

ORIGINAL ARTICLE

COMPLICATION OF CORTICOSTEROID INJECTION: RUPTURE OF PLANTAR FASCIA

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ABSTRACT

Introduction: A series of 550 patients with a clinical diagnosis of plantar fasciitis. All patients were initially given a conservative trial with anti-inflammatory medications along with resting and icing and rest. 280 patients of planter fasciitis got relieved by such conservative management. Only 270 patients received corticosteroid injections and 37 of them were diagnosed with planter fascia rupture post injection. The Diagnosis of the rupture was mostly clinical which was assessed by windlass stretch test by dorsiflexion of the ankle and first toe. In patients who are diabetic the chances of rupture also increases. Treatment following rupture included supportive shoes, orthoses, and time.

Methods: All patients with clinical diagnosis of PF who came to Dr. Ziauddin Hospital out-patient department from 2012 to 2016 were taken into our study after consent. Only those patients were given CI that reappeared to the Outpatient with similar or worsening of symptoms. 4 out of the 37 patients in whom the clinical assessment was inconclusive MRI were done which showed attenuation of the plantar fascia. From these observations and data, the author concluded that PFR had occurred.

Results: Out of 270 patients only 37 patients (13.7%) were diagnosed with plantar fascia rupture. With increase in BMI the chances rupture increases. The majority had resolution of their new symptoms, but they often took up to 6 months to reoccur. In the remainder, there were persisting symptoms.

Conclusion: Corticosteroid injections, although helpful in the treatment of plantar fasciitis, appear to predispose to plantar fascia rupture.

KEYWORDS: CI: Corticosteroid Injections, BMI: Body Mass Index, PF: Plantar Fasciitis, PFR: Plantar Fascia Rupture

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INTRODUCTION

Inflammation of the plantar fascia is known as plantar fasciitis. Patient typically complains of localized tenderness made worse on stepping on the heel and this is due to calcaneal spurs. Physical activity overload, abnormal foot mechanics, or may be underlying diseases that cause arthritis, such as Reiter disease, ankylosing spondylitis, and diffuse idiopathic skeletal hyperostosis are precipitants to plantar fasciitis. The aim of treatment is to decrease inflammation and avoid re-injury. Icing decreases pain and inflammation. Anti-inflammatory agents were given to decrease the inflammation and corticosteroids injections.

The plantar fascia is a broad structure that is situated

between the medial calcaneal tubercle and the proximal phalanges of the toes. Rather than a true fascia, it is more like an aponeurosis and serves as the most vital structure for arch support. The plantar fascia is predominantly composed of longitudinal collagen fibers. There are three distinct structural components: the medial component, the central component (plantar aponeurosis), and the lateral component. The largest and most prominent being the central component. In the younger age group, plantar fascia is closely related to the Achilles tendon. It maintains a continuous fascial connection between the two, from the distal aspect of the Achilles to the calcaneal tubercle, where the plantar fascia originates. However, in the elderly, this connection loses its continuity and they are left with few, if any, connecting fibers.

Although ruptures are rare, corticosteroid injections into the heel have been shown to be a causative agent.^{1,16,23} Leach et al. was the first to report spontaneous rupture in 1978.¹⁶ In this report, and in subsequent articles by Herrick and Herrick¹² and Ahstron rapid resolution of the patients' symptoms within 6 to 8 weeks was the rule. Recently, Sellman's work has shown that rupture post corticosteroid injection may lead to long-term sequelae. We aim to define complications in patients with plantar fascia rupture who have had corticosteroid injections and evaluate their treatment and subsequent prognosis.

METHODS

550 patients, who were clinically diagnosed to be suffering from plantar fasciitis, were evaluated from January 2012 to December 2016 in Dr. Ziauddin University Hospital Out-patient Departments. The management was tailored for each patient with respect to the location and the severity of symptoms at the time presentation. All patients were prescribed nonsteroidal anti-inflammatory drugs and/or oral mild narcotic analgesic and advised to modify their activity along with rest. A stiff-soled athletic shoe with an orthotic, or a boot walker, was utilized until symptoms improved. Chart analysis and telephone surveys were carried out for follow up analysis.

280 patients were treated successfully conservatively with icing, anti-inflammatory drugs, physiotherapy exercises or orthosis. The remaining 270 patients did not respond to conservative measures, mentioned above or their symptoms partially or temporarily got better and they revisited our clinics with the reoccurring planter fasciitis. In these 270 patients corticosteroid injections were given which comprised of Depomedrol 40mg with 2% Lidocaine which were injected into the plantar fascia origin. Both of these injections were taken in 10cc disposable syringe. 40mg of Depomedrol consisting of 1ml and 5ml of 2% Lidocaine were taken. The needle is changed to a 25Gauge needle. The heel is cleaned with pyodene solution, covering almost half of the heel on the medial side. Disposable surgical gloves are worn and this solution is injected on the medial side of the heel into the tenderest point. The surgeon normally feels the bone (calcaneum) with the needle and gently draws out the needle and start injecting the solution. The area is cleaned by spirit swab. The patient is allowed to stand up and put full weight on the affected heel. He/she is advised to apply ice compressions at home for 24 to 48 hours until the inflammation of the injected solution settles down. Anti-inflammatory drugs are normally prescribed for the first few days.

Only 37 patients were among the patients who had received the injections and had plantar fascia rupture. All of the 270 patients were counseled in detail and they agreed to receive a corticosteroid injection in their heels. Of the 270 patients received corticosteroid injections, 193 patients were male and 77 patients. Initially all patients were evaluated and underwent physical examination and observation of gait. The plantar fascia was examined and palpated to detect any mass or thickening. Continuity of the plantar fascia was assessed by Windlass stretch testing by dorsiflexing the ankle and the first toe. The maneuver is also performed on the opposing foot for comparison. In one case where there was bilateral involvement, tension was absent in both feet. The rest of the extremity was examined and neurovascular status was also assessed. Subjective and objective evaluations were conducted, 2 to 52 weeks (average of 14 weeks) after injection.

Clinical results were determined by using a modification of the scoring system developed at the Mayo Clinic for assessing postoperative results after plantar fascia release⁷. Recovery of the patients was gauged by this system at the latest follow-up according to three categories: as excellent (90-100 points), good (80-89 points), fair (70-79 points), or poor (70 points). Additionally, we asked the patients' opinion of the most effective treatment and how long the maximum recovery took since the onset of new (post rupture) symptoms.

RESULTS

Out of the 550 total number of patients, only 270 (49.1%) patients were given corticosteroid injections, the remaining 280 patients responded to conservative management. From the 270 patients who had received corticosteroid injection only 37 patients were diagnosed with plantar fascia rupture, with a percentage of 13.7%. From the patients who had received steroid injections, 193 were male and 77 female; 28 males with percentage of 14.5% and 9 females (11.7%) were diagnosed with planter fascia rupture as demonstrated in Table 1.

It can be seen that as the Body Mass Index increases the chances rupture also increases as demonstrated in Table 2-A, with a significant P-Value of <0.008 as demonstrated in Table 2-B. Patients who have diabetes are 4.5 times more prone to rupture than those who are non-diabetic Table 3-C and a significant p-value of <0.001 (Table 3-B).

TABLE 1: MALE FEMALE RUPTURE DISTRIBUTION

		PLANTER FASCIA RUPTURE		TOTAL	
		YES	NO		
MALE	COUNT	28	165	193	
	% WITHIN GENDER_1	14.5%	85.5%	100.0%	
FEMALE	COUNT	9	68	77	
	% WITHIN GENDER_1	11.7%	88.3%	100.0%	
TOTAL		37	233	270	
		% WITHIN GENDER_1	13.7%	86.3%	100.0%

TABLE 1-A: CHI-SQUARE TESTS

	VALUE	DF	ASYMP. SIG. (2-SIDED)	EXACT SIG. (2-SIDED)	EXACT SIG. (1-SIDED)
PEARSON CHI-SQUARE	.370 ^a	1	.543		
CONTINUITY CORRECTION ^b	.170	1	.680		
LIKELIHOOD RATIO	.380	1	.538		
FISHER'S EXACT TEST				.695	.347
N OF VALID CASES	270				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.55.
 b. Computed only for a 2x2 table

TABLE 1-B: RISK ESTIMATE

	VALUE	95% CONFIDENCE INTERVAL	
		LOWER	UPPER
ODDS RATIO FOR GENDER_1 (M / F)	1.282	.575	2.860
FOR COHORT PLANTER FASCIA RUPTURE = YES	1.241	.615	2.507
FOR COHORT PLANTER FASCIA RUPTURE = NO	.968	.876	1.070
N OF VALID CASES	270		

TABLE 2: CASE PROCESSING SUMMARY

	CASES					
	VALID		MISSING		TOTAL	
	N	PERCENT	N	PERCENT	N	PERCENT
BODY MASS INDEX * PLANTER FASCIA RUPTURE	270	100.0%	0	0.0%	270	100.0%

TABLE 2-A: BODY MASS INDEX * PLANTER FASCIA RUPTURE CROSS TABULATION

			PLANTER FASCIA RUPTURE		TOTAL
			YES	NO	
BODY MASS INDEX	UNDERWEIGHT (<18.5)	COUNT % WITHIN BODY MASS INDEX	0 0.0%	2 100.0%	2 100.0%
	HEALTHY (18.5-24.9)	COUNT % WITHIN BODY MASS INDEX	8 8.0%	92 92.0%	100 100.0%
BODY MASS INDEX	OVERWEIGHT (20.0-29.9)	COUNT % WITHIN BODY MASS INDEX	19 13.8%	119 86.2%	138 100.0%
	OBESE (>40.0)	COUNT % WITHIN BODY MASS INDEX	10 33.3%	20 66.7%	30 100.0%
TOTAL		COUNT % WITHIN BODY MASS INDEX	37 13.7%	233 86.3%	270 100.0%

TABLE 2-A: BODY MASS INDEX * PLANTER FASCIA RUPTURE CROSS TABULATION

	VALUE	DF	ASYMP. SIG. (2-SIDED)	EXACT SIG. (2-SIDED)
PEARSON CHI-SQUARE	12.844 ^a	3	.005	.020
LIKELIHOOD RATIO	11.209	3	.011	.012
FISHER'S EXACT TEST	11.019			.008
N OF VALID CASES	270			

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .27.

TABLE 3: CASE PROCESSING SUMMARY

	CASES					
	VALID		MISSING		TOTAL	
	N	PERCENT	N	PERCENT	N	PERCENT
DIABETES * PLANTER FASCIA RUPTURE RUPTURE	270	100.0%	0	0.0%	270	100.0%

TABLE 2-A: BODY MASS INDEX * PLANTER FASCIA RUPTURE CROSS TABULATION

		PLANTER FASCIA RUPTURE		TOTAL
		YES	NO	
Diabetes	COUNT	14	28	42
	% within Diabetes	33.3%	66.7%	100.0%
	% within Planter Fascia Rupture	37.8%	12.0%	15.6%
	COUNT	23	205	228
	% within Diabetes	10.1%	89.9%	100.0%
	% within Planter Fascia Rupture	62.2%	88.0%	84.4%
Total	COUNT	37	233	270
	% within Diabetes	13.8%	86.2%	100.0%
	% within Planter Fascia Rupture	100.0%	100.0%	100.0%

TABLE 3-B: CHI-SQUARE TESTS

	VALUE	DF	ASYMP. SIG. (2-SIDED)	EXACT SIG. (2-SIDED)	EXACT SIG. (1-SIDED)
PEARSON CHI-SQUARE	16.206 ^a	1	.000	.000	.000
CONTINUITY CORRECTION ^b	14.300	1	.000		
LIKELIHOOD RATIO	13.174	1	.000	.001	.000
FISHER'S EXACT TEST					
N OF VALID CASES	270				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.76.

b. Computed only for a 2x2 table

TABLE 3-C: RISK ESTIMATE

	VALUE	95% CONFIDENCE INTERVAL	
		LOWER	UPPER
ODDS RATIO FOR DIABETES (DIABETIC / NON-DIABETIC)	4.457	2.057	9.653
FOR COHORT PLANTER FASCIA RUPTURE = YES	3.304	1.855	5.885
FOR COHORT PLANTER FASCIA RUPTURE = NO	.741	.596	.922
N OF VALID CASES	270		

DISCUSSION

Plantar fasciitis is a condition which has many synonyms in medical language. Subcalcaneal pain, calcaneodynia and heel spur are a few such examples. Regardless of what name is used, the patient presents with the complaint of 'heel pain'. If we further divulge into the matter the pain typically shows up after rest or in the morning and usually is a result of increased activity levels, such as in patients that are frequent in sports that require running. A spontaneous onset is usually observed but certain variables such as increase in weight, prolonged

standing, altered levels of activity and training Z errors, all have shown associations with Plantar fasciitis.^{2,9,18,21,25}

For the treatment of Plantar fasciitis, a conservative approach is usually adopted where a patient is advised to take rest, physiotherapy, use anti inflammatory medications, elevate the heel and use heel supports such as cushions, orthotic devices or splints. More than 80-90% of patients respond well to a nonoperative, conservative approach^{2,4,5,9,10,11,17,18,21,25}. That said, there is a spectrum when it comes to the forms of treatment and there is great diversity in the degree of success each one

offers^{4, 5, 11,17,18,21}. At times when the conservative approach fails, we turn to injectable agents such as corticosteroids, which are quite popular amongst most studies^{4,5,11,17,18,21,25}.

On the contrary there are studies that talk about the risks associated with these injections. Mann et al.⁵ believes fat pad atrophy to be a consequence of corticosteroid injections. Previously carried out studies^{1, 2} state that rupture of the plantar fascia is also a complication of such injections.

A number of studies have attributed spontaneous tendon rupture to these local injections. An article written by Y¹³ Kennedy and Willis¹⁴ looks at the effect of corticosteroids injected into the Achilles tendon of rabbits and talks about consequential collagen necrosis and disruption of collagen fibers. Furthermore it states that complete biomechanical reconstruction occurs after 6 weeks of the procedure. We have interestingly found, in our series of cases, that the average rupture time is about 10 weeks. This suggests that this sort of intervention hinders the healing process in Planter fasciitis. Further evidence supporting this notion is provided by a piece written by Sellman²³. In a series of 37 patients it was found that in about 50% with symptomatic rupture will present with long term or permanent injury related sequelae^{7,13,19,22}. Additionally Huang et al¹³ pointed out of the damaging effect of plantar fasciotomy, as the plantar fascia is vital in maintaining the longitudinal arch and stability.

In recent times, studies have given support to the thought that rupture or surgical release because increased strain on the lateral column structure and result in lateral midfoot pain.¹⁹

Now the question that arises is that, is cortisone truly a contributing factor in the cases of rupture? In the 2 years of this study, 550 patients that presented with heel pain were seen by the author. Among the ones who suffered plantar fascia rupture only 55 had received a steroid injection, which translates into 29%.

Patients in our study mostly presented with a pain vaguely explained as midfoot pain and weakness. This pain arose randomly after rupture and worsened with unprotected activity. The lateral column was found to be most often involved, even though majority pointed out the pain to be in the mid foot. Out of a total of 37, 21 patients localized their midfoot pain in the lateral column. The rest had diffused midfoot pain. Planter fascia elongation has also been found to have a relationship with acquired hammertoe deformities. With increasing age, declining efficiency of intrinsic flexors and plantar aponeurosis may allow hyperextension of the proximal phalanx. We observed that 10 patients developed asymmetric hammertoe on the affected foot after the rupture of the plantar fascia and

nerve dysfunction was not a contributor to the symptoms. We also noted six patients who developed intermittent or permanent disability of the lateral plantar nerve. Patients complained of numbness or tingling in the plantar-lateral forefoot and upon examination the lateral plantar nerve showed decreased sensation and/or intrinsic motor weakness. The cause of this is thought to be a result of lost arch support, which causes hyperpronation.

Long-term relief was inconstant and in some cases not achieved. These side effects of plantar fascia rupture are an evidence of a recent series demonstrating poor outcomes of plantar fasciotomy. Using a comparable scoring system, Daly et al.⁷ obtained 57% excellent results after plantar fasciotomy compared to the 40% excellent results our series showed. The lower scores observed with complete plantar fascia rupture maybe due to some source of stability provided with partial fasciotomy. Additionally, longer follow-ups by Daly et al. could have resulted in improved scores⁷. For patients with refractory symptoms this may be a viable alternative, though we have no experience with surgical management. Christel et al.⁶ reported on the surgical treatment of plantar fascia ruptures in 16 athletes. The released the plantar fascia and excised the pathologic scar tissue. On average a 16-month follow-up was done and all patients were pain free. In our study, the majority did not localize persistent pain to the rupture site.

CONCLUSION

Calcaneal osteotomy and lateral column lengthening are suggested by some experimental studies and they say this reduces demands on the plantar fascia, perhaps even substitutes function in persistently symptomatic patients. Though we have experience in this approach, theory suggests that patients with persistent lateral plantar nerve dysfunction could be improved by correction of the pes planus deformity combined with nerve decompression. To summarize, 270 out of the 550 patients were injected with steroids during the time interval of our study, accounting for 37 ruptures post injection on clinical assessment. We therefore had a 13.7% complication rate for patients injected, concluding that corticosteroid injections although maybe helpful in treating recurrent/ un-resolving symptoms with a 86.3% success rate, but may predispose to planter Fascia rupture.

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