Research Square

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Insertional Achilles Tendinopathy: Operative Outcomes in the Military

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Abstract

Introduction: Insertional Achilles tendinopathy (IAT) operative outcomes within the active duty United States military have not been previously reviewed.

Materials and Methods: A single center retrospective review of consecutive patients diagnosed with IAT was performed. Surgical patients were followed until they returned to full duty or were released from the military. Outcomes included Visual analog scale (VAS) pain scores, the ability to return to running and time to do so, and the ability to return to military specific duty. All complications were recorded and followed until resolution. Statistical analysis was performed with an independent samples *t* Test.

Results: Our data analysis included 113 active duty military patients. Fifty-eight (55%) patients underwent operative treatment for insertional IAT. Eight patients had bilateral procedures for a total of 66 Achilles procedures evaluated. Mean duration of follow up was 42 months (range, 12-143). Mean age at time of surgery was 37.2 years (range, 21-54). Length of pre-operative physical therapy had a mean of 6.5 months (range, 2-36).

Visual analog scores significantly improved at all time points from 5.4 pre-op to 2.7, 2.9, 2.7, 2.9 at 3, 6, 12, and 24 months respectively. There was no significant improvement in VAS scores after the 3-month post-operative visit. Mean return to run time was 9 months (range 4.5-16). At 1 year, 80% (46/58) of patients returned to military duty although 43% of patients that returned to duty had restrictions in regards to running. Complications were recorded in 18 of 66 procedures (27%). The most common complication was superficial wound infection or superficial wound dehiscence. Complications requiring return to the OR were observed in 6 patients (9%).

Conclusions: This is the first study to evaluate the outcomes of IAT in an active military population. Active duty patients diagnosed with IAT failed non-operative management and required surgical intervention in 55% of the population studied. For those patients who were treated surgically we documented an 80% return to duty rate and a significant reduction of subjective pain scores from a mean of 5.4 to a mean of 2.6 at final follow-up. There was no significant change in the VAS score after the 3-month post-operative evaluation. Service members were able to return to duty at a mean of 7 months and return to running at a mean of 9 months. The high rate of return to duty and significant improvement in pain scores demonstrate that the surgical management of IAT is a viable treatment option for patients who could not otherwise remain on active duty. With that said, the complication rate of 27% is high. Patients and providers should consider the risks, benefits, and the duration of therapy during their shared decision-making process.

Introduction

Insertional Achilles tendinopathy (IAT) is a common overuse injury that presents with pain and swelling at the insertion of the Achilles onto the calcaneus. The etiology of IAT is associated with mechanical overload at the Achilles insertion resulting in degeneration of the tendon with loss of the tendon structure

and increased fatty infiltration.[1] Changes in training, running, exertion on hills or on uneven ground have all be associated with the development of IAT.[1,2,3]

IAT is differentiated from non-insertional Achilles tendinopathy secondary to the location of the pathologic tendon changes and edema noted at the retrocalcaneal bursa.[4,5] Radiographs demonstrate bone spurs, osteophytes, or enthesophytes in up to 65% of patients with symptomatic IAT.[1] An example of an enthesophyte is seen in Fig. 1A. Ultrasound or magnetic resonance imaging (MRI) may demonstrate partial tears, thickening, or pathologic changes within the Achilles as it inserts into the calcaneus.[2]

Non-operative management can include rest, activity modification, eccentric exercises, extra-corporal shock wave therapy (ECSWT), night splints, and injections.[1,2,6,7,8] With the exception of ECSWT and eccentric therapy, there is insufficient evidence to support the use of most non-operative treatment modalities.[6] Surgical treatment due to failure of conservative management is often required. [9,10,11,12] Multiple surgical treatment options have been described to include endoscopic and open techniques.[13,14] The open approach with debridement and detachment of the Achilles tendon followed by double row suture anchor repair has recently been described as a preferred technique.[15,16,17] The surgical treatment of IAT is associated with known complication rate of up to 30%.[18]

Treatments and outcomes for IAT differ from those for non-insertional Achilles tendinopathy. While previous studies have demonstrated that non-insertional Achilles tendinopathy has been shown to affect 12–24% of military recruits, outcomes related specifically to IAT within the military have not been previously reviewed.[19,20] The purpose of this study, therefore, is to evaluate the outcomes of operative management of IAT in an active duty military population.

Methods

This is a retrospective review of consecutive patients who presented to a single medical center for the diagnosis of IAT from January 2007-May 2017. The following ICD-9 (International Statistical Classification of Diseases and Related Health Problems) codes were utilized for initial screening: 726.70, 726.71. The following CPT (Current Procedural Terminology) codes were utilized for initial screening: 27680, 27652, 27654, 27650, 27659, 27658. The screened records were then reviewed to ensure that criteria for the diagnosis of insertional Achilles tendinopathy were met and that patients with non-insertional Achilles tendinopathy or acute injuries were excluded.

Inclusion criteria included active duty military diagnosed with IAT as defined by pain at the insertion of the Achilles with associated swelling lasting over 6 weeks. The surgical cohort were required to have a documented failure of at least 3 months of conservative management. Surgical management had to include 3 components: a retrocalcaneal exostectomy, Achilles tendon debridement, and documentation of Achilles reattachment via a double row repair if greater than 50% of the tendon insertion was compromised by the disease or surgical exposure. An example of a post-operative radiograph is seen in Fig. 1B.

All patients were followed either until they returned to full duty, were released from the military or had a minimum of 2 years clinical follow-up. Radiographic and clinical data collection was completed on all patients who met inclusion criteria. Visual Analog Scale (VAS) pain scores were collected prior to treatment, and at 3, 6, 12, and 24 months following treatment. Return to duty rates, physical limitations, complications, and medical discharge rates were recorded as outcome measures. Statistical analysis of VAS changes was performed utilizing an independent samples *t* Test.

Data on patients with the diagnosis of chronic IAT who did not undergo surgery was collected in order to determine the rate of surgical management. These patients were identified by ICD-9 codes and similar to the surgical cohort had documented physical exam findings consistent with IAT present for over 6 weeks. No specific treatment criteria were required in this cohort but records had to be complete up until the time they were released to full duty or were released from military duty.

Results

There were 113 patients who met inclusion criteria. Within the operative cohort, our data analysis included 58 active duty military patients. Fifty-five patients were diagnosed with IAT but did not undergo surgery during the study period. Within the surgical cohort, 8 patients received bilateral procedures for a total of 66 surgical interventions or 66 ankles. In the treatment group, 34 patients were active US (United States) Army, 8 patients US Navy, 7 US Marine Corps, 7 Air Force and 2 from the US Coast Guard. Mean age at treatment was 37.2 years (range, 21–54). Length of pre-operative physical therapy had a mean of 6.5 months (range, 3-36mo). Other modalities prior to operative correction were also recorded with 19% (11 patients) receiving a PRP injection, 1 patient received a steroid injection, 17% (10 patients) received extra-corporal shock wave therapy (ECSWT). Demographics are listed in Table 1.

Table 1
Demographics

Total Patients	**121**
Surgical Patients	58/121 (48%)
Ankles	66
Age	37 years (range 21–54)
Male/Female	51/7
Length of pre-op therapy	6.5 months (range 3–36)
Pre-op therapy	58/58 (100%)
Pre-op ECSWT	10/58 (17%)
Pre-op PRP	11/58 (19%)

Following surgery, VAS scores significantly improved at all time points from a mean of 5.4 pre-op to 2.7, 2.9, 2.7, 2.9 at 3, 6, 12, and 24 months respectively. The difference in VAS scores from the pre-operative evaluation until the final evaluation at 2 years was significant (p = 0.001). The change in VAS score from the 3-month mark to the final 2-year follow-up was not significant (p = 0.28). Mean return to run time was 9 months (range 4.5–16). At 1 year, 46 of 58 (80%) patients returned to duty. 43% (19 of 46) of patients who returned to duty were not able to run at their pre-injury level and remained on permanent restrictions related to running. Two patients retired during the study period but had returned to full duty and were not on any permanent duty restrictions at the time of their retirement. Medical separation was required for 14% (8 of 58) of patients secondary to restrictions related to IAT. All outcomes are listed in Table 2.

Table 2
Outcomes

VAS Pre-Op	**5.4 (range 2–9)**	
VAS at 3 months	2.7 (range 0–8)	
VAS at 6 months	2.9 (range 0–8)	
VAS at 1 year	2.7 (0–6)	
VAS at 2 years	2.9 (0–7)	P = 0.00001
Return to active duty rate	46/58 (80%)	
Return to active duty with no restrictions	27/58 (47%)	
Return to active duty with decreased running	19/58 (33%)	
Medical discharge secondary to IAT	8/58 (14%)	
Time to return to duty	7 months (range 2–11)	
Time to return to running	9 months (range 2–13)	

Surgical complications requiring a return to the operating room (OR) were observed in 6 patients (9%). Reasons for return to OR included: infection (2), recurrent tendonitis (3), and sural nerve entrapment (1). Of the 2 patients that returned to the operating room for a deep infection, one developed calcaneal osteomyelitis. The patient with osteomyelitis underwent serial debridements, elected not to proceed with Achilles reconstruction upon clearance of his infection, and wears a dynamic AFO (ankle foot orthosis) for athletic activities. The second patient cleared his infection after serial debridements, 6 weeks of intravenous antibiotics, and underwent a flexor hallucis longus tendon (FHL) transfer with good success. Both patients with deep infections remained on active duty but did not return to running without restrictions. Of the 3 patients who underwent a revision for continued pain, 1 was augmented with an FHL transfer at the time of the revision. 2 of the 3 patients who were revised for continued pain remained on active duty with running restrictions and 1 underwent a medical discharge secondary to the Achilles. The

one patient who returned to the operating room for sural nerve entrapment underwent a neurectomy of the sural nerve and was able to remain on active duty but with restrictions on running.

Twelve ankles (18%) had complications related to the Achilles that required further management but did not require a surgical revision. This included PRP (platelet rich plasma) injections in 2 patients, dry needling in 2 patients, and a toe off AFO in 1 patient. Both patients treated with PRP and the patient treated with an AFO were able to return to running at a decreased level. One of the patients treated with dry needling was able to return to full duty and the second patient did not recover and required a medical discharge. 2 ankles were treated for a superficial wound infection with oral antibiotics. One of the patients with the superficial infection returned to full duty and the second required a medical separation. 3 ankles had superficial wound dehiscence which healed via secondary intent. One of the patients with the wound dehiscence required a medical separation due to continued insertional Achilles pain and the other 2 patients returned to full duty. Two patients had symptomatic surgical incision sites or hypertrophic scar tissue. Both patients with adherent scar tissue underwent scar revision. Both patients with revised scars returned to full duty. A list of complications is seen in Table 3.

Table 3
Complications

Total rate	**27% (18/66)**
Return to the OR	9% (6/66)
Deep infection requiring I&D	3% (2/66)
Recurrent IAT requiring revision	5% (3/66)
Neuropathy requiring neurectomy	2% (1/66)
Additional interventions (PRP, dry needling)	6% (4/66)
Bracing or AFO	2% (1/66)
Superficial wound infection	3% (2/66)
Wound dehiscence	5% (3/66)
Symptomatic scar	3% (2/66)

Fifty-eight patients or 66 ankles during the study period required surgery, the data is consistent with a non-operative failure rate of 55% (66/121) when failure is defined as surgical intervention. In the non-operative group, 3 (5%) of these patients were medically separated from the military secondary to their diagnosis. 14 (27%) of the 52 patients who remained on active duty required permanent restrictions in regards to running. Seventeen patients in the non-operative cohort were offered surgery but elected to continue with non-operative management and activity modifications. Forty-seven patients in the non-operative cohort were treated with physical therapy, 10 were treated with PRP injections, and 7 were treated with ECSWT.

Discussion

The incidence of IAT in the military has not been previously reported. Prior studies have tended to combine rates of insertional and non-insertional Achilles tendinopathy together.[19,20] Often the diagnosis is mislabeled as a tendonitis rather than a tendinopathy which leads runners and military service members to believe that it will resolve with rest and anti-inflammatories alone.[21] Combining the results of non-insertional tendinopathy with IAT can also be misleading as treatment modalities that are successful for non-insertional Achilles tendinopathy have not always been successful in patients diagnosed with IAT.[21]

This series of patients who underwent operative management of IAT is one of the largest series of patients in the literature.[22] We were able to identify 58 patients who underwent operative management of IAT. An additional 55 patients were identified who were treated for IAT but did not proceed with operative management during the study period. With the numbers available, we found that 48% (58/ 121) of military patients with the diagnosis of IAT went on to require operative management for the diagnosis of IAT during the study period. This is consistent with previous studies that have found that 53–89% of patients with the diagnosis of IAT eventually require surgical management.[23] This high rate of operative management speaks to the chronicity of the condition. Although patients often report an acute onset of symptoms, chronic enthesophytes are seen in 65% of symptomatic demonstrating that the disease process began long before the condition became symptomatic.[1]

Consistent with recommendations, all patients in this series were treated initially with at least 3 months of physical therapy. Eccentric exercises and progressive strengthening have both been studied extensively in the treatment of IAT. Satisfaction scores following treatment with therapy alone have ranged from 28–67% in previous studies.[1,7,24,25] With that said, VAS pain scores following exercise programs have been reported to average 2–5 out of 10 and other studies have demonstrated up to 70% poor results.[6]

Ten patients in the operative cohort and 7 patients in the non-operative cohort were treated with ECSWT. In our series, ECSWT was offered to patients who did not respond to an initial trial of physical therapy. A recent study found that ECSWT was superior to eccentric exercise in the treatment of IAT, although neither treatment arm reduced mean VAS scores below a mean of 3 out of 10.[6,7] ECSWT was not offered to every patient in our series as its efficacy has not been studied in patients who have an enthesophyte or Haglund's deformity.

Eleven of the patients in the operative cohort were treated provisionally with PRP. There is limited data available to support the use of PRP in the treatment of IAT. Previous studies have combined patients having the diagnosis of IAT with patients diagnosed with non-insertional achilles tendinopathy.[1,21,26] In general, PRP was offered to patients who had failed therapy and were not interested in surgical management or were considered to be poor candidates for surgical management due to co-morbidities. No attempt to evaluate the efficacy of PRP in our population was made with the numbers given and the lack of clear indications for the procedure.

In our series, 80% (46/58) of the patients who underwent operative management for IAT were able to remain on active duty. For patients that returned to full duty, the mean recovery time was 7 months. 47% (27/58) of the patients studied were able to remain on active duty without restrictions on running. The restrictions on running typically state that the service member is able to run 'at their own pace and distance.' This allows the service member to remain on active duty and allows them to take an alternate aerobic event for their bi-annual physical fitness test. The alternate events differ by service but typically include a bicycle, swim, or walk option. For the service members that were able to return to running, the mean time to return to running was 9 months. The difference in the return to duty time (7 months) and the return to running time (9 months) is secondary to the fact that some of the patients in the cohort returned to duty with running restrictions as described above. There was a mean improvement in the VAS score of 2.5 out of 10 for the surgical cohort. The difference between the pre-operative VAS score (mean of 5.4) and the final VAS score (2.9) was statistically significant. It is interesting to note that there was no significant difference between the final VAS score and the VAS score at any of the post-operative visits recorded at 3 months, 6 months, and 1 year. While patients are able to return to athletic activities between 7 and 9 months, the maximum improvement in pain occurred by the third month post-operative month in our cohort.

The complication rate in our operative cohort was high. Eighteen (27%) of our patients were treated for a complication related to the surgery. Six (10%) required revision surgery. One patient developed osteomyelitis and after undergoing serial debridements and a long course of antibiotics he elected not to proceed with an Achilles reconstruction. The most common complication that did not require a return to the OR related to superficial wound complications which included both dehiscence and infection. Two patients had a superficial infection that responded to oral antibiotics and 3 patients had a dehiscence of the wound that healed by secondary intent. This high wound complication rate is consistent with previous reports demonstrating wound complication rates of up to 30%.[17] The majority of the wound complications reported, however, have been treated conservatively without a return to the operating room.[17] We also had 2 cases of symptomatic scar tissue that required scar excision. Rates of scar hypersensitivity have been reported to be as high as 34%.[17] The medial based incision in this series was utilized in order to keep the potential scar away from the shoe heel counter. In addition, keeping the incision removed from the achilles paratenon was felt to potentially decrease the risk of adherence to the tendon or paratendon.

Our study has strengths and limitations. Given that this study was conducted at a single center in a closed medical system, detailed notes regarding the surgery and post-operative course were available. Limiting the study to active duty military service members allowed for objective occupational outcomes. The military requires service members to run a certain distance in a certain time depending on the branch. The inability to accomplish this task results in a documented duty restriction, limitation, or profile. In addition, those service members who could not return to running at any level underwent medical discharge from the military. Military limitations may not be generalizable to all patients, but most athletes understand the basic requirements of a service member and can understand these results as they apply

to their own athletic endeavors. While we had strict occupational outcomes measures, the only patient reported outcome measure captured in the electronic medical record is the visual analog scale. Although this is not a true longitudinal study designed to capture an incidence rate, we were able to review the electronic medical record to capture those patients who were treated for the same condition without surgery. This enabled us to demonstrate that 55% of patients who present with IAT went on to require surgical management on our series.

Conclusion

This is the first study to evaluate the outcomes of IAT in an active military population. Active duty patients diagnosed with IAT failed non-operative management and required surgical intervention in 55% of the population studied. For those patients who were treated surgically we documented an 80% return to duty rate and a significant reduction of subjective pain scores from a mean of 5.4 to a mean of 2.6. Although there was a significant improvement in VAS scores from the pre-operative value as compared to the VAS score at each follow up visit, there was no significant change in the VAS score after the 3 month post-operative evaluation. Service members who were able to return to duty did so at a mean of 7 months. The patients who were able to return to running did so at a mean of 9 months. The high rate of return to duty and significant improvement in pain scores demonstrate that the surgical management of IAT is a viable treatment option for patients who could not otherwise remain on active duty. With that said, the complication rate of 27% is high. Patients and providers should consider the risks, benefits, and the duration of therapy during their shared decision-making process.

Abbreviations

IAT (insertional Achilles tendinopathy), VAS (Visual Analog Scale), MRI (magnetic resonance imaging), ECSWT (extra Corporal shock wave therapy), ICD-9 (International Statistical Classification of Diseases and Related Health Problems), CPT (Current Procedural Terminology), US (United States), OR (operating room), AFO (ankle foot orthosis), PRP (platelet rich plasma), FHL (flexor hallucis longus)

Declarations

ETHICS APPROVAL AND CONSENT TO PARTICIPATE: This study was reviewed by the IRB (Institution Review Board) and approved as a quality improvement project not requiring individual consent due to the de-identified nature of the data. All data was de-identified prior to review to include the single radiographic image utilized in Figure 1.

CONSENT FOR PUBLICATION: Yes. Publication clearance was submitted to the institution.

AVAILABILITY OF DATA AND MATERIAL: De-identified spreadsheets can be made available upon reasonable request from the corresponding author.

COMPETING INERESTS: The authors report no conflict of interest. The views expressed in this manuscript are those of the author(s) and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the US Government.

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AUTHORS CONTRIBUTIONS: GL: First author responsible for obtaining study approval, literature review, data collection and evaluation of results. RE: Responsible for data collection, literature review and organization of data. PR: Senior author responsible for literature review, study design, evaluation of data and manuscript development and submission.

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Figures

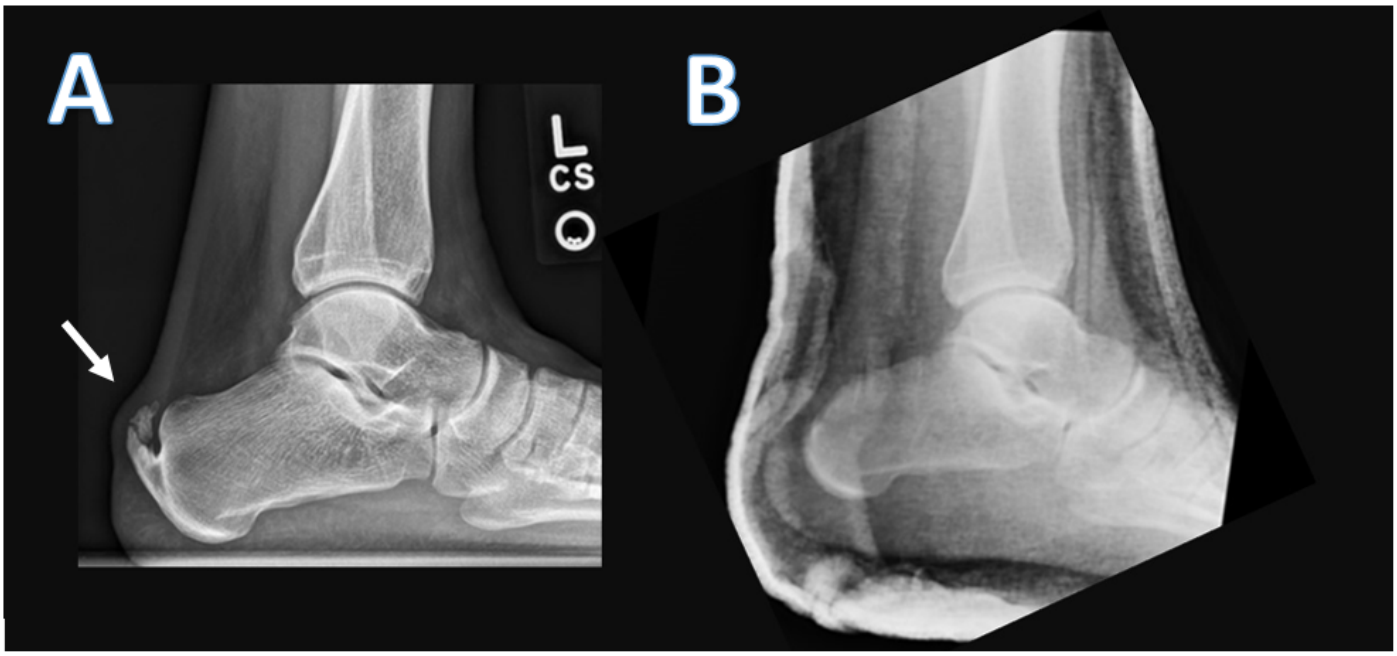

Figure 1

The enthesophyte at the insertion of the Achilles consistent with insertional Achilles tendinopathy is marked with a white arrow in Figure 1A. In Figure 1B, the enthesophyte has been removed as part of the operative intervention.