ORIGINAL ARTICLE

Platelet rich plasma (PRP) in the surgical treatment of Haglund's syndrome: the use of PRP membranes as an intra-operative local adjuvant

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ABSTRACT

Aim Haglund's syndrome may be responsible for chronic pain in the ankle and hindfoot. Although numerous therapeutic approaches have been described in the literature, to this date no consensus over a surgical treatment has been established. We report our experience in the treatment of Haglund's syndrome and pre-insertional calcifications of the Achilles tendon using an open surgical approach and platelet rich plasma (PRP) membranes as a local adjuvant.

Methods The study retrospectively evaluated patients with Haglund syndrome treated with a direct posterior access, Achilles tendon split, bursectomy, resection of the heel deformity and topical administration of PRP membranes. After surgery, a standardized rehabilitation protocol was performed. The preoperative and postoperative functionalities of the foot and ankle were assessed using the American Orthopaedic Foot & Ankle Society (AOFAS) score. Intraoperative and postoperative complications were recorded.

Results Twenty consecutive patients were included. The mean follow-up was 23 months. No patient had major intraoperative or postoperative complications. After the surgery, the mean AOFAS score increased from 44.1 to 92.0, resulting in a statistically significant increase in patient functionality after the treatment (p=0.001).

Conclusion Our results suggest that an open surgical approach consisting of a combination of bursectomy, resection of the calcaneal deformity, and topical administration of PRP membranes may be effective for the treatment of Haglund's disease.

Key words: Achilles tendon, AOFAS, Haglund's syndrome, heel pain, PRP

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INTRODUCTION

Posterior heel pain is a common condition, and its treatment can be a challenge for foot and ankle surgeons (1). The term Haglund's Disease refers to a degenerative condition of the hindfoot characterized by osteochondrosis of the posterior calcaneal apophysis, followed by exostosis of the posterior-superior corner of the calcaneus and retrocalcaneal bursitis (2). Although insertional Achilles tendonitis (IAT), calcaneal exostosis and retrocalcaneal bursitis can also present as isolated conditions, in case they occur together, they comprise the Haglund's triad (2-7). The exostosis of the posterosuperior calcaneus, also known as Haglund's deformity, was first described in 1928 by Patrick Haglund, and was soon considered to be an important cause of local heel pain. In fact, it was hypothesized that the impingement of the enlarged posterosuperior calcaneal prominence and the fibres at the insertion of the Achilles tendon caused local inflammation, with consequential insertional bursitis and insertional degeneration of the Achilles tendon (1-4).

Clinically, an increase in the poster superior or poster external tuberosity of the calcaneus can be observed from the first stages of the disease. Functional factors such as a hollow foot, routinary physical activities including sports or work and the use of shoes with rigid posterior buttress can trigger inflammatory processes which could then lead to hyperkeratosis, erythema, bursitis and chronic hindfoot pain (2-5).

In clinical practice, the combination of plan x rays and MRI scans can be effective in order to confirm the clinical suspicion of Haglund's disease. X rays can show an exostosis of the calcaneus, as well as eventual associated calcifications of the Achilles tendon (5). Radiographic measurements, including Fowler's angle and parallel pitch lines, are commonly used to assess the prominence of the calcaneal spur. The Fowler-Philip angle (FPA), in particular, is crucial for the diagnosis and the management of IAT and retrocalcaneal bursitis, as patients with an FPA higher than 75 degrees are most likely to have clinical manifestations. MRI scans, for their part, show not only the calcaneal exostosis, but also the inner structure of the tendon and the state of the retrocalcaneal bursa. MRI images are therefore useful to allow a certain diagnosis of retrocalcaneal bursitis and IAT (6).

Once the diagnosis of Haglund's disease has been established, an adequate treatment must be undertaken (7).

Conservative measures include a reassessment of the shoe of the patient and heel pads or heel lifts in cases of high arched feet (8). The effects of heel elevation on the relationship between the calcaneal bursal projection and the Achilles tendon and retrocalcaneal bursa have been described (8,9). Although the size of the calcaneal bursal projection remains the same when the heel is elevated, the plantar calcaneal pitch angle decreases and shifts the osseous calcaneal bursal projection away from the retrocalcaneal soft tissues, decreasing friction and irritation (9).

Casting may be necessary for pain reduction and an ice bag may be needed to deal with swelling (2-4, 7-10). Anti-inflammatory drugs (oral or topical), stretching exercise, and physiotherapy may relieve tension from the calcaneal tendon. Local perilesional steroid injections are also used in refractory cases (3).

If conservative treatment is not effective, then surgical treatment options like retrocalcaneal decompression and calcaneal ostectomy or osteotomy are used (10).

In this study we evaluated outcomes obtained on patients with Haglund's triad of our surgical technique that is consisted of a central tendon-splitting approach that preserved the longitudinal continuity of the Achilles tendon, an excision of the retrocalcaneal bursa and the resection of Haglund's prominence. Intra-operative local administrations of platelet rich plasma were added to promote Achilles tendon healing.

PATIENTS AND METHODS

Patients and study design

This single-centre retrospective study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All patients gave their written consent.

All patients with Haglund Syndrome that received a surgical treatment with intra-operative administration of platelet-rich plasma (PRP) in Cisanello Hospital of Pisa (Italy) between April 2020 and April 2022 were evaluated. Only patients who did

not experience benefits after 6 months of non-operative treatment were included in the study.

Each patient had pre-operative X-ray, ultrasound images and MRI scans in order to allow an adequate morphostructural evaluation of patients' ankles and hindfeet. Inclusion criteria were as follows: the absence of underlying rheumatic diseases or previous local surgical treatments, chronic retrocalcaneal pain that lasted at least 3 months, radiographic evidence of Haglund deformity, imaging evidence of retrocalcaneal bursitis and insertional Achilles tendinopathy with peri-insertional calcifications, previous non-operative treatments carried out for at least 6 months before surgery without significant benefit (Figure 1). Exclusion criteria were pre-operative neurological deficits, body mass index (BMI) higher than 40, and contraindications for the administration of autologous PRP (chronic administration of anticoagulant drugs or history of coagulopathies, neoplastic lesions and history of knee or kidney failures).

Figure 1. X-rays of a patient with Haglund deformity and insertional calcifications (Restuccia G., Azienda Ospedaliera Universitaria Pisana, 2022)

Methods

The pre-operative function status was assessed using the American Orthopaedic Foot and Ankle Society (AOFAS) Ankle-Hindfoot Score (11). Only cases with pre-operative AOFAS score lower than 70 received surgical indications and were included in the study. Each surgery was performed by the same senior surgeon.

Surgical technique. Patients were set in a prone position, with an ischemic tourniquet at the root of their thigh. The Achilles tendon and the Haglund deformity were identified with palpation and ultrasound guidance. A longitudinal posterior approach to the distal Achilles tendon was used. A sharp dissection was then carried down to the paratenon. The tendon was longitudinally split in its centre, preserving the tendon insertion but allowing an adequate exposure of the dipper anatomical layers (Figure 2).

Contextually, the damaged areas of the tendon received an accurate debridement and insertional

Figure 2. Intra-operative images of our surgical approach. A longitudinal approach is used to expose the Achilles tendon, which is then split in its centre to expose the retrocalcaneal bursa and the bone (Restuccia G., Azienda Ospedaliera Universitaria Pisana, 2022)

calcifications were removed in the distal segment of the tendon. The continuity of Achilles tendons insertion was always preserved while performing the procedure. The retrocalcaneal bursa was excised to expose the superior aspect of the calcaneus and Haglund's prominence was excised using a chisel. The tendon opening and the underlying area that received bursectomy was filled with PRP gel membrane obtained by patients' autologous blood (RegenATS; Regen Lab, Le Mont-sur-Lausanne, Switzerland) (Figure 3A).

The split tendon was sutured with a 2-0 Vicryl wire. The second PRP gel membrane was sutured under the paratenon, which was also repaired with 2-0 Vicryl wire (Figure 3B).

The skin was then closed with 3-0 Prolene sutures, and a cast was applied to maintain the foot in a plantigrade position.

Post-operative intercourse. The cast was maintained in place and weight bearing was completely avoided for three weeks. Three weeks after

Figure 3. Two platelet-rich plasma (PRP) membranes obtained centrifugating patient's circulating blood were set underneath the tendon (A) and sutured on its external surface (B) (Restuccia G., Azienda Ospedaliera Universitaria Pisana, 2022)

surgery, the plaster cast was replaced by a walking boot with controlled ankle motion in order to maintain a slight plantar flexion. The walking boot was used full-time for the following three weeks and weight-bearing was introduced as tolerated. Six weeks after surgery, patients were allowed to dismiss their walking boots and wear regular comfortable shoes. Rehabilitation, consisting of Achilles tendon stretching, active and passive ankle range of motion exercises, and proprioception training, was started three weeks after surgery and continued until patients were sufficiently trained and had achieved their functional goals.

Cycling was allowed within 2 months after surgery, whereas running was permitted 3 months after the intervention.

Postoperative follow-up consisted of serial office visits, clinical evaluations and X-rays.

Complications were evaluated according to the Clavien-Dindo Classification (12), consisting of 5 grades, categorized along the treatments necessary to treat the complication.

Each complication with grade II or higher was reported. Patients' final functional status was assessed with the AOFAS (11) and the Victorian Institute of Sport Assessment-Achilles questionnaire (VISA-A) (13) scoring systems within 12 months after surgery. The AOFAS score evaluates patients' ankle pain, functionality and anatomical alignment with a global rate from zero to 100. The VISA-A scale limits its focus to pain and functionality attributable to the Achilles tendon and its connected structures, assigning a score out of 100.

Statistical analysis

A two-tailed T-student test was used to evaluate whether, in our cohort, the difference between pre-operative and post-operative AOFAS scores were importantly significant.

RESULTS

Twenty consecutive patients suffering from Haglund's syndrome were included in the study. They were 12 males and 8 females, with a mean age at surgery of 54.0 (37-73) years. Their mean pre-operative AOFAS score was 44.1 (range of 25-65).

All our cases received the same surgical treatment. None of our patients suffered from major intra-operative complications.

The mean post-operative follow-up was 23.0 (range of 12-35) months.

None of our patients had post-operative complications of grade II or higher according to the Clavien-Dindo classification (12). After surgery, only three patients suffered from mild-to-moderate episodic heel pain that could be adequately treated with painkillers as needed. None had significant limitations of their ankles' or feet's ranges of motion (ROM) (14) nor suffered from Achilles tendon stiffness. None of our patients had wound dehiscence or infections of their surgical site.

At their latest follow-up, patients' mean post-operative VISA-A score and AOFAS score were 91.3 (75-100) and 92.0 (80-100), respectively (Table 1).

Table 1. Pre-operative and post-operative clinical characteristics of 20 patients*

Patient	Gender	Age (years)	Pre-op AOFAS	Post-op AOFAS	VISA-A	Follow-up (months)
1	Female	59	65	100	100	35
2	Male	37	31	95	95	32
3	Male	73	46	100	95	31
4	Female	61	37	95	90	31
5	Male	31	32	90	92	30
6	Female	47	67	90	87	29
7	Female	52	51	90	80	26
8	Male	62	28	85	95	26
9	Male	60	49	95	92	26
10	Female	55	35	80	77	25
11	Female	63	32	80	75	23
12	Male	47	41	95	93	21
13	Male	44	37	90	95	21
14	Male	43	46	90	100	19
15	Female	63	51	100	100	18
16	Male	59	53	95	92	16
17	Male	47	65	100	97	14
18	Male	57	51	100	98	13
19	Male	48	25	80	81	13
20	Female	73	41	90	92	12

*none of the patients had complications; AOFAS, describe abbreviation; VISA-A, describe abbreviation;

No significant correlation between patients' age and their post-operative AOFAS score (r=0-125; p=0.599).

Post-operative AOFAS scores were significantly higher than the ones recorded before surgery (p=0.001).

DISCUSSION

Haglund's disease can lead to severe functional impairment and cause limitations in patients' quality of life especially in its most advanced stages (4). Although conservative approaches are the first-line treatments for Haglund's disease, some patients could not obtain significant relief from their heel pain even after several months of care; in these cases, surgery is performed in order to reduce pain and restore patients' functionality (7). The aim of surgical approaches includes the excision of the inflamed retrocalcaneal bursa, the resection of Haglund's deformity and local aids for the healing of the Achilles tendon. Despite both endoscopic and open approaches being largely described in modern literature, a gold-standard surgical technique has not been established to this date (7,15). In particular, the use of a midline tendon-splitting approach has already been reported by some authors (16-20). In 2008, Anderson et al. performed a retrospective comparative study on two cohorts of cases with Haglund's Disease: one was treated with a tendon-splitting approach, whereas the other one received a lateral para-Achilles approach. In both sub-populations surgery was effective in providing good pain relief and restoring patients' functionality, but they also noted that the tendon-splitting group returned to their normal activities quicker than other patients. The patients treated by Anderson with a tendon splitting approach had significant functional improvements, as their mean AOFAS score rose from 43 to 81 after surgery (16). In 2017, Xia et al. evaluated the effectiveness of a tendon-splitting approach on 22 patients with a 15-month follow-up. Their experience provided further evidence that this surgical approach could lead to significant pain relief and resorption of functional impairment (mean AOFAS from 39 to 83) (17). Our results are in line with previously reported studies that used tendon-splitting approaches (17), as our mean post-operative AOFAS score rose to 92. Although pain relief can also be attributable to the removal of the retrocalcaneal bursa, the healing of the Achilles tendon represents a pivotal factor in order to allow both pain reduction and improvement of patients' functional performances (21). In fact, Achilles tendon's continuity and strength are necessary to allow a complete dorsal flexion and provide passive and active stabilization of the ankle and hindfoot (21). Surgical techniques that could aid post-operative tendon recovery could therefore be crucial to maximize the effectiveness of the whole intervention (20, 21). Some studies have already advocated for the importance of local debridement to promote Achilles tendon's health. McGarvey et al. published on the importance of bursectomy and accurate debridement in the treatment of insertional Achilles tendinosis (19). In a more recent paper, Guler et al. reported encouraging results obtained on 27 patients with Haglund' disease who had been treated with central Achilles tendon splitting followed by a double-row suture anchor and concomitant tendon debridement (20).

Debridement apart, literature still lacks evidence on the use of other strategies to aid post-operative local healing in cases with Haglund's disease. The PRP, obtained with the centrifugation of autologous peripheral blood, was proven to be effective in promoting and enhancing the healing of several sites including bones, tendons and other soft tissues when administered alone or in combination with other treatments (22-28). In consideration of PRP's properties, we implemented it in our clinical practice, placing it below and above the treated tendon. In doing so, we aimed to promote tissue healing, thereby improving patients' post-operative performances and reducing the risk of local complications. Our encouraging outcomes support the idea that PRP can be an effective adjuvant for surgical approaches in cases with Haglund's disease. In fact, significant improvements of post-operative functionality, absence of stiffness or pain in the Achilles region and lack of wound dehiscence or infections testify the effectiveness of our surgical approach.

The study has some limitations. The retrospective nature did not allow complete standardization of the postoperative follow-up procedures for each patient, post-operative MRIs were taken only for some cases and not for the whole population on

a regular basis. Additionally, the short size partially limited the statistical significance of some of the data associations we wanted to investigate. Further studies with larger cohorts and a control group treated without PRP could be necessary in order to increase the significance of our findings.

Despite these limitations, our article provides the first evidence of the effectiveness of PRP membranes used as a local adjuvant for open surgical approaches in Haglund's syndrome. Our results suggest that the surgical treatment consisting of tendon-splitting approach, Haglund deformity recession and accurate bursectomy, in association with the topical addition of PRP, can be a promising technique in the treatment of Haglund's Disease.

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TRANSPARENCY DECLARATION

Conflicts of interest: None to declare.

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