to the development of this article: RGH *(<https://orcid.org/0000-0003-3951-8408>) participated in the review process, approved the final version; BKB *(<https://orcid.org/0000-0002-1997-5372>) interpreted the results of the study, participated in the review process; CDCCF *(<https://orcid.org/0000-0003-3522-1076>) conceived and planned the activities that led to the study, wrote the article, participated in the review process, approved the final version; CAM *(<https://orcid.org/0000-0003-3482-5265>) interpreted the results of the study, participated in the review process and approved the final version; MSPC *(<https://orcid.org/0000-0002-0758-2547>) conceived and planned the activities that led to the study, wrote the article, participated in the review process, approved the final version; JHTR *(<https://orcid.org/0000-0002-4379-5099>) interpreted the results of the study, participated in the review process and approved the final version. *ORCID (Open Researcher and Contributor ID).

REFERENCES

- Aldridge T. Diagnosing heel pain in adults. *Am Fam Physician*. 2004; 70(2):332-8.
- Badakhshi H, Buadch V. Low dose radiotherapy for plantar fasciitis. Treatment outcome of 171 patients. *Foot (Edinb)*. 2014;24(4):172-5.
- Baxter DE, Pfeffer GB. Treatment of chronic heel pain by surgical release of the first branch of the lateral plantar nerve. *Clin Orthop Relat Res*. 1992;(279):229-36.
- Bazaz R, Ferkel RD. Results of endoscopic plantar fascia release. *Foot Ankle Int*. 2007;28(5):549-56.
- Brugh A, Fallat L, Savoy-Moore R. Lateral column symptomatology following plantar fascial release: a prospective study. *J Foot Ankle Surg*. 2002;41(6):365-71.
- Buchbinder R. Clinical practice. Plantar fasciitis. *N Engl J Med*. 2004; 350(21):2159-66.
- Davies M, Weiss G, Saxby T. Plantar fasciitis: how successful is surgical intervention? *Foot Ankle Int*. 1999;20(12):803-7.
- Díaz-Llopis IV, Gómez-Gallego D, Mondéjar-Gómez FJ. Botulinum toxin type A in chronic plantar fasciitis: clinical effects one year after injection. *Clin Rehabil*. 2013;27(8):681-5.
- Di Giovanni B, Moore A, Zlotnicki J, Pinney S. Preferred management of recalcitrant plantar fasciitis among orthopaedic foot and ankle surgeons. *Foot Ankle Int*. 2012;33(6):507-12.
- Franceschi F, Papalia R, Franceschetti E, Paciotti M, Maffulli N, Denaro V. Platelet-rich plasma injections for chronic plantar fasciitis: a systematic review. *Br Med Bull*. 2014;112(1):83-95.
- Hogan KA, Webb D, Shereff M. Endoscopic plantar fascia release. *Foot Ankle Int*. 2004;25(12):875-81.
- Holtmann H, Niewald M, Prokein B, Graeber S, Ruebe C. Randomized multicenter follow up trial on the effect of radiotherapy for plantar fasciitis depending on dose and fractionation-a study protocol. *Radiat Oncol*. 2015;10:23.
- Lemont H, Ammirati KM, Usen N. Plantar fasciitis: a degenerative process (fasciosis) without inflammation. *J Am Podiatr Med Assoc*. 2003;93(3):234-7.
- Leong E, Afolayan J, Carne A, Solan M. Ultrasound scanning for recalcitrant plantar fasciopathy. Basis of a new classification. *Skeletal Radiol*. 2013;42(3):393-8.
- Martin RL, Irrgang JJ, Conti SF. Outcome study of subjects with insertional plantar fasciitis. *Foot Ankle Int*. 1998;19(12):803-11.
- Morton TN, Zimmerman JP, Lee M, Schaber JD. A review of 105 consecutive uniport endoscopic plantar fascial release procedures for the treatment of chronic plantar fasciitis. *J Foot Ankle Surg*. 2013; 52(1):48-52.
- Nery C, Raduan F, Mansur N, Baunfeld D, Del Buono A, Maffulli N. Endoscopic approach for plantar fasciopathy: a long-term retrospective study. *Int Orthop*. 2013;37(6):1151-6.
- Ohuchi H, Ichikawa K, Shinga K, Hattori S, Yamada S, Takahashi K. Ultrasound-assisted endoscopic partial plantar fascia release. *Arthrosc Tech*. 2013;2(3):e227-30.
- O'Malley MJ, Vosseller JT, Gu Y. Successful use of platelet-rich plasma for chronic plantar fasciitis. *HSS J*. 2013;9(2):129-33.
- Othman AM, Ragab EM. Endoscopic plantar fasciotomy versus extracorporeal shock wave therapy for treatment of chronic plantar fasciitis. *Arch Orthop Trauma Surg*. 2010;130(11):1343-7.
- Peterlein CD, Funk JF, Hölscher A, Schuh A, Placzek R. Is botulinum toxin A effective for the treatment of plantar fasciitis? *Clin J Pain*. 2012;28(6):527-33.
- Pfeffer G, Bacchetti P, Deland J, Lewis A, Anderson R, Davis W, et al. Comparison of custom and prefabricated orthoses in the initial treatment of proximal plantar fasciitis. *Foot Ankle Int*. 1999;20(4):214-21.
- Radwan YA, Mansour AM, Badawy WS. Resistant plantar fasciopathy: shock wave versus endoscopic plantar fascial release. *Int Orthop*. 2012;36(10):2147-56.
- Richter M, Zech S, Geerling J, Frink M, Knobloch K, Krettek C. A new foot and ankle outcome score: questionnaire based, subjective, visual-analogue-scale, validated and computerized. *Foot Ankle Surg*. 2006;12(4):191-9.
- Riddle DL, Pulisic M, Pidcoke P, Johnson RE. Risk factors for Plantar fasciitis: a matched case-control study. *J Bone Joint Surg Am*. 2003; 85(5):872-7.
- Riddle DL, Pulisic M, Sparrow K. Impact of demographic and impairment-related variables on disability associated with plantar fasciitis. *Foot Ankle Int*. 2004;25(5):311-7.
- Riddle DL, Schappert SM. Volume of ambulatory care visits and patterns of care for patients diagnosed with plantar fasciitis: a national study of medical doctors. *Foot Ankle Int*. 2004;25(5):303-10.
- Sean NY, Singh I, Wai CK. Radiofrequency microtenotomy for the treatment of plantar fasciitis shows good early results. *Foot Ankle Surg*. 2010;16(4):174-7.
- Shetty VD, Dhillon M, Hegde C, Jagtap P, Shetty S. A study to compare the efficacy of corticosteroid therapy with platelet-rich plasma therapy in recalcitrant plantar fasciitis. *Foot Ankle Surg*. 2014; 20(1):10-3.
- Singh D, Angel J, Bentley G, Trevino SG. Fortnightly review. Plantar fasciitis. *BMJ*. 1997;315(7101):172-5.
- Tay KS, Ng YC, Singh IR, Chong KW. Open technique is more effective than percutaneous technique for TOPAZ radiofrequency coblation for plantar fasciitis. *Foot Ankle Surg*. 2012;18(4):287-92.
- Wolgin M, Cook C, Graham C, Mauldin D. Conservative treatment of plantar heel pain: long-term follow-up. *Foot Ankle Int*. 1994;15(3):97-102.

33. Kitaoka HB, Alexander IJ, Adelaar RS, Nunley JA, Myerson MS, Sanders M. Clinical rating systems for the ankle-hindfoot, mid-foot, hallux and lesser toes. *Foot Ankle Int.* 1994;15(7):349-53.
34. Guyatt GH. A taxonomy of health status instruments. *J Rheumatol.* 1995;22(6):1188-90.
35. Ware JE, Shelbourne CD. The MOS 36-item short-form health survey (SF-36): Conceptual framework and item selection. *Med Care.* 1992;30(6):473-83.
36. Ciconelli RM, Ferraz MB, Santos W, Meinão I, Quaresma MR. Tradução para a língua portuguesa e validação do questionário genérico de avaliação da qualidade de vida SF-36 (Brasil SF-36). *Rev Bras Reumatol.* 1999;39(3):143-50.
37. Rodrigues RC, Masiero D, Mizusaki JM, Imoto AM, Peccin MS, Cohen M, et al. Tradução, adaptação cultural e validação do "American orthopaedic foot and ankle society (AOFAS) ankle-hindfoot scale. *Acta Ortop Bras.* 2008;2:107-11.
38. Watson TS, Anderson RB, Davis WH, Kiebzak GM. Distal tarsal tunnel release with partial plantar fasciotomy for chronic heel pain: an outcome analysis. *Foot Ankle Int.* 2002;23(6):530-7.