ORIGINAL ARTICLE

Correlation between Clinical Outcome Following Ultrasound-guided Steroid Injection in Retrocalcaneal Bursa and Preprocedural MRI Findings in Different Grades of Achilles Tendinitis

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Abstract

Chronic posterior heel or ankle pain most commonly results from the pathology of the Achilles tendon, its insertion into the calcaneum, or the two associated bursae. Achilles tendinitis or tendinopathy, a very common clinical syndrome, primarily resulting from overuse injuries is often associated with retrocalcaneal bursitis. The purpose of this study was to find out the effect of ultrasound-guided steroid injection at retrocalcaneal bursa in cases of Achilles tendinitis and to correlate its clinical outcome with preprocedural magnetic resonance imaging (MRI) grading. Sixty-nine patients with clinically and MRI proven Achilles tendinitis were included in the study. MRI findings of tendinitis were graded according to severity. Each patient received an ultrasound-guided injection of 40 mg of methylprednisolone and 1–2 mL of 0.25% bupivacaine into the retrocalcaneal bursa. The outcome was determined and was evaluated in relation to the preprocedural MRI findings. Fifty-seven patients reported at least some relief of symptoms after a follow-up period of 6 months while 12 patients showed no improvement. Shorter duration of symptoms and minor grade MRI findings were associated with complete resolution. Ultrasound-guided steroid injection in retrocalcaneal bursa may be of benefit in the short-term management of clinically and MRI proven Achilles tendinitis.

Keywords: Achilles tendinitis, MRI, Retrocalcaneal bursa, Tendinopathy, Ultrasound-guided injection.

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Introduction

Chronic posterior heel or ankle pain most commonly results from the pathology of the calcaneal insertion site of the Achilles tendon or the two associated bursae.[1] Both the bursae are located just proximal to the Achilles tendon insertion. Bursa lying deep to the tendon is called the retrocalcaneal bursa while the one superficial to it is known as the calcaneal bursa. Posterior heel pain may be caused by the inflammation of either of these two bursae.[2–6]

Achilles tendinopathy, a very common clinical syndrome, primarily results from overuse injuries due to intrinsic or extrinsic factors. It presents with pain, swelling, and impaired performance. Anatomically, it is classified into two varieties, insertional and non-insertional tendinopathy. Both inflammatory and degenerative changes can be found in the tendon.[7]

It has been found that tendon Achilles tendinopathy, mainly its insertional variety, is often associated with retrocalcaneal bursitis along with superficial calcaneal bursitis and Haglund's deformity, bony enlargement on the back of the heel.[8] Achilles tendinopathy is known to be more common among athletes.[9–13] Nevertheless, it is not restricted to athletes only and up to one-third of people affected may be non-athletes.[14]

Clinical examination should start with a full assessment of the lower limb to exclude or identify the potential intrinsic factors or the biomechanical contributors. An examination should include an inspection to detect swelling, erythema, asymmetry, etc.; palpation for tenderness; range-of-motion measurement; and examination maneuvers that simulate tendon loading and reproduce pain.[15] A palpable tendon nodule, which moves during plantarflexion and dorsiflexion of the foot, constitutes a positive arc sign while reduction of pain on ankle dorsiflexion indicates a positive Royal London Hospital test. Both tests are specific but not sensitive for diagnosing tendinopathy.[16] When a clinical diagnosis of tendinopathy is formulated, it can be corroborated by radiological findings to confirm the definitive diagnosis.

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.[17] 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.[18]

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Ultrasound, on the other hand, is known to be reliable to show retrocalcaneal bursa and it can also be used to perform dynamic examination.[17] 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.[19] Other studies like "Ultrasound-guided injection treatment of retrocalcaneal bursitis" done by Chu et al. are already there in the literature.[20] 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.

Materials and Methods

The study was conducted in the Department of Physical Medicine and Rehabilitation, Bankura Sammilani Medical College, Bankura, West Bengal, India during the period from April 2018 to April 2019. 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 69 patients participated in this study. Informed consent was obtained from all the individuals and the study was carried out in accordance with the institutional ethics committee guidelines.

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.[17]

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, patients symptom duration as well as age groups were drawn. Statistical software (SAS version 8, SAS Institute) was used and appropriate tests were done for data analysis.

Results

In our study, a total of 69 patients with Achilles tendinitis were selected for ultrasound-guided steroid injection at retrocalcaneal bursa after clinical and MRI confirmation. Thirty-one men and 38 women with 24–88 years age group patients were included in the study. The duration of symptoms was 3–120 weeks with a mean duration of 13.6 ± 21.6 weeks. No patients reported exacerbation of symptoms.

Twelve patients (17.4%) reported no change in symptoms. Initially, 4 of these 12 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 one of these patients, the short duration of the symptom-free period may be attributed to her quick return to sports activity against advice. Seventeen patients (24.64%) 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, 7 out of these 17 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. Forty patients (57.9%) 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 17% (16 out of 23) of patients younger than 40 years, 57% (17 out of 30) of patients belonging to the 40–60 years age group, and 50% (8 out of 16) of patients older than 60 years reported complete resolution. On the other hand, only one (4.35%) patient younger than 40 years, six (20%) patients belonging to the 40–60 years age group, and four (25%) patients older than 60 years patients failed to achieve any improvement (Table 2).

Patients with low-grade lesions reported much more complete resolution than patients with higher-grade lesions. Around 80% of

Table 1: MRI grading of Achilles tendinopathy

Grade	*Frequency (n)*	*Percentage*
I	23	33.33
II	5	7.25
III	30	43.48
IV	6	8.7
V	5	7.24

Table 2: Patient outcome by age group

Age group (years)	*Number (n)*	*Complete resolution (%)*	*Partial resolution (%)*	*No change (%)*
<40	23	69.57	26.09	4.35
41–60	30	56.67	23.33	20
>60	16	50	25	25

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 50% mark. Thirty-three percent (2 out of 6) patients with grade IV findings and none of those with grade V reported complete resolution. Eighty percent of patients with grade V findings failed to achieve any improvement (Table 3).

Thirty-five out of 48 patients (72.92%%) with symptom duration of <1 year reported complete resolution of symptoms, compared to 5 out of 21 (23.81%) patients with symptom duration of >1 year and 2 out of 12 (17%) of those with symptom duration of >2 years achieving the same. As much as 40% of patients reporting complete resolution had a duration of symptoms of <3 months while only 5% of those patients achieving complete resolution belonged to the group of symptom duration of >2 years. Similarly, around 58% 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 ($n = 40$) and partial resolution or no change ($17 + 12 = 29$) 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 ($p = 0.0002$). Younger age group patients showed much more improvement (complete resolution) than other groups, but there was no significant difference (42 vs 52.2 years, $p > 0.05$) in age. The proportion of patients with complete resolution showed significantly shorter mean symptom duration than other outcomes (mean duration 7.8 vs 21.8 weeks, $p = 0.02$) 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 ($n = 40$) and partial resolution (17) 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 ($p = 0.0007$). Complete resolution increased significantly in younger patients than the older age group (mean age 46.6 vs 58 years). The proportion of patients with some resolution showed a shorter mean symptom duration, but the difference was not significant (9.3 vs 34.2 weeks, $p = 0.06$). Again improvement was similar among both genders.

Table 3: Patient outcome by MRI grade

Grade	*Patients*	*Complete resolution*	*Partial resolution*	*No change*
I	23 (33.33%)	18 (78.26%)	4 (17.39%)	1 (4.35%)
II	5 (7.25%)	4 (80%)	0 (0%)	1 (20%)
III	30 (43.48%)	16 (53.33%)	8 (26.67%)	6 (20%)
IV	6 (8.7%)	2 (33.33%)	4 (66.66%)	0 (0%)
V	5 (7.25%)	0 (0%)	1 (20%)	4 (80%)
Total	69 (100%)	40 (57.9%)	17 (24.64%)	12 (17.4%)

Table 4: Patient outcome by pretreatment symptom duration

Symptom duration (months)	*Patients (n)*	*Complete resolution (%)*	*Partial resolution (%)*	*No change (%)*
<3	19	84.21	15.79	0
3–5.9	16	68.75	18.75	12.5
6–11.9	13	61.54	30.77	7.69
12–24	9	33.33	44.44	22.22
>24	12	16.67	25	58.33

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 83% of patients reported relief of symptoms (approximately 58% complete and 25% 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.[19] 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.[21] Another study conducted by Goldberg-Stein et al. showed image-guided injection into retrocalcaneal bursal space improves the precision of targeted steroid injection.[22] 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.[23] 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.[24] 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 83% of 69 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. Patients with symptoms for <1 year and with minor grade MRI findings have significantly better results than the patients with longer symptom duration and more severe MRI findings. Age and sex do not seem to have a significant correlation with the outcome. 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.

Carry Home Message

Ultrasound-guided steroid injection into the retrocalcaneal bursa may be of benefit in the short-term management of clinically and MRI proven Achilles tendinitis.

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