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Original Article

Functional Outcome of 3 Years Follow Up after Mini-Open Tendo- Achilles Splitting Technique for Excision of Haglund's Deformity in Non-athletes

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ABSTRACT:

Background: Haglund's deformity enlarges the posterolateral tuberosity of the calcaneus that is usually linked to insertional Achilles tendonitis. It can induce inflammation of the posterior calcaneal bursa, which results in pain and edema. This is known as Haglund syndrome. This study aimed to assess the effectiveness and safety of the mini-open Achilles splitting technique for treatment of Haglund's deformity, to improve symptoms and enhance the stability of the tendon by securing it to the calcaneus using anchor suture, which prevents tendon rupture, especially if the tendon is degenerated and debridement is required.

Methods: We conducted a retrospective cohort study on 15 cases of non-athlete's feet with Haglund syndrome treated by the tendon Achilles splitting technique, which involved completely excising the bony prominence and posterior calcaneal bursae before reattaching the tendon Achilles with anchor sutures to the calcaneus. The follow-up was at least three years post-surgery for all patients. The American Orthopedic Foot and Ankle Society ankle hindfoot score (AOFAS) was used to evaluate the results.

Results: There was a highly statistically significant increase ($p < 0.001$) in AOFAS score postoperative compared to preoperative (61.37 ± 8.46 versus 87.65 ± 7.53) with percentage of increase of 42.8%. Regarding the correlation between percent of change in AOFAS score and different parameters among the studied cases, there was a statistically significant negative correlation between percent of increase in AOFAS score and duration of symptoms ($r = -0.29$, $p = 0.04$) and operation duration ($r = 0.36$, $P = 0.01$).

Conclusions: Suture anchor reattachment of tendon Achilles following mini-open tendon splitting to excise the Haglund's deformity could be a very effective approach for surgical removal of the exostosis with hopeful results with a minimal complication rate.

Keywords: Haglund's deformity, calcaneal bursitis, anchor sutures.

INTRODUCTION

Haglund syndrome is a disorder produced predominantly by the Tendon-Achilles impinging upon the postero-superior tuberosity of the calcaneus, resulting in inflammation of the retro-calcaneal bursa [1], which was initially described by Patrick Haglund in 1928 [2]. According to reports, the disease has a hereditary propensity, and persons with a family history are five times more likely to get Haglund syndrome than those who do not [3,4].

Clinically, it is defined by a bony exostosis of the postero-superior tuberosity of the calcaneus, followed by inflammation at the tendon-Achilles insertion, resulting in edema, pain, tenderness, and limited dorsiflexion of the ankle. [5,6]. Middle-aged women are more likely to be affected than men. [7,8]. The conservative treatment could be a line for Haglund syndrome in its early stages such as: non-steroidal anti-inflammatory drugs (NSAIDs), eccentric strength exercises, extracorporeal shock

wave treatment, and orthotic insoles like heel elevators or ankle-foot orthoses [9].

Furthermore, injecting steroids directly into the tendon is not suggested since it can damage the tendon and result in serious Achilles tendon rupture [10,11,12]. When conservative treatment fails to sufficiently improve symptoms, we usually go for surgery [13,14].

The surgical principal depends upon removal of the postero-superior tuberosity of the calcaneus and excision of the retro-calcaneal bursa [15]. The mini-open dorsal approach of the tendon Achilles insertion is recommended and careful tendon splitting without total detachment to perform the procedure, and the Achilles tendon insertion is reinforced and fastened with an anchor suture. Clinical studies have indicated a wide range of reliable suture procedures and materials. On the contrary, the para-median technique typically allows for less pathological exposure and results in resection [16,17].

In case of pathological tendon Achilles rupture occurred as a complication of Haglund's syndrome, V-Y tendoplasty can take place in association with anchor suture fixation to the calcaneus but if the defect is larger than 5-8 cm autologous tendon graft is used to fill in the gap and then reinsertion is done to the calcaneus by interference screw, though some authors prefer to use allogeneous tendon graft [18,19].

Our hypothesis of using this technique was to provide adequate exposure of the exostosis to allow complete resection, to totally remove the bursa, to debride the necrotic tissue of the tendon and to secure the tendon after debridement into the calcaneus by anchor sutures to give the best potentiality of healing without rupture.

So, this study aimed to assess the effectiveness and safety of the mini-open tendon Achilles splitting technique for treatment of Haglund's deformity, to improve symptoms and enhance the stability of the tendon by securing it to the calcaneus using anchor suture which prevents tendon rupture especially if the tendon is degenerated and debridement is required.

METHODS

We conducted a retrospective cohort study on 15 patients suffering from Haglund's deformity which caused chronic discomfort in the back of the heel which was resistant to conservative measures

treated by tendon Achilles splitting technique at Orthopedic Department, Zagazig University Hospitals from January 2018 to January 2021. All patients were evaluated clinically through history taking, which included activity level. All patients had at least three years of follow-up after surgery.

The research ethics board of the Faculty of Medicine at Zagazig University gave its approval to the study, and all participants gave written informed consent. A component of the Code of Ethics for Research Involving Humans, the Declaration of Helsinki ensures that the study was carried out in compliance with its provisions. Before this study could begin, we obtained the approval from the Institutional Review Board (IRB#777/27-10-2024). We included all cases from both sexes who had Haglund's deformity which caused chronic discomfort in the back of the heel which was resistant to conservative measures.

We excluded all patients who had any of the following characteristics: Patients having prior ankle or calcaneal fractures, patients who had seronegative arthritis, ankle mal-alignment, patients who had degeneration more than 50% of thickness of the tendon-Achilles or total tendon rupture, or skeletally immature patients. Patients who had prior surgery on the same heel as well as patients who had diabetes or other significant systemic disorder are precluded from surgery to prevent serious consequences were also excluded from the study.

Detailed history, with special stress on the signs of inflammation like swelling, warmth, redness, and tenderness may be present over the posterior heel. Evaluation of bursa, tendon and calcaneus was done. Patients reported swelling and discomfort on the back of the heel related to the insertion of tendon-Achilles. Both active and passive ankle movement generate pain. We utilized the Thompson calf squeeze test to measure Achilles tendon integrity [14]. All patients had their American Orthopedic Foot and Ankle Society (AOFAS) ratings documented prior to surgery [15].

Radiological evaluation: A plain X-ray was used to assess posterior calcaneal tubercle size, calcification, and the amount of calcaneoplasty required after surgery. Magnetic resonance imaging (MRI) was used to assess the degree of tendon deterioration and the existence of an inflamed bursa.

Operative technique

Patient lied prone on the operative table after spinal anesthesia. (Fig 1A). Then a 6 cm midline incision

was done over the Achilles tendon over the posterior superior calcaneal tuberosity. Tendon splitting was done along the skin incision without interruption of the tendon continuity (Fig 1B). Calcaneoplasty was done completely under vision using osteotome, electric burr and curette. Removal of bursae was also done to clear the pressure upon the tendon (Fig 1C). Then a 3mm double loaded anchor suture was applied into the posterosuperior surface of the calcaneus and the opened tendoachilis was secured into the calcaneus (Fig 1D and E). Wound closure and short knee cast were done for 3 weeks in equines, then plantigrade cast was done for another 3 weeks. Walking was encouraged inside walking cast for another 2 weeks then cast was removed and returning back to normal life was started (Fig.1F) We used the calcaneal parallel pitch lines to assess the amount of bone should be removed while doing calcaneoplasty. Line 1 started at the calcaneocuboid most inferior point and traveled along the calcaneus' inferior surface. Line 2 extends from the posterior facet of the subtalar and travels parallel to line 1. Calcaneoplasty was considered adequate when there was no visible bony protrusion above line 2 (Fig.1G).

Complications

Open surgical excision was routinely used by orthopedic surgeons; nevertheless, it had some disadvantages, including wound dehiscence, avulsion of the tendon, an unattractive scar, persistent heel soreness, sural nerve injury or painful neuroma. The follow-up for was at least three years post-surgery for all patients. The American Orthopedic Foot and Ankle Society ankle hindfoot score was used to evaluate the results.

Statistical Methods

The acquired data was digitized and statistically evaluated with the SPSS (Statistical Package for Social Science) version 25.0. Qualitative data was provided as frequencies and relative percentages. The standard deviation (SD) was used to represent quantitative data as a mean. The paired sample T test was applied to normally distributed data to determine the difference between quantitative

variables in the same group before and after treatment. The level of significance for the performed statistical tests is displayed above. Results with P values more than 0.05 are regarded non-significant, whereas P values less than 0.05 were considered significant. Results with a P-value of 0.001 were considered extremely significant. The percentage change was determined as follows: $((\text{post value} - \text{pre value})/\text{pre value})$ multiplied by 100 gives the percentage of change.

RESULTS

The present study was conducted on 15 cases 9 women and 6 men with age range (37 - 55 years with mean 41.31 ± 5.61 years). Weight range of the studied cases is (75 - 115 Kg with mean 92.34 ± 9.81 Kg). Most frequent occupations were employee and housewives 33.3% & 26.7% respectively (Table 1).

This study showed that the right-side injuries was 8 patients (53.3%) and 7 patients (46.7%) was in left side symptoms duration ranged from 4 to 12 months with mean 7.13 ± 2.81 months while follow up time ranged from 2 to 3 years with mean 2.68 ± 0.37 years (Table 2).

There was a highly statistically significant increase ($p < 0.001$) in AOFAS score postoperative compared to preoperative (61.37 ± 8.46 versus 87.65 ± 7.53) with percent of increase 42.8%. (Fig.2).

Regarding correlation between percent of change in AOFAS score and different parameters among the studied cases, there was a statistically significant negative correlation between percent of increase in AOFAS score and duration of symptoms ($r = -0.29$, $p = 0.04$) and operation duration ($r = 0.36$, $P = 0.01$) (Table 3).

Among 15 cases included in our study, three case showed complications (13.3%) (Figure 3), two cases (13.3%) had complications, one case had superficial wound infection and 1 had wound dehiscence, complete recovery achieved by parenteral antibiotics and single case of postoperative (CRPS), recovery was achieved by physiotherapy and steroid.

Table 1: Demographic characteristics of studied cases

Variable		(n=15)
Age: (years)	Mean ±SD	41.31±5.61
	Range	37-55
Sex:	Male N(%)	6 (40%)
	Female N(%)	9 (60%)
Weight: (Kg)	Mean ±SD	92.34±9.81
	Range	75-115
Occupation:	House wife N(%)	4 (26.7%)
	Farmers N(%)	1 (6.7%)
	Skilled N(%)	3(20%)
	Workers N(%)	2 (13.3%)
	Employee N(%)	5 (33.3%)

Sd: Standard deviation

Table 2: Clinical data of studied cases:

Variable		(n=15)
Side:	Right N(%)	8 (53.3%)
	Left N(%)	7 (46.7%)
Symptoms duration: (months)	Mean ±SD	7.13±2.81
	Range	4-12
Follow up duration: (months)	Mean ±SD	2.68 ± 0.37
	Range	2 - 3

Sd: Standard deviation

Table 3: Correlation between change in AOFAS score and different parameters among the studied cases

Variable	% of change in AOFAS (n=15)	
	r	P
Age: (years)	-0.10	0.86 NS
Weight: (Kg)	0.21	0.14 NS
Symptoms duration: (months)	-0.43	0.001*
Operation duration	-0.36	0.01*

r: Pearson’s correlation coefficient * : Significant (P<0.05)



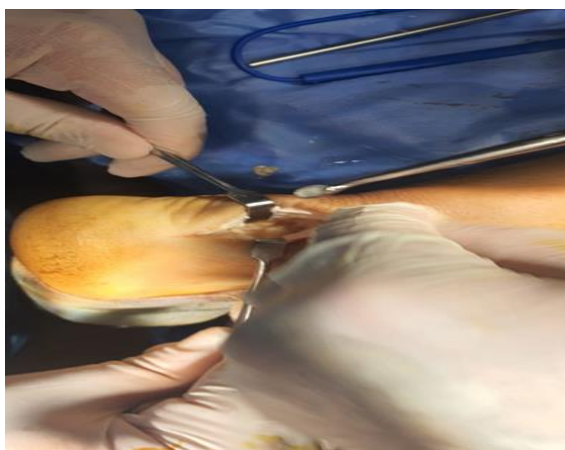
(A)



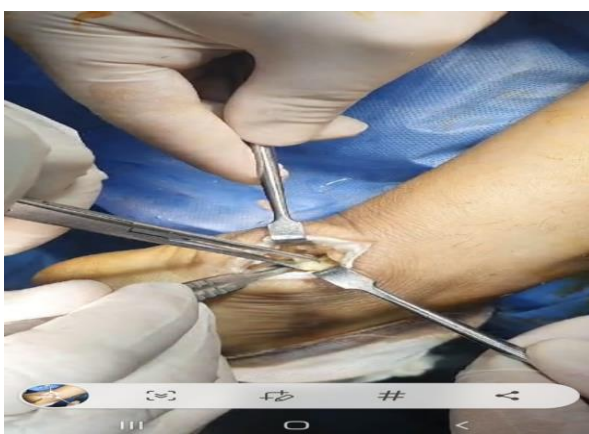
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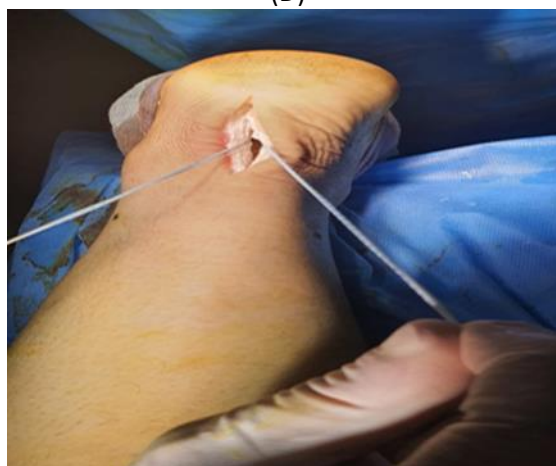
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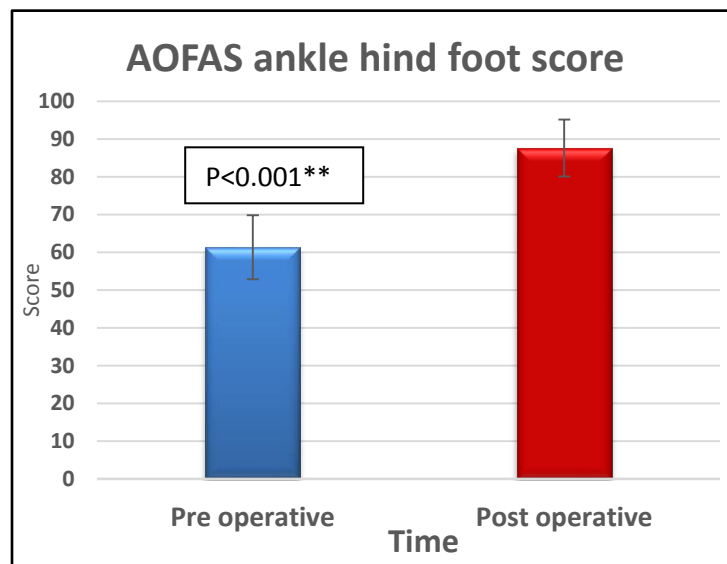


(G)



(H)

Figure 1: Operative Technique (A): Preoperative X-ray, (B): Surgical incision, (C): Calcaneoplasty, (D): Curettage of the osseous bump, (E): Bursectomy, (F): Anchor suture applied to Calcaneus, (G): Wound closure, (H): calcaneal parallel pitch lines and postoperative X-ray showing the Anchor suture.



AOFAS: American Orthopedic Foot and Ankle Society, P: For paired t test **: Highly significant (P<0.001)

Figure (2): AOFAS score pre and final postoperative among the studied cases.

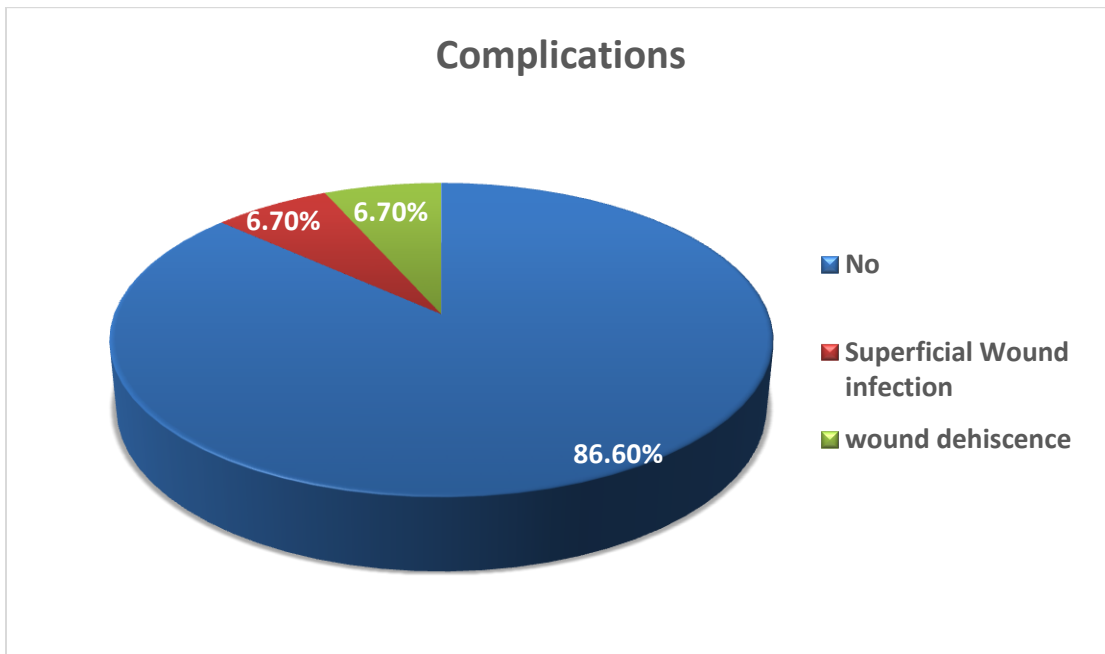


Figure (3): Frequency and type of complications among the studied cases.

DISCUSSION

Haglund's deformity enlarges the posterosuperior tuberosity of the calcaneus that is usually linked to insertional Achilles tendonitis. It can induce inflammation of the posterior calcaneal bursa, which results in pain and edema. It may be accompanied by degeneration of the tissue of the Achilles tendon due to friction against the exostosis. Different methods for management could be used such as: open lateral approach, midline tendon Achilles splitting technique followed by fixation of the tendon to the calcaneus using anchor sutures and endoscopic resection [1].

We included 15 Patients are included in this study which was held between 2018 and January 2021 at Zagazig University Hospitals. Postoperative follow up was for at least three years for all patients. Our results showed high significant improvement postoperatively for all patients, as regard pain and function. We used AOFAS scores to assess the results for all patients preoperatively and postoperatively. Our results showed a highly statistically significant increase in postoperative score compared to pre (61.37 ± 8.46 versus 87.65 ± 7.53) with percentage of increase 42.8%.

These results were near to those obtained by Jiang et al. [19] they observed that open removal of the bony exostosis followed by reinsertion of the

tendon-Achilles by double-row suture technique could be a good choice for management of Haglund's deformity.

Our results were also similar to those obtained by Anderson et al. [20] who conducted a retrospective comparative study on a group of patients (66 foot in 62 people) to assess the outcomes of open surgery by lateral approach against midline tendon-splitting. They discovered that both groups' AOFAS scores rose dramatically, from 43 to 81 for the tendon-splitting group and 54 to 86 for the lateral approach group. They concluded that both operations relieved symptomatic discomfort, although the tendon-splitting group returned to normal function earlier.

Schneider et al. [8], on the other hand, conducted a retrospective study on a group of patients (49 heels in 36 patients) who had been operated by open removal of the bony exostosis through the lateral approach then, they were followed up for four 48 months. They identified seven patients disappointed, three of them necessitated re-do surgery, with only 73.5% satisfaction rate. They concluded that open surgical procedures typically disappoint patients.

Endoscopic calcaneoplasty is an alternative procedure for management of Haglund s syndrome, Kondreddi et al. [21] made a study on 25 heels in 23 patients who underwent endoscopic calcaneoplasty with a one-year follow-up. The patients' preoperative

AOFAS score of 57.92 improved significantly to 89.08 after surgery. They determined that endoscopic calcaneoplasty was extremely successful, with better cosmetic results and less problems. However, endoscopic calcaneoplasty is technically difficult with a high curve of learning. Also, patients who had degeneration in Achilles tendon more than 50% had poorer outcomes if managed endoscopically as the diseased tendon tissue was still present and tendo Achilles rupture was still potential. Inadequate calcaneoplasty and long duration of the procedure were major drawbacks of the procedure.

Among 15 cases included in our study, two cases showed complications (13.3%). One case suffered from wound dehiscence, single case of superficial infection, complete recovery achieved by parenteral antibiotics. These results are close to those obtained by Yuen et al. [22] who reported a complication rate of (12.3%) for open surgery. The need for revision or repeat surgery was indicated in (2.6%), Wound-related problems (e.g., infections, paresthesia and wound dehiscence etc.), hematoma formation, and Achilles tendon rupture were all documented.

On the contrary, our complications were not matched with those obtained by Jennifer et al. [23] used the mini-open approach on 44 feet (10 males, 34 women; 25 rights, 19 left) and experienced a complication rate of 50%. They reported that 22 individuals (2 men, 20 women; 14 right and 8 left) developed problems. Sural nerve entrapment (3 cases, 13.6%), incisional healing problems resulting in restricted motion (8 cases, 36.3%), rupture of the Achilles tendon repair and ectopic bone formation at the tendon insertion site (11, 50%). Ten of the 22 patients/feet (45.5%) had revision surgery.

Our mini-open technique is done by midline tendon Achilles splitting incision so, our procedure is away from the sural nerve and medial calcaneal sensory nerve. The use of bone wax prevented hematoma formation. The short duration and the small incision of the procedure minimizes the wound healing complication rate. Anchor sutures used in our study are a safeguard against tendon avulsion.

In our study, the age of the patients and BMI have no significant relationship with the prognosis of the disease. This finding is similar to that obtained by Jae Hoon Ahn et al [14] From August 2001 to April 2010, they conducted 15 feet on 15 patients who had received surgery therapy for Haglund syndrome using the central tendon-splitting method. The results were like ours, as the mean AOFAS increased from

62.1 ± 7.5 to 92.5 ± 3.5 at the last follow-up visit ($p = .001$), with no significant correlation with age or BMI.

We found in the present study that the duration of symptoms before the operative procedure was of negative correlation with the prognosis of the patient this may be due to the occurrence of degenerative changes in Achilles tendon with the longstanding pathology. This finding was supported by Schneider et al. [8]

This study limitations include the limited number of our cases, on the other hand, the advantage is that we could totally remove the bony prominence and the bursa and we could also debride the degenerated tendon tissue after which, we could reattach the tendon safely to the calcaneus by the anchor suture which provided adequate stability of the construct till complete healing with low risk of tendon avulsion or rupture. In the future we could have comparative study with the endoscopic technique to assess.

CONCLUSIONS

Suture anchor reattachment of tendon Achilles following mini-open tendon splitting to excise the Haglund's deformity is a very effective approach for surgical excision of Haglund's deformity with good results and a low complication rate.

Conflict of interest: The authors declare that they have no competing interest.

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