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Original Research Article

Pre-procedural MRI Findings in Different Grades of Achilles Tendinitis and Correlated with Clinical Outcomes after Ultrasound-guided Retrocalcaneal Bursa Injections of Steroid

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Abstract

Aim: The aim of the study to evaluate the correlation between Clinical Outcome Following Ultrasound guided Steroid Injection in Retrocalcaneal Bursa and Preprocedural MRI Findings in Different Grades of Achilles Tendinitis.

Methods: This prospective randomized control study conducted in the Department of Physical Medicine and Rehabilitation, Patna Medical College, Patna, Bihar, India, for 3 months. A total of 50 patients participated in this study. Ankle MRI was done with a 1.5-T MRI system. In each case, apart from the usual sagittal and axial plane images, coronal oblique T2-weighted, coronal oblique short-TI inversion recovery (STIR), axial gradient-echo images were also acquired at similar repetition and echo times as per the recommendation.

Results: 8 patients (16%) reported no change in symptoms. 10 patients (20%) reported partial relief of symptoms at 6 months post-intervention follow-up with a reduction in pain or improvement in activities of daily living. Initially, 5 out of these 10 reported complete resolution lasting 2 weeks while 3, 2, and 4 patients reported the period of complete resolution as 4 weeks, 6 weeks, and 8 weeks, respectively, followed by a gradual return of symptoms but never touching the baseline severity till the endpoint of our study. Resolution of symptoms was always partial in one of these patients. 32 patients (64%) achieved complete resolution of symptoms after 6-month follow-up. Interestingly, three of them initially reported only partial resolution of symptoms in the first week after the intervention. No significant complications were reported. Patients with low-grade lesions reported much more complete resolution than patients with higher-grade lesions. Around 84% of patients having low-grade pathology (MRI grade I and II) reported complete resolution, while the percentage of complete resolution among the patients suffering from mid-grade MRI findings (grade III) dropped to just a little above 68.18% mark. In our study, we were comparing the clinical outcome between complete resolution (n = 32) and partial resolution or no change (10+ 8 = 18) in respect of preprocedural MRI grading, patients' age, gender, and duration of the symptom. The proportion of patients with complete relief of symptoms decreased significantly with increasing MRI grading ($p = 0.0003$). Our study also comparing the patients with clinical improvement between complete resolution (n = 32) and partial resolution (10) in respect of preprocedural MRI grading, patients' age, gender, and duration of the symptom. Complete resolution decreased as MRI grading increased in a significant linear trend ($p = 0.0008$). Complete resolution increased significantly in younger patients than the older age group (mean age 47.6 vs 59 years). The proportion of patients with some resolution showed a shorter mean symptom duration, but the difference was not significant (9.4 vs 34.3 weeks, $p = 0.07$).

Conclusion: MRI of the Achilles tendon and the retrocalcaneal area may be of benefit to patients with clinically suspected Achilles' tendinopathy because it allows confirmation of the diagnosis and also helps the operator to predict the likelihood of different patients to respond to ultrasound-guided retrocalcaneal bursal steroid and bupivacaine injection.

Keywords: Tendinitis, Retrocalcaneal Bursa, MRI, Ultrasound- guided Steroid Injection

Introduction

Chronic tendinosis of the Achilles tendon is a common overuse injury that is seen not only in athletes but also in the general population [1]. This condition is painful and a cause of considerable distress and disability. Previous research has shown that histologically tendinosis is a non-inflammatory process resulting from a failed wound-healing cascade with evidence of disordered, haphazard healing; intratendinous collagen degeneration; fiber disorientation and thinning; hypercellularity; scattered vascular in-growth; and increased interfibrillar glycosaminoglycans [2,3]. Studies have also shown that these areas of collagen degeneration correspond to the hypoechoic areas seen on sonography [4]. Hyperosmolar dextrose has been used for years by medical practitioners as part of prolotherapy regimens for the treatment of chronic musculoskeletal pain with varying degrees of success reported in the literature [5]. Prolotherapy is a technique in which a small volume of an irritant solution (proliferant) is injected at multiple sites around a ligament or tendon in- sertion [6]. This solution is purported to initiate a local inflammatory response at the site of injection, which induces fibroblast proliferation and subsequent collagen synthesis resulting in a tighter and stronger ligament or tendon [7].

Magnetic resonance imaging (MRI) is a reliable imaging modality frequently used for detecting soft tissue pathologies. This valuable imaging technique helps show the anatomy of the Achilles tendon as well as associated structures including retrocalcaneal bursa and is a very sensitive tool to detect various pathological changes within the tendon as a result of overuse injuries [8]. In addition to providing important information about the pathological state of the Achilles tendon, MRI images can also provide information useful for patient treatment and consequently the prognosis.9 [18] Ultrasound, on the other hand, is known to be reliable to show retrocalcaneal bursa and it can also be used to perform dynamic examination [8]. As a result, this non-ionizing tool has become the preferred option for image-guided injections including injection into the retrocalcaneal bursa. US-guided local corticosteroid injection is an effective and safe modality for refractory Achilles enthesitis in patients with spondyloarthropathy (SpA) and was reported to result in reversion of acute changes at the entheseal site in a study conducted by Srivastava and Aggarwal [10].Other studies like "Ultrasound-guided injection treatment of retrocalcaneal bursitis" done by Chu et al. are already there in the literature [11].But studies to find out the effect of ultrasound (US)-guided injection of long-term steroid in retrocalcaneal bursa on Achilles tendinitis specifically in respect to preprocedural MRI findings are not available at present

Material and methods

This prospective randomized control study conducted in the department of Physical Medicine and Rehabilitation, Patna Medical College, Patna, Bihar, India, for 3 months

Methodology

Patients with posterior ankle pain with functional impairment of all sexes attending the department of physical medicine and rehabilitation were included in the study. Patients suffering from infective arthritis, fracture, and dislocation of the bone-forming ankle joint, neoplasm, and patients with a congenital deformity or pregnant women were excluded from the study. Patients having a contraindication to MRI and patients with a history of prior ankle surgery or local injection were also kept out of the study.

A total of 50 patients participated in this study. Ankle MRI was done with a 1.5-T MRI system. In each case, apart from the usual sagittal and axial plane images, coronal oblique T2-weighted, coronal oblique short-TI inversion recovery (STIR), axial gradient-echo images were also acquired at similar repetition and echo times as per the recommendation [8].

MRI findings were classified into five grades according to pathological involvement of tendon thickness of the affected part of the Achilles tendon with or without retrocalcaneal bursitis. Grade I consisted of tendinitis <10% tendon thickness involvement,grade II consisted of 10–20% tendon thickness involvement, grade III consisted of 21–50% tendon thickness involvement, grade IV consisted of >50 to 90% tendon thickness involvement, and grade V consisted of >90% tendon thickness involvement (Table 1).

A thorough clinical evaluation was done in each case. 40 mg methylprednisolone mixed with 1–2 mL of 0.25% bupivacaine was administered by 22-gauge needle at retrocalcaneal bursa under ultrasonography (USG) guidance through medial approach after standard aseptic technique and under local anesthetics.

All patients with clinical and MRI proven Achilles' tendinitis were selected for treatment.

Standard conservative treatment was continued for 2 weeks after injection. The outcome was subjectively determined after a 6-month mean follow-up period and was classified as one of the following outcome groups: (1) complete resolution, (2) partial improvement (defined as a reduction in subjective pain but not complete resolution of symptom after injection), and (3) no change. Before injection, patients' demographic parameters including age, sex, occupation, and duration of symptoms were noted. Correlation between patient's outcomes at 6 months post-intervention and preprocedural MRI findings, patient's symptom duration as well as age groups were drawn. Statistical software SPSS 25.0 was used, and appropriate tests were done for data analysis.

Results

In our study, a total of 50 patients with Achilles' tendinitis were selected for ultrasound-guided steroid injection at retrocalcaneal bursa after clinical and MRI confirmation. 22 men and 28 women with 20–70 years age group patients were included in the study. The duration of symptoms was 3–120 weeks with a mean duration of 14.6 ± 20.6 weeks. No patients reported exacerbation of symptoms.

8 patients (16%) reported no change in symptoms. Initially, 2 of these 8 patients reported resolution of symptoms for short periods lasting 10 days, 4 weeks, 5 weeks, and 8 weeks only. Finally, the symptoms were back to baseline at 6-month follow-up period. At least 1of these patients, the short duration of the symptom-free period may be attributed to her quick return to sports activity against advice. 10 patients (20%) reported partial relief of symptoms at 6 months post-intervention follow-up with a reduction in pain or improvement in activities of daily living. Initially, 5 out of

these 10 reported complete resolution lasting 2 weeks while 3, 2, and 4 patients reported the period of complete resolution as 4 weeks, 6 weeks, and 8 weeks, respectively, followed by a gradual return of symptoms but never touching the baseline severity till the endpoint of our study. Resolution of symptoms was always partial in one of these patients. 32 patients (64%) achieved complete resolution of symptoms after 6-month follow-up. Interestingly, three of them initially reported only partial resolution of symptoms in the first week after the intervention. No significant complications were reported.

Different age group patients were differently benefited from treatment. Nearly 20% (2out of 10) of patients younger than 40 years, 62.5% (20 out of 32) of patients belonging to the 40–60 years age group, and 50% (4 out of 8) of patients older than 60 years reported complete resolution

Patients with low-grade lesions reported much more complete resolution than patients with higher-grade lesions. Around 84% of patients having low-grade pathology (MRI grade I and II) reported complete resolution, while the percentage of complete resolution among the patients suffering from mid-grade MRI findings (grade III) dropped to just a little above 68.18% mark. 25 percent (1 out of 4) patients with grade IV findings and none of those with grade V reported complete resolution. 75 percent of patients with grade V findings failed to achieve any improvement (Table 3).

13 out of 15 patients (86.67%%) with symptom duration of <1 year reported complete resolution of symptoms, compared to 6 out of 13 (46.15%) patients with symptom duration of >1 year and 3 out of 8 (37.5%) of those with symptom duration of >2 years achieving the same. As much as 26% of patients reporting complete resolution had a duration of symptoms of <3 months while only 6% of those patients achieving complete resolution belonged to the group of symptom duration of >2 years. Similarly, around 50% of patients with no change had symptom duration of >2 years while the percentage of no change among patients having symptom duration of <3 months is 0 (Table 4).

In our study, we were comparing the clinical outcome between complete resolution (n = 32) and partial resolution or no change (10+ 8 = 18) in respect of preprocedural MRI grading, patients' age, gender, and duration of the symptom. The proportion of patients with complete relief of symptoms decreased significantly with increasing MRI grading ($p = 0.0003$). Younger age group patients showed much more improvement (complete resolution) than other groups, but there was no significant difference ($p > 0.05$) in age. The proportion of patients with complete resolution showed significantly shorter mean symptom duration than other outcomes (mean duration 7.9 vs 22.8 weeks, $p = 0.03$) and a significant difference was not present in the proportion of both genders with resolution ($p < 0.01$).

Our study also comparing the patients with clinical improvement between complete resolution (n = 32) and partial resolution (10) in respect of preprocedural MRI grading, patients' age, gender, and duration of the symptom. Complete resolution decreased as MRI grading increased in a significant linear trend ($p = 0.0008$). Complete resolution increased significantly in younger patients than the older age group (mean age 47.6 vs 59 years). The proportion of patients with some resolution showed a shorter mean symptom duration, but the difference was not significant (9.4 vs 34.3 weeks, $p = 0.07$). Again improvement was similar among both genders.

Table 1: MRI grading of Achilles tendinopathy

Grade	Number	%
I	17	34
II	3	6
III	22	44
IV	4	8
V	4	8

Table 2: Patient outcome by MRI grade

Grade	Patients	Complete resolution	Partial resolution	No change
I17	17 (34%)	14 (82.35%)	2 (11.76%)	1 (5.88%)
II3	3 (6%)	2 (66.67%)	0 (0%)	1 (33.33%)
III22	22(44%)	15 (68.18%)	4 (18.18%)	3 (13.64%)
IV4	4 (8%)	1 (25%)	3 (75%)	0 (0%)
V4	4 (8%)	0 (0%)	1 (25%)	3 (75%)
Total	50 (100%)	32 (64%)	10(20%)	8 (16%)

Table 3: Patient outcome by pre-treatment symptom duration

Symptom duration		Complete resolution	Partial resolution	No change
(months)	Patients (n)	(%)	(%)	(%)
<3	15	13(86.67	2(13.33)	0
3–5.9	12	7(58.33)	3(25)	2(16.67)
6–11.9	10	6(60)	3(30)	1(10)
12–24	5	3(60)	1(20)	1(20)
>24	8	3(37.5)	1(12.5)	4(50)

Discussion

The results of this study suggest that ultrasound-guided steroid injection at retrocalcaneal bursa may be of benefit in the short-term management of clinically and MRI proven Achilles' tendinopathy with or without retrocalcaneal bursitis. Around 84% of patients reported relief of symptoms (approximately 64% complete and 20% partial responses) at least for a period of 6 months after treatment. In a study done by Srivastava and Aggarwal, retrocalcaneal bursal steroid injection was evaluated for MRI proven refractory Achilles' tendinitis in patients with seronegative SpA [10]. All patients had statistically significant improvement in visual acuity scale (VAS) pain score as well as decreased local inflammatory changes in the form of a statistically significant reduction in tendon thickness, vascularity, peritendinous edema, bursitis, and bursal vascularity. None of the patients had tendon rupture or other injection-related complications and as per their conclusion, US-guided local corticosteroid injection may be regarded as an effective and safe modality for refractory Achilles enthesitis. Clinical improvement found in our study is corroborating well with that achieved in their study.

Fredberg and Bolvig in their review article on Jumper's Knee, another overuse syndrome involving the patellar tendon,

concluded that ultrasonography is an effective tool for the guidance of local steroid injection and local peritendinous injections with long-acting steroids is a helpful and safe treatment option in tendinopathy, thereby validating the objective, protocol, and safety of our study [12].Another study conducted by Goldberg-Stein et al. showed image- guided injection into retrocalcaneal bursal space improves the precision of targeted steroid injection [13]. Over two-third of patients (69%) experienced a clinically significant response and 14% of the patients became free of pain. Authors pointed out that some of the patients with retrocalcaneal bursitis often clinically present similar to those with insertional Achilles' tendinopathy and patients in their study with Achilles' tendinitis but without retrocalcaneal bursitis, were also benefited from intrabursal injection. Their findings are also similar to those of our study.

In another study conducted by Hoksrud et al., sclerosing injections with polidocanol resulted in a significant improvement in knee function and reduced pain in patients with patellar tendinopathy which is known to be similar to tendon Achilles tendinopathy in pathology as far as neovascularization is concerned [14].Maxwell et al. showed sonographically guided intratendinous injection of hyperosmolar dextrose yielded a good clinical response in patients with chronic tendinopathy of the tendon Achilles in terms of reduction of pain at rest and during tendon-loading activities as well as in terms of reduction of tendon thickness and neovascularization [15].Though the injecting material, injection site, and the disease entity are different in these studies, as per as etiopathology of the disease, use of guided injection and effect of the treatment are concerned, the results of these studies corroborate with those of our study, either directly or indirectly.

Conclusion

Our finding of 84% of 50 patients having achieved symptom relief at 6-month follow-up suggests that ultrasound-guided steroid injection at retrocalcaneal bursa may be of benefit in the short- term management of clinically and MRI proven Achilles' tendinitis or tendinopathy. MRI of the Achilles tendon and the retrocalcaneal area may be of benefit to patients with clinically suspected Achilles' tendinopathy because it allows confirmation of the diagnosis and also helps the operator to predict the likelihood of different patients to respond to ultrasound-guided retrocalcaneal bursal steroid and bupivacaine injection.

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