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Long-Term Clinical Outcomes Following the Central Incision Technique for Insertional Achilles Tendinopathy

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ABSTRACT

Background: **The central incision technique, more than any other exposure, allows for optimal access to the diseased Achilles tendon as well as the Haglund's prominence and the retro calcaneal bursa. We hypothesized that the central incision technique would be an effective, well-tolerated surgical incision for the surgical treatment of insertional Achilles tendinopathy with minimal to no loss of plantarflexion strength.** ***Methods:*** **Retrospective review of a single surgeon's experience with 27 patients, 29 surgical procedures utilizing this central approach. Isokinetic testing of plantarflexion strength, AOFAS Foot and Ankle Survey and AOFAS hindfoot score were administered to 22 patients at a mean followup time of 4 years. An additional telephone assessment was performed at a mean followup time of 7 years.** ***Results:*** **Average recovery time was 5.7 (range, 2 to 16) months. There was no significant difference in plantarflexion strength between the operative and nonoperative sides. At the early (4-year) assessment, 15 patients had an AOFAS hindfoot score of 100; the average AOFAS hindfoot score was 96. The long-term assessment at a mean of 7 years; 22 patients (including the two bilateral cases) reported pain scores of 0 and they had no strength deficits. Overall, there was a 96% (22 of 23) satisfaction rate.** ***Conclusion:*** **Surgical debridement and resection for insertional Achilles tendinopathy using the central incision technique appears to be a technically optimal procedure affording 96% pain-free patients out 7 years with minimal to no loss of strength.**

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INTRODUCTION

Insertional Achilles tendinopathy is frequently seen among recreational male runners between 35 and 45 years of age, and is most often considered to be an overuse injury. The older patient who presents with insertional Achilles tendinopathy tends to be female, sedentary, less athletic, overweight, and frequently has multiple medical conditions such as hypertension and diabetes.[1,6] Nonoperative treatment includes a combination of rest, shoe wear modification, non-steroidal anti-inflammatory medications (NSAIDS), ice, physical therapy, and in acute cases, the use of a short leg cast to immobilize the foot or a night splint to maintain maximum dorsiflexion. Surgical intervention should be considered in patients when nonoperative methods fail and significant symptoms persist.

Several surgical approaches for treating insertional Achilles tendinopathy have been described including endoscopic resection of the retrocalcaneal bursa and any prominent posterior calcaneal process.[9,12] Open procedures have included a number of different incisions such as vertical and J-shaped incision medial[13,14] and/or lateral[15,16] to the Achilles tendon, simultaneous medial and lateral vertical peritendinous incisions,[3] transverse incisions,[4] and a single central longitudinal posterior Achilles tendon splitting incision.[3,7,11] No technique has yet to establish itself as the most effective. Access to the entire Haglund's prominence may be limited with some approaches making it difficult to reach both the bone and the degenerated portion of the Achilles tendon. The central Achilles tendon splitting approach, affords in our opinion, the best exposure overall with greater access to the diseased tissue as well as Haglund's prominence while sparing a portion of the anatomic insertion of the tendon. In addition, the flexor hallucis longus tendon is also accessible through this same incision, should tendon augmentation be required.

The central Achilles splitting technique as originally described by McGarvey and Baxter et al. in 2002, has produced very good results with respect to clinical outcome and satisfaction in a series of 22 patients.[11] The purpose of this study was to document our long term clinical and radiographic outcomes of patients in whom the central Achilles splitting incision was used for treatment of insertional Achilles tendinopathy.

MATERIALS AND METHODS

Hospital patient records were searched to identify surgical patients treated for insertional Achilles tendinopathy with the central splitting technique by the senior author (J.N.) dating from May of 1994 to February of 2006. A total of 27 patients with 29 surgical procedures (two patients had bilateral surgery) were identified. Each of the 27 patients had an extensive course of conservative therapy preoperatively. All patients underwent debridement of the Achilles tendon with excision of all degenerative tendon, partial detachment of the Achilles tendon from the calcaneus, partial calcaneal exostectomy of the Haglund prominence, and full excision of the retrocalcaneal bursa via the central incision technique by the senior author.

There were 19 female and eight male patients. The mean age at the time of surgery was 66 (range, 44 to 81) years. Nineteen heels were on the right side and 16 on the left. The mean time from onset of heel pain until surgery was 27.7 (range, 1 to 96) months. Average patient weight was 95.9 (range, 73 to 123) kg and average height was 166.3 (range, 146 to 185) cm, with an average body mass index of 35 (seriously obese). There were no athletes in this patient population. There were patients with comorbidities such as hypertension, diabetes, heart disease and a history of peripheral vascular disease although all patients had good pulses.

Surgical technique & postoperative management

Each patient was placed in the prone position once a regional nerve block anesthetic had been administered. A thigh tourniquet was used in all cases. A midline skin incision was made from the plantar heel proximally for about 8 cm (Figure 1A); the paratenon was identified and centrally incised for later repair. Once the Achilles tendon was exposed, a full thickness, midline split was made in the tendon starting about 6 cm proximal to the insertion. The Achilles split was carried distally to the most inferior attachment of the tendon onto bone. The tendon was then elevated with a scalpel off the calcaneus at its distal attachment both medially and laterally until the entire distal exostosis was exposed. (Figure 1B) The tendon insertion was always left intact medially and laterally. Complete detachment was never necessary to expose all the pathology. Up to 70% of the tendon was frequently detached to visualize the entire distal spur. The degenerative portion of the Achilles tendon was carefully excised from the intact tendon. This amount ranged from 10% to 50% of the tendon. The degenerative tendon was visibly different from the normal tendon; with the degenerative tendon being discolored and the collagen fibrils disoriented. All calcifications within the tendon were also excised. The distal exostosis was removed with a rongeur, and then the Haglund exostosis was removed with an oscillating saw or osteotome in an oblique fashion from distal to proximal. (Figure 1C) Care was taken not to disrupt the subtalar joint. All calcifications protruding on the calcaneus and within the Achilles tendon were removed and confirmed with an intraoperative fluoroscopic image. The tendon was then reattached to the newly created cancellous surface of the calcaneus with two 3.5-mm corkscrew suture anchors, one placed medially and the other directly lateral at the same bone level, ensuring equal tension was maintained both medially and laterally as the sutures were tied. (Figure 1D) The split tendon was then sutured side to side with 2-0 Vicryl and the suture knots were buried within the tendon. (Figure 1E) The paratenon was closed with 4-0 Vicryl using a locked running stitch, and the skin reapproximated with 4-0 Nylon. No patient required an FHL tendon transfer. No patient required a proximal tendon recession because in all cases, after repair the foot could be dorsiflexed to a neutral position without interruption of the repaired tendon. A postoperative plaster splint in slight plantarflexion was applied to reduce skin tension and the patient was kept nonweightbearing initially. Two weeks following surgery, sutures were removed and the patient was placed either into a camwalker with a 1-cm felt heel lift or a short leg cast in slight plantar flexion and all patients were allowed full weightbearing at this point. The camboot was used in reliable patients and in those in whom less than half of the Achilles tendon insertion was released. A cast was used in unreliable patients or those in whom a more extensive release was performed. At 6 weeks postoperative, the patient transitioned to a comfortable shoe with a 1-cm heel lift which they used for an additional 6 weeks. Some patients utilized a heel lift for up to 6 months following surgery at their own discretion. No patient was sent for formal physical therapy. Patients were instructed in gastroc-soleus strengthening exercises at 12 weeks postoperative and were then seen back at 6 and 12 months postoperative.

Two separate followup assessments were performed on this set of patients. For the initial postoperative assessment, patients underwent isokinetic testing of the gastroc-soleus complex to assess return of plantarflexion strength. In addition, a physical exam, radiographic exam, and AOFAS hindfoot score was obtained. Pre- and postoperative clinical examination included gait analysis, assessment of posterior heel tenderness, range of motion measurement for the ankle and subtalar joints, evaluation of heel width, wound healing, pulse, sensory deficits, assessment of heel cord contracture and presence of ankle or subtalar instability. Calf circumference was measured 15 cm below the medial joint line of the knee around the smallest part of the leg and at the height of

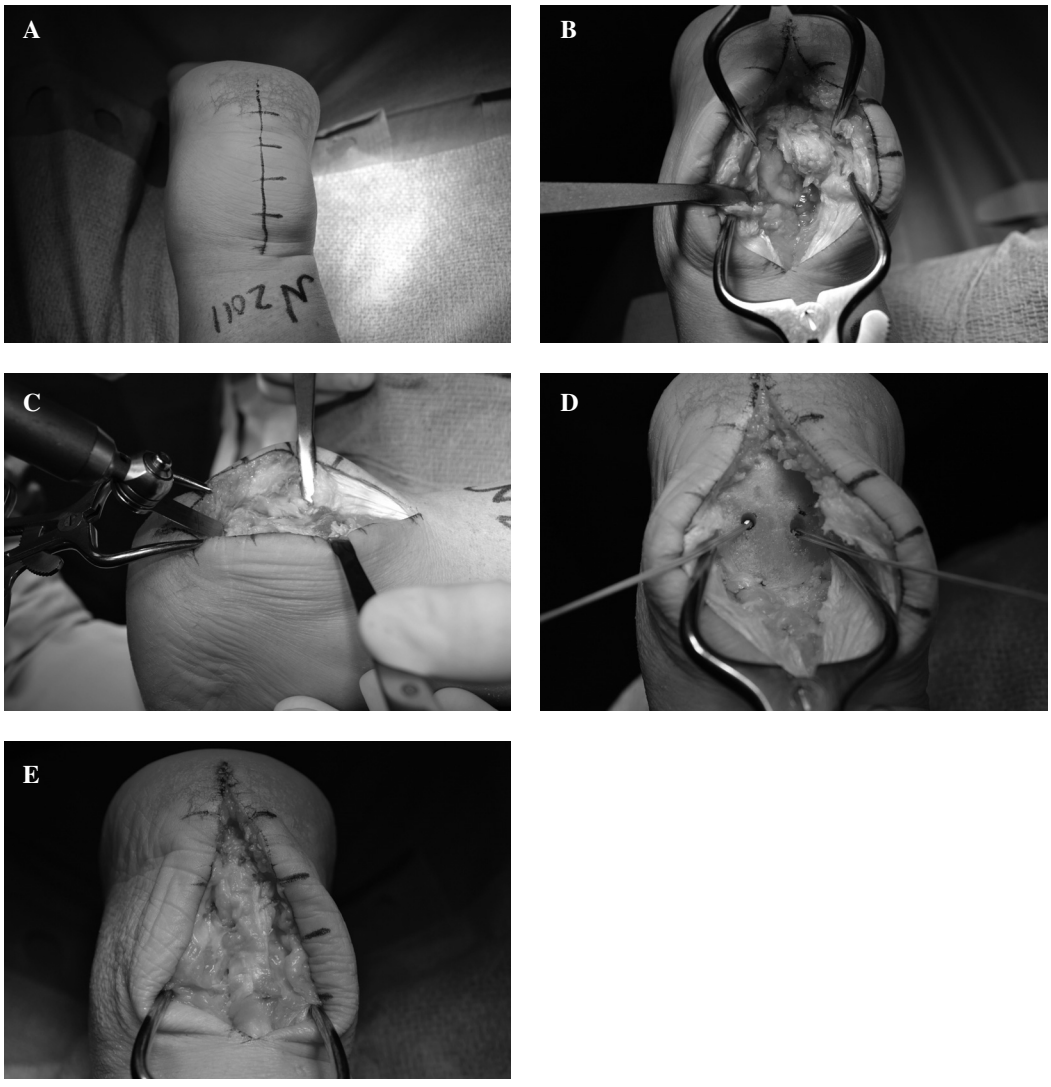

Fig. 1: **A**, Proposed skin incision. Patient is prone on the operating room table. **B**, Exposure with split Achilles tendon, massive exostosis, synovitis visualized in the retrocalcaneal bursa as well as Haglund's deformity. **C**, Oscillating saw cutting the posterior aspect of the calcaneus and the Haglund's deformity. **D**, Suture anchors placed for repair of partially detached Achilles tendon. **E**, Closure (note the Fiberwire suture repair).

the malleoli. Bilateral lateral radiographs were also obtained to look for recurrence of soft tissue calcification.

For the early postoperative assessment, 22 patients (23 heels) were contacted and 19 patients with 20 heels returned for testing. All 19 patients underwent isokinetic testing, administration of an AOFAS questionnaire, a detailed physical examination to document calf size and ankle and subtalar range of motion. Additionally all 19 patients had bilateral radiographs to evaluate any recurrent calcifications. The mean followup for these patients was 4 years (range, 35 to 97 months).

Isokinetic testing

Each patient was weighed and measured for calibration purposes. Following a 10-minute warm-up period on a stationary bicycle using a standard protocol of no resistance and a rate of 150 rpm, each patient was tested on a Cybex isokinetic testing device to assess plantarflexion strength compared to the nonoperative site. For the two patients that had bilateral procedures, isokinetic testing was only performed on the first surgical side. All testing was performed with the patient in the prone position to avoid simultaneous contracture of other muscle groups and possible distortion of the results. Each patient was asked to perform two maximum strength movements and then five test repetitions following an initial five motion warm-up. All test results were recorded using the Cybex Medical/Henley Healthcare Software, Version 2.06.

RESULTS

All patients presented with posterior heel pain and had failed nonoperative management; 13 patients had a range

of motion at the ankle and subtalar joint equal to the contralateral side, while four patients had more dorsiflexion on the affected side than they did on the contralateral side and eight patients demonstrated a slight loss of dorsiflexion on the affected side. Each patient had visible calcification at the Achilles insertion on lateral radiographs, while some had large bone spurs or even multiple calcific bodies within the Achilles tendon itself. All radiographs showed enthesopathic changes and a prominent posterior calcaneal tuberosity (Haglund's deformity).

The average time for pain resolution following surgery was 5.7 (range, 2 to 16) months. One patient had a superficial wound infection that was treated with a course of oral antibiotics; no additional surgical intervention was necessary in any of the patients.

At the initial evaluation, there was no significant difference among ten patients with respect to calf circumference while seven patients had 1 cm of calf atrophy compared to the contralateral, nonoperative side, and two patients had a 2 cm increase in the calf size on the operative side. Achilles contracture was documented at 5 degrees in four patients and 10 degrees in five patients. The remaining patients did not demonstrate any tightness of the Achilles tendon. We defined an Achilles contracture as an ankle in which dorsiflexion was less than the opposite normal ankle when the knee was fully extended and the subtalar joint was locked.

Post-surgical AOFAS questionnaires yielded the following results: of the 22 patients who were surveyed at a mean followup time of four years, three were completely pain free, six reported mild pain ascending stairs, two had pain when standing, four complained of mild to moderate stiffness, five had difficulty with shoes having a high heel counter, one had chronic swelling and one had giving way problems. Four patients altered their lifestyles to avoid potentially damaging activities, and six patients reported no problems at all. Sixteen patients achieved an AOFAS hindfoot score of 100, three patients scored 90, and the other three each scored an 85, 84, and 82, respectively. The average AOFAS hindfoot score was 96.4.

Lateral radiographs showed a recurrent small calcification (less than 0.5 cm) in seven cases, a moderate calcification (0.5 to 1 cm) in one case, and a large calcification (more than 1 cm) in three cases. There were no recurrent calcifications in 11 heels. Interestingly, the contralateral foot revealed no signs of insertional Achilles tendinopathy in seven patients, small calcifications in six patients, three had moderate calcification, and five patients demonstrated large calcifications, with one patient having a very large Haglund prominence.

Isokenitic testing was performed on 19 patients and the operative side demonstrated 41.1 Nm and the contralateral nonoperative side demonstrated 40.4 Nm of peak torque. Overall there was no significant difference in strength between the operative and nonoperative side.

A later telephone interview was conducted to document the long-term patient self-assessment of their surgical procedure. This telephone survey was conducted at a mean of 7 years following surgery and 23 patients undergoing 25 procedures were able to respond to this telephone questionnaire. Twenty-two patients (including the two bilateral cases) reported being completely pain-free (pain score of 0) and were satisfied with the operation without reservation, one patient was not satisfied. With respect to activity, two patients reported mild limitations secondary to other medical conditions, with little to no effect on sport or work related activities. One patient was unable to return to jogging while another added jogging as a new activity following surgery. Three patients stated that they were unable to wear closed back shoes due to posterior heel tenderness, and two patients continued to wear an in-shoe orthosis. Only one patient in the surveyed group was dissatisfied with the surgery and would not recommend the procedure to a friend. This patient underwent a second corrective procedure with a different surgeon, and reports ongoing varying pain levels (pain score, 2 to 7), an inability to return to work due to chronic dependence on pain medications, an altered gait with a limp, and being severely limited in her ability to walk distances (1 to 6 blocks only) as well as her general activity level.

DISCUSSION

Chronic insertional Achilles tendinopathy is a condition of unknown etiology and pathogenesis that is often, but not always associated with pain during loading of the Achilles tendon. Clinically, patients with insertional Achilles tendinopathy present with posterior heel pain and usually have an exacerbation of their symptoms following exertion. The pain is frequently located posterolateral and there is tenderness at the tendon-bone interface. A standing lateral radiograph will help confirm the diagnosis.

When surgery becomes necessary, the central Achilles splitting technique permits the surgeon unfettered access to the most common area of diseased Achilles tendon, the middle third, and the underlying bony prominence is available for easy removal. This approach also retains the critical medial and lateral areas of anatomic attachment of the tendon to the calcaneus. We have not used this technique in a young, athletic population; the vast majority of our patients were sedentary, overweight, and had other medical comorbidities. We have not used this procedure in patients without pedal pulses and do not recommend it in those patients. Our study further demonstrates that the vast majority of our patients were obese (BMI 35), yet this did not preclude an excellent result.

In 2006, Johnson et al.[7] reported on a series of 22 patients who underwent insertional Achilles tendinopathy surgery using the central splitting technique with an average followup of 34 months. Their conclusion was that overall the central tendon splitting approach yielded good relief of pain with improved function, shoe wear, and the ability to work without painful postoperative scars.[7] To our knowledge, our series

of 27 patients and 29 procedures has the longest followup to date with intermediate to long-term followup ranging on average from 4 to 7 years. The clinical examination, radiographic, isokinetic testing and followup survey data reported in this paper support the hypothesis that the central splitting technique is well-tolerated and does not affect patient's return of strength and functional use of the tendon. All but one patient remained pain-free at final followup, and they were able to return to their prior work and sport related activities without reservation or restriction. The isokinetic testing confirmed no significant loss in plantarflexion strength for all patients tested. Patients reported a 96% (21 of 22) satisfaction rate at 4-year followup, and a 96% (22 of 23) satisfaction rate at 7-year followup with the same patients stating that they would either repeat or recommend the procedure to a friend or family member.

Interestingly, our postoperative radiographs showed recurrent calcifications in 50% of the patients (11 of 22) who also reported being pain-free. Asymptomatic calcifications were noted on the nonoperative side in 64% of the patients (14 of 22). This suggests it may only be necessary to debride degenerative, hypertrophied tendon and not necessarily small calcific soft-tissue lesions within the tendon. It also appears that the source of pain and degeneration of the tendon is multi-factorial and not simply related to the presence of Haglund's deformity and intratendinous calcification. It is interesting to speculate that the finding of postoperative recurrent calcifications in asymptomatic patients might suggest that the surgical detachment and reattachment of the Achilles tendon potentially denervates the enthesis thus relieving symptoms.

Other surgical approaches to insertional Achilles tendonopathy have been utilized in the past. Schepsis et al.[13] described a longitudinal incision 1 cm medial to the Achilles tendon from the musculotendinous junction down to the Achilles insertion for the surgical treatment. If exposure of the bursa and posterior aspect of the calcaneus were necessary, then they would extend the skin incision transversely medial to lateral at the level of insertion to form a J-shaped incision.[13] In their review of 21 patients treated through the J-incision for insertional Achilles tendinopathy, they reported a mix of satisfactory outcomes with approximately a 70% rate of good to excellent results.[13] Watson et al.[15] and Yodlowski et al.[16] favored a posterolateral incision with elevation of the lateral Achilles tendon insertion in a lateral to medial, superior to inferior direction. A cuff of calcaneal periosteum was elevated anteriorly to facilitate later repair of the Achilles insertion. In a 2007 paper discussing the Cincinnati incision, Carmont and Maffulli[4] note that while none of their patients reported numbness, there remained a risk of iatrogenic sural nerve injury as this semi-circumferential incision is almost perpendicular to the course of the sural nerve. In contrast to these other techniques, the central incision approach is parallel and medial to the course of the sural nerve. In addition, the central splitting technique involves less vascular disruption than other approaches. An examination of the vascular anatomy and the angiosomes of the hindfoot confirms that the midline approach is situated centrally to the peroneal angiosome and the posterior tibial angiosome, thereby potentially reducing injury to the distal angiosome boundaries.[2,8] Further, our data demonstrated that detaching 70% of the Achilles tendon and reattaching it did not lead to postoperative rupture even in obese patients. Furthermore, we have demonstrated that there does not appear to be a need for augmentation of the remaining Achilles tendon with an FHL transfer.

Recovery following surgery for insertional Achilles tendinopathy can be slow and some patients may take up to 12 months to regain complete function and a return to prior levels of activity.[13,14] In our series, patients required an average of 5 months to achieve moderate resolution of residual tenderness and/or discomfort, and to resume their previous level of work and sporting activities. Our long-term followup shows further improvement between 3 to 4 years and the 7-year results. Examination and testing of these patients confirmed that 95.5% (21 of 22 heels) regained equal strength to the nonoperative side. The followup survey of these patients yielded a 96.6% success rate (28 of 29 procedures) with respect to comfort, strength, activity and overall satisfaction. Our findings are in sharp disagreement with those of McGarvey et al.,[11] who stated that patients over the age of 50 did poorly with the central splitting surgical techniques. We found just the opposite, patients over 50 did remarkably well and without complications.

CONCLUSION

The central splitting technique for the surgical treatment of Achilles tendinopathy allows the surgeon to treat all areas of pathology at the distal site of the tendon while minimizing the risk of wound complications and vascular or nerve injury, increasing the likelihood of good long-term success with respect to strength, range of motion and function.

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