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Surgical Treatment of Insertional Achilles Tendinopathy With or Without Endoscopic Gastrocnemius Recession: A Retrospective Comparative Study

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Purpose: Insertional Achilles tendinopathy (IAT) is a common cause of posterior heel pain, often associated with Haglund deformity, degenerative changes at the tendon insertion, and gastrocnemius tightness. Standard surgical management includes open debridement, retrocalcaneal bursectomy, calcaneal exostectomy, and Achilles tendon reattachment. The role of adjunct endoscopic gastrocnemius recession (EGR) remains controversial because comparative data on functional outcomes, ankle motion, and complications are limited.

Methods: This single-center retrospective comparative study included patients with chronic IAT who failed ≥3 months of nonoperative management and underwent surgery between January 2019 and December 2023. All patients received open debridement, Haglund resection, retrocalcaneal bursectomy, and double-row reattachment with or without adjunct EGR. Patients were allocated to gastrocnemius (GR, n = 18) or no gastrocnemius (no GR, n = 15) recession groups. Outcomes included VAS pain, FAAM, SF-36 physical and mental subscales, heel-rise height difference, ankle dorsiflexion, and complications, assessed preoperatively and at three, six, and 12 months postoperatively.

Results: Thirty-three patients were analyzed. At three months postoperatively, the GR group had lower pain, higher FAAM and SF-36 physical scores, and greater dorsiflexion gains. By 12 months, pain, function, heel-rise symmetry, and complication rates were similar; wound complications and transient nerve symptoms occurred only in the no GR and GR groups, respectively.

Conclusions: Adjunct EGR in IAT surgery provides earlier pain relief, better short-term functional recovery, and sustained dorsiflexion improvement without increasing overall complications and may reduce wound-related problems.

Keywords: insertional Achilles tendinopathy, endoscopic gastrocnemius recession, Haglund deformity, retrospective comparative study, functional outcomes, ankle dorsiflexion

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Insertional Achilles tendinopathy (IAT) is a common cause of posterior heel pain in active middle-aged adults[1,2,5]. Patients typically present with posterior heel pain, tenderness at the Achilles tendon insertion, and a prominent calcaneal exostosis, often accompanied by swelling and erythema. The condition arises from repetitive overload, gastrocnemius tightness, hindfoot malalignment, and mechanical irritation from a Haglund deformity[2-4,6,7].

Nonoperative treatment, including activity modification, eccentric calf stretching, footwear modification, heel lifts, orthoses, nonsteroidal anti-inflammatory drugs, and extracorporeal shockwave therapy, is considered first-line management for insertional Achilles tendinopathy[1,2,5,15]. However, outcomes are less predictable than in midportion disease, and many patients require surgical intervention after structured conservative care[2,5,21]. Standard operative management, including open debridement, retrocalcaneal bursectomy, resection of the posterosuperior calcaneal prominence, and double-row suture-anchor Achilles tendon reattachment, has yielded excellent pain relief and functional outcomes in multiple series[2,6,7,10,11].

Gastrocnemius recession has been proposed as an adjunctive procedure in patients with gastrocnemius contracture, based on the rationale that reducing gastrocnemius tightness decreases tensile load at the Achilles insertion and improves pain. Isolated gastrocnemius recession has shown promising results in non-insertional and insertional Achilles tendinopathy, although concerns remain regarding plantarflexion weakness and sural nerve injury[2,4,12,14,15]. Comparative evidence on adding gastrocnemius recession to insertional Achilles surgery is limited. Therefore, this study aimed to compare clinical and functional outcomes of standard open insertional Achilles surgery with or without adjunct endoscopic gastrocnemius recession, hypothesizing that recession would improve early pain, functional recovery, and ankle dorsiflexion without increasing complications or compromising plantarflexion function[2,4-7,12-15].

METHODS

Study Design and Setting

This retrospective comparative study included consecutive patients with insertional Achilles tendinopathy who underwent operative treatment between January 2019 and December 2023 at a tertiary orthopaedic referral hospital. The study was approved by the institutional review board (COA no. 056/67) and conducted in accordance with the Declaration of Helsinki and relevant medical ethics guidelines.

Patient Selection

Eligible patients were adults with clinical and a radiographic diagnosis of insertional Achilles tendinopathy, characterized by posterior heel pain localized to the Achilles insertion, tenderness at the insertion, and radiographics demonstrating calcific enthesophytes or a posterosuperior calcaneal prominence consistent with Haglund deformity (Figure 1A) or magnetic resonance imaging showing distal Achilles tendon thickening with increased signal at the calcaneal insertion and associated retrocalcaneal bursitis (Figure 1B) [4,16,17]. All patients underwent clinical assessment for gastrocnemius tightness using the Silfverskiöld test, in which increased ankle dorsiflexion with the knee flexed compared with the knee extended indicates gastrocnemius contracture[23,24]. A positive Silfverskiöld test was defined as greater maximal passive ankle dorsiflexion in knee flexion than in full knee extension in neutral foot alignment, with a ≥10° difference indicating clinically significant gastrocnemius contracture[24].

Nonoperative treatment comprised of activity modification and avoidance of prolonged standing, running, and jumping[2,4,5], daily gastrocnemius-soleus stretching using an eccentric or wall-stretch protocol[1,2,4], short-term use of nonsteroidal anti-inflammatory drugs and acetaminophen for symptomatic relief at initial presentation followed by primarily nonpharmacologic management[2,4,5], and footwear modification with heel lifts or orthoses, as appropriate[2,4,5].

Inclusion criteria were aged ≥18 years, clinical and imaging diagnosis of insertional Achilles tendinopathy with or without calcific enthesophytes(4,16,17), without previous surgery on the ipsilateral Achilles tendon or hindfoot, without systemic inflammatory arthropathy or neuromascular disease affecting gait, and without open fractures or major concomitant trauma to the foot and ankle. All patients had failed 3–6 months of standardized nonoperative treatment(2,4,7) underwent open Achilles debridement, Haglund resection, retrocalcaneal bursectomy, and double-row Achilles reattachment with or without adjunct endoscopic gastrocnemius recession(11-15), and had a minimum clinical follow-up of 12 months. Adjunct endoscopic gastrocnemius recession was reserved for patients with clinically significant gastrocnemius contracture, defined by a positive Silfverskiöld test(24). The analysis excluded patients who met these criteria but had incomplete outcome data, follow-up <12 months, or major protocol deviations.

Clinical and operative data were collected retrospectively, and patients were classified into two groups according to the index procedure: gastrocnemius recession (GR), which underwent the standard open insertional Achilles procedure plus adjunct endoscopic gastrocnemius recession(22), and no GR, who underwent the standard open insertional Achilles procedure alone(11). All surgeries were performed by a single fellowship-trained foot and ankle orthopaedic surgeon using techniques consistent with those described in the literature(11,22).

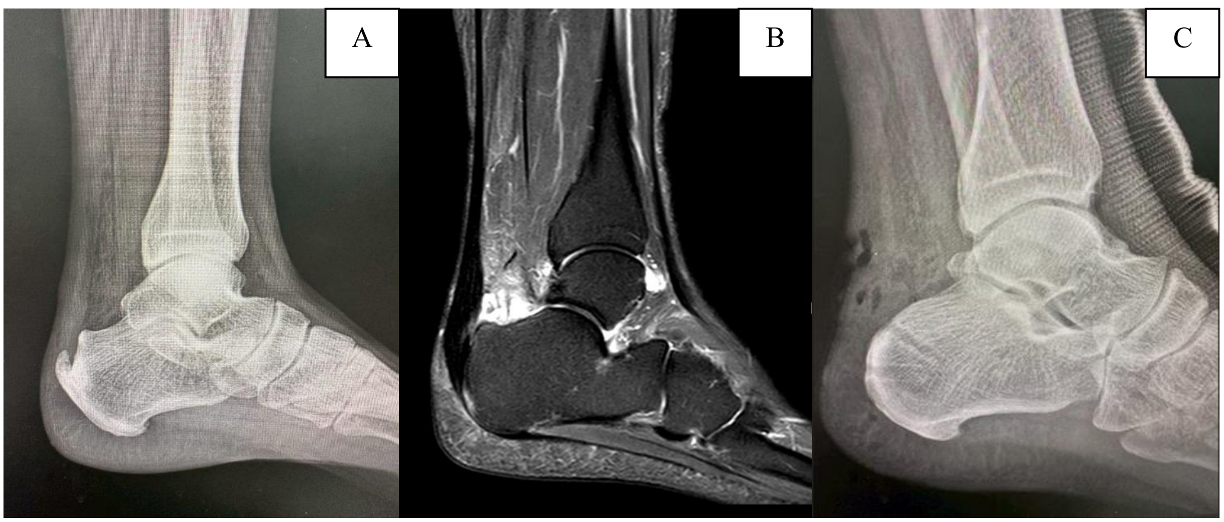

Fig. 1 (A) Preoperative lateral radiograph showing a prominent Haglund deformity and calcific enthesophyte at the Achilles tendon insertion, consistent with insertional Achilles tendinopathy. **(B)** Sagittal STIR MRI of the ankle demonstrating thickening and increased signal intensity of the distal Achilles tendon at its calcaneal insertion, associated retrocalcaneal bursitis, and a posterosuperior calcaneal prominence consistent with Haglund deformity. **(C)** Postoperative lateral radiograph demonstrating resection of the posterosuperior calcaneal prominence and restoration of a smooth posterior calcaneal contour at the Achilles insertion.

Surgical Techniques

All patients underwent a midline posterior longitudinal incision centered over the Achilles insertion, approximately 5 cm in length(6,8,11). The Achilles tendon was split longitudinally in the midline at the insertion, maintaining small medial and lateral flanges attached to the calcaneus. Degenerative and calcified tendon tissue at the insertion was debrided. The posterosuperior calcaneal prominence (Haglund deformity) was resected using an oscillating saw, and the surface was contoured with a rasp to create a smooth bony profile, in line with current operative techniques for insertional Achilles disease (Figure 1C). Retrocalcaneal bursa and inflamed peritendinous tissue were excised[6,8,10,11]. Achilles tendon reattachment was performed using a double-row suture-bridge construct with suture anchors in the calcaneal tuberosity, as commonly described for IAT (Figure 2A) [6,11]. The tendon was tensioned in approximately 20° of plantarflexion, and layered closure was performed.

Endoscopic gastrocnemius recession was performed in the GR group, with the patient in the prone position before the hindfoot procedure, using techniques analogous to those described by Phisitkul et al. (Figure 2B)[22]. Two small medial and lateral portals were created approximately 2 cm distal to the gastrocnemius–soleus musculotendinous junction. A 4-mm endoscope was introduced after blunt dissection to the deep fascia, and the gastrocnemius aponeurosis was visualized[22]. A retrograde knife was used to transect the aponeurosis under direct visualization, avoiding the sural nerve (Figure 2C). Adequate release was confirmed intraoperatively by an increase in passive ankle dorsiflexion with the knee extended.

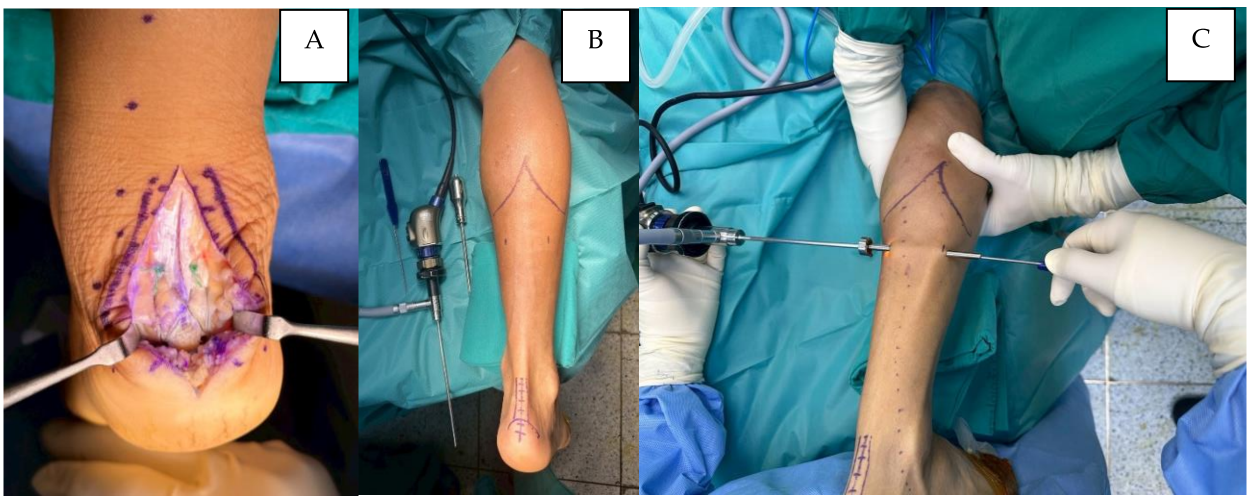

Fig. 2 (A) Intraoperative photograph showing the completed double-row suture-bridge reattachment of the Achilles tendon to the calcaneal tuberosity through a central tendon-splitting approach after debridement of degenerated insertional tissue and Haglund resection. **(B)** Patient positioning and portal planning for endoscopic gastrocnemius recession, with the limb in prone position and medial and lateral portal sites marked approximately 2 cm distal to the gastrocnemius–soleus musculotendinous junction. **(C)** Intraoperative endoscopic gastrocnemius recession demonstrating insertion of the endoscope through the medial portal and a retrograde cutting instrument through the lateral portal to transect the gastrocnemius aponeurosis under direct visualization.

Postoperative Protocol

All patients followed a standardized postoperative rehabilitation protocol adapted from previously published regimens after insertional Achilles surgery and a randomized trial comparing conventional with accelerated rehabilitation after Achilles reattachment[18]. The protocol was applied identically in both groups.

- Weeks 0–2: Short-leg splint in approximately 20° of plantarflexion; non–weight-bearing with crutches.
- Weeks 2–3: Partial weight-bearing in a controlled ankle-motion boot with three heel lifts.
- Weeks 3–5: Progressive full weight-bearing in the boot, removing one heel lift each week; active dorsiflexion permitted to neutral (90°).

- Weeks 5–6: Full weight-bearing in the boot without heel lifts.
- After week 6: Transition to regular footwear as tolerated, with progressive range-of-motion and strengthening exercises without dorsiflexion restriction.

Analgesia and standard wound care were provided uniformly in both groups.

Outcomes were assessed at baseline (preoperatively) and three, six, and 12 months postoperatively using validated foot and ankle instruments(8,10,11,18-20). Pain was assessed using the visual analogue scale (VAS)(8,10). Function was measured with the FAAM ADL and Sport subscales, including Thai-validated versions(18,20). Health-related quality of life was evaluated with SF-36 physical and mental component scores, using a Thai-validated version(18,19). Heel-rise height difference (HRHD) was defined as the side-to-side difference in maximal heel-rise height, calculated from bilateral heel-rise testing. For each limb, heel-rise height was measured thrice using a tape measure, and their average was used for analysis to reduce random measurement error. All HRHD measurements were obtained by a single fellowship-trained foot and ankle surgeon who was familiar with the protocol, which minimized inter-rater variability. Ankle dorsiflexion with the knee extended was recorded to quantify the effect of gastrocnemius recession(12,14,22). Complications and tourniquet time were documented(6,8,10,13,14). The use of Thai-validated SF-36 and FAAM ensured culturally appropriate patient-reported outcomes(18-20). The primary outcome was the FAAM ADL score at 12 months postoperatively. Secondary outcomes included FAAM Sport, VAS pain, SF-36 physical and mental component scores, heel-rise height difference, ankle dorsiflexion, tourniquet time, and complications.

Statistical Analysis

Statistical analyses were performed using Stata version 16.0 (StataCorp LLC, College Station, TX, USA). Descriptive statistics were calculated for all variables. Continuous and categorical data were summarized as means with 95% confidence intervals and frequencies and percentages, respectively. The normality of continuous variables was assessed using the Shapiro–Wilk test. All variables were approximately normally distributed. Between-group comparisons of baseline and perioperative variables were performed using independent t-tests and Fisher's exact tests for continuous and categorical data, respectively. Generalized linear models were used to compare VAS, FAAM, SF-36, HRHD, dorsiflexion improvement, and tourniquet time between groups over time, adjusting for age, sex, body mass index (BMI), smoking status, diabetes, ASA class, side, and time to surgery. Statistical significance was set at $p < 0.05$.

RESULTS

Demographics

This study included 33 patients (GR group;18, no GR group; 15). Baseline demographic and clinical characteristics, including age, sex, BMI, smoking status, diabetes mellitus, ASA class, and side of involvement, did not differ significantly between groups. Preoperative ankle dorsiflexion with the knee extended was significantly lower in the GR recession group than in the no GR group ($3.0^0 \pm 2.5^0$ vs. $11.0^0 \pm 3.0^0$, $p < 0.001$), indicating more pronounced gastrocnemius tightness among patients selected for recession (Table 1).

Overall Clinical and Functional Outcomes

Preoperatively, mean VAS scores were similar between groups (8.13 vs. 8.37, coefficient; -0.24, 95% CI; -0.85–0.37, p = 0.439). At three months, VAS decreased to 2.01 and 3.38 in the GR and no GR groups, respectively, with an adjusted between-group difference of -1.37 points (95% CI; -1.68–-1.06, p < 0.001). By 12 months, both groups had VAS scores of 0.82 (coefficient; -0.01, 95% CI; -0.47–0.46, p = 0.981, Table 2).

FAAM ADL scores were comparable at baseline (38.75 vs. 39.16, coefficient; -0.40, 95% CI; -2.20–1.39, p = 0.659) and improved in both groups. At three months, the GR and no GR groups scored 74.62 and 68.59, respectively (coefficient; 6.04, 95% CI; 4.00–8.07, p < 0.001), and at six months, the scores were 82.18 vs 80.99, respectively, with no significant between-group difference (coefficient; 1.19, 95% CI; -1.00–3.39, p = 0.288). At 12 months,

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both groups had high FAAM ADL scores (91.49 vs. 90.54, coefficient; 0.95, 95% CI; -1.26–3.16, p = 0.400), with no statistically significant difference (Table 2, Figure 3). FAAM Sport scores showed a similar pattern, with faster early improvement and significantly higher scores in the GR group at three and six months and similarly high scores in both groups at 12 months (Table 2, Figure 4).

SF-36 physical component scores significantly increased over time in both groups. Preoperative values were 36.70 vs. 38.10 (coefficient; -1.40, 95% CI; -3.80–1.00, p = 0.254), increasing at three months to 68.24 vs. 62.73 (coefficient; 5.51, 95% CI; 3.32–7.70, p < 0.001). At six and 12 months, between-group differences were small and not statistically significant (82.06 vs. 81.62 and 91.98 vs. 90.79, respectively, p > 0.05, Table 2). SF-36 mental component scores improved similarly in both groups, with no statistically significant differences (Table 2).

Heel-rise height difference decreased from 17.76 mm vs. 16.49 mm preoperatively (coefficient; 1.26, 95% CI; -1.19–3.71, p = 0.313) to 0.32 mm vs. 0.27 mm at 12 months (coefficient; 0.05, 95% CI; -0.28–0.38, p = 0.770). Ankle dorsiflexion improved in each group but was consistently greater in the GR group, with adjusted between-group differences of 3.68°, 3.42°, and 4.76° at three, six, and 12 months, respectively (all p < 0.001). Mean tourniquet time was slightly longer in the GR group (77.55 vs. 74.75 min, coefficient; 2.80, 95% CI; -1.54–7.14, p = 0.206, Table 2). The overall postoperative complication rate was low in both groups, with no cases of Achilles tendon re-rupture or fixation failure. In the GR group, two patients (11.1%) developed transient sural nerve irritation, whereas in the no GR group, two patients (13.3%) experienced superficial wound infection; all complications were managed nonoperatively without long-term sequelae. Although absolute complication rates were similar, wound-related complications occurred only in the no-GR group, whereas nerve-related symptoms were limited to the GR group.

Table 1 Baseline demographic and clinical characteristics of patients undergoing Achilles insertional debridement and reattachment with and without adjunct endoscopic gastrocnemius recession.

Data	Gastrocnemius recession (n = 18)		No gastrocnemius recession (n = 15)		P-value
	n	%	n	%	
Sex					
Man	8	(44.44)	6	(40.00)	1.000
Woman	10	(55.56)	9	(60.00)	
Age (years), mean±SD	58.33	±6.55	56.07	±10.62	0.458
BMI (kg/cm^2), mean±SD	26.43	±2.39	25.88	±2.06	0.492
Smoking	2.00	(11.11)	2.00	(13.33)	1.000
Diabetes mellitus	1.00	(5.56)	2.00	(13.33)	0.579
ASA class					
1	12.00	(66.67)	8.00	(53.33)	0.733
2	5.00	(27.78)	6.00	(40.00)	
3	1.00	(5.56)	1.00	(6.67)	
Side					
R	10.00	(55.56)	6.00	(40.00)	0.491
L	8.00	(44.44)	9.00	(60.00)	
Preoperative ankle dorsiflexion, knee extended (^{0}), mean ± SD	3.0^0	± 2.5^0	11.0^0	± 3^0	<0.01

BMI, body mass index; ASA, American Society of Anesthesiologists.

Table 2 Clinical, functional, and perioperative outcomes in patients treated with and without adjunct endoscopic gastrocnemius recession.

Parameters	Gastrocnemius recession group (n = 18)	No gastrocnemius recession group (n = 15)	Coefficient	95% CI	P value
VAS, mean (95% CI)					
Preoperative	8.13 (7.74–8.52)	8.37 (7.94–8.80)	-0.24	-0.85–0.37	0.439
3 months postoperative	2.01 (1.82–2.20)	3.38 (3.16–3.60)	-1.37	-1.68–-1.06	<0.001
6 months postoperative	1.63 (1.36–1.90)	1.78 (1.48–2.08)	-0.16	-0.58–0.27	0.475
1 year postoperative	0.82 (0.52–1.11)	0.82 (0.49–1.14)	-0.01	-0.47–0.46	0.981
FAAM ADL, mean (95% CI)					
Preoperative	38.75 (37.61–39.90)	39.16 (37.89–40.43)	-0.40	-2.20–1.39	0.659
3 months postoperative	74.62 (73.32–75.92)	68.59 (67.15–70.02)	6.04	4.00–8.07	<0.001
6 months postoperative	82.18 (80.78–83.57)	80.99 (79.44–82.53)	1.19	-1.00–3.39	0.288
1 year postoperative	91.49 (90.08–92.90)	90.54 (88.98–92.10)	0.95	-1.26–3.16	0.400
FAAM sport, mean (95% CI)					
Preoperative	26.10 (24.77–27.42)	25.68 (24.22–27.15)	0.41	-0.167–2.49	0.697
3 months postoperative	52.59 (50.00–55.19)	45.56 (42.68–48.43)	7.04	2.96–11.11	0.001
6 months postoperative	65.22 (63.88–66.58)	62.86 (61.37–64.35)	2.37	0.24–4.49	0.029
1 year postoperative	84.57 (83.24–85.89)	82.65 (81.18–84.12)	1.91	-0.17–4.00	0.072
SF-36 Physical health subscale, mean (95% CI)					
Preoperative	36.70 (35.17–38.23)	38.10 (36.40–39.79)	-1.40	-3.80–1.00	0.254
3 months postoperative	68.24 (66.85–69.63)	62.73 (61.19–64.27)	5.51	3.32–7.70	<0.001
6 months postoperative	82.06 (81.05–83.06)	81.62 (80.50–82.73)	0.44	-1.15–2.02	0.590
1 year postoperative	91.98 (91.09–92.87)	90.79 (89.80–91.78)	1.19	-0.21–2.60	0.095
SF-36 Mental health subscale, mean (95% CI)					
Preoperative	51.02 (49.68–52.35)	51.13 (49.66–52.61)	-0.12	-2.22–1.97	0.909
3 months postoperative	65.83 (64.93–66.74)	67.40 (66.40–68.40)	-1.56	-2.99–-0.14	0.031
6 months postoperative	82.51 (81.40–83.62)	82.39 (81.17–83.62)	0.12	-1.62–1.86	0.894
1 year postoperative	92.18 (91.57–92.80)	91.71 (91.03–92.39)	0.47	-0.49–1.43	0.339
Heel rise height difference (HRHD), mean (95% CI)					
Preoperative	17.76 (16.20–19.31)	16.49 (14.77–18.22)	1.26	-1.19–3.71	0.313
3 months postoperative	11.70 (11.11–12.30)	7.42 (6.76–8.08)	4.28	3.34–5.21	<0.001
6 months postoperative	1.64 (1.34–1.94)	1.56 (1.23–1.90)	0.08	-0.40–0.56	0.733
1 year postoperative	0.32 (0.12–0.53)	0.27 (0.04–0.51)	0.05	-0.28–0.38	0.770
Degrees of dorsiflexion improvement, mean (95% CI)					
3 months postoperative	6.70 (6.29–7.11)	3.02 (2.57–3.48)	3.68	3.02–4.32	<0.001
6 months postoperative	9.10 (8.62–9.58)	5.68 (5.15–6.21)	3.42	2.66–4.18	<0.001
1 year postoperative	10.80 (10.22–11.37)	6.04 (5.41–6.67)	4.76	3.86–5.65	<0.001
Complications					
Tourniquet time (min), mean (95% CI)	77.55 (74.74–80.35)	74.75 (71.65–77.84)	2.80	-1.54–7.14	0.206

Abbreviations: FAAM, Foot and Ankle Ability Measure; HRHD, heel-rise height difference; CI, confidence interval; VAS, visual analogue scale; SF-36, 36-Item Short Form Health Survey.

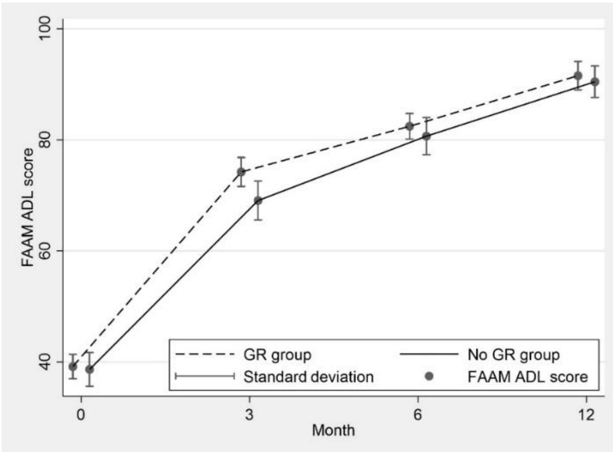

Fig. 3 Change in FAAM-ADL scores over time in patients treated with and without gastrocnemius recession. Error bars represent 95% confidence intervals.

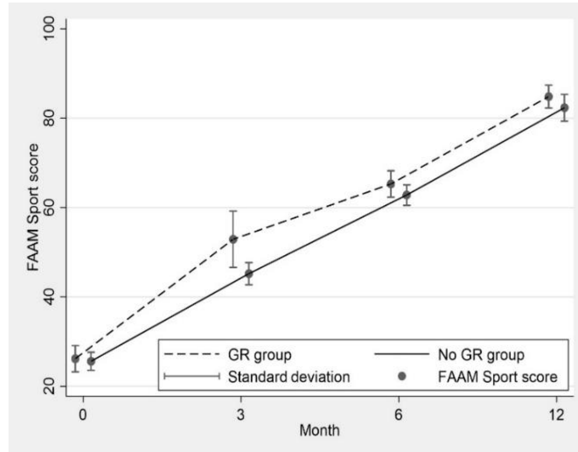

Fig. 4 Change in FAAM-Sports scores over time in patients treated with and without gastrocnemius recession. Error bars represent 95% confidence intervals.

DISCUSSION

This single-center retrospective comparative study demonstrates that, in the operative management of insertional Achilles tendinopathy, adjunct endoscopic gastrocnemius recession provides earlier pain relief, faster short-term functional improvement, and greater, sustained gains in ankle dorsiflexion compared with standard open debridement, Haglund resection, and Achilles reattachment alone, without increasing overall complication rates or causing loss of plantarflexion function at midterm follow-up(2,4-7,10-12,14,15). Despite having significantly more limited preoperative ankle dorsiflexion with the knee extended, reflecting more severe gastrocnemius contracture, patients in the GR group achieved faster early recovery than those in the no GR group. At three months, FAAM-ADL and SF-36 physical scores were higher in the GR group, along with greater dorsiflexion gains, indicating that surgically addressing isolated gastrocnemius tightness can offset the functional disadvantage associated with preoperative equinus and translate into earlier improvements in pain and function. These findings complement existing evidence that standard IAT surgery yields excellent outcomes after failure of conservative care and suggest that addressing gastrocnemius tightness adds measurable short-term benefit in appropriately selected patients(2,4-7,10-12,14,15).

The improved early VAS, FAAM, and SF-36 physical scores in the GR group are consistent with the biomechanical concept that gastrocnemius tightness increases tensile load at the Achilles insertion and recession can reduce this load and improve symptoms(2,4,12,14). Studies of isolated gastrocnemius recession for Achilles tendinopathy and other hindfoot disorders have reported significantly reduced pain, improved function, and high patient satisfaction, with generally acceptable complication rates(12,14,15). This study extends those observations by demonstrating that, if combined with standard insertional Achilles surgery, endoscopic gastrocnemius recession enhances early recovery while achieving similarly favorable mid-term pain, functional, and health-related quality of life outcomes as surgery without recession(4-7,10,11).

To better interpret the clinical relevance of the superior three-month outcomes in the GR group, the observed between-group differences should be considered in relation to published minimum clinically important difference (MCID) thresholds. Sutton et al. reported MCID ranges of 1.8–5.2 points for VAS pain and 11.1–22.7 points for FAAM-ADL in foot and ankle surgery, whereas Chen et al. reported MCID values for SF-36 physical component score (PCS) of 4.15 and 8.34 points by the distribution- and anchor-based methods, respectively, in progressive collapsing foot deformity surgery[25,26]. In this study, the adjusted between-group difference at three months was 1.37 points for VAS pain and 6.04 points for FAAM-ADL, indicating statistically significant but relatively modest early advantages that did not clearly reach the published MCID thresholds for these measures. Contrastingly, the 5.51-point higher SF-36 physical score in the GR group exceeded the distribution-based MCID reported by Chen et al., suggesting that the early improvement in overall physical health status may be clinically perceptible to patients[26]. These findings suggest that adjunct endoscopic GR may provide its main benefit in accelerating early postoperative recovery, because pain and functional outcomes were comparable between groups by 12 months.

Potential concerns with gastrocnemius recession include residual calf weakness and sural nerve injury in athletic patients[12,15]. However, available series and systematic reviews suggest that objective strength deficits after GR are generally small and often not clinically significant, and careful technique can minimize nerve-related complications[12,15]. The greater heel-rise height difference observed in the recession group at three months (11.70 vs. 7.42 mm) suggests a modest degree of early side-to-side asymmetry in plantarflexion performance, which may reflect transient weakness or reduced endurance after gastrocnemius lengthening. Importantly, this difference resolved over time; by 12 months, heel-rise height difference was <1 mm in both groups and no longer differed between them, whereas FAAM Sport, FAAM ADL, and SF-36 physical scores were similarly high, supporting the notion that endoscopic GR does not result in meaningful midterm strength loss if performed appropriately.

The overall postoperative complication rate was low in both groups, and all events resolved without lasting sequelae. However, the pattern of complications differed; wound-related problems occurred only in the no GR group, whereas the GR group experienced transient sural nerve irritation without wound complications. This pattern is consistent with previous reports describing low overall complication rates after gastrocnemius recession, with transient sural nerve symptoms as the most common adverse event[12,14,15]. Additionally, addressing gastrocnemius tightness may reduce tension at the wound and lower the risk of wound-related complications in hindfoot surgery[13], although this study was not powered to detect small differences in specific complication types.

Evidence on combining GR with insertional Achilles procedures remains limited. Vesely et al. reported that adding GR to isolated Haglund surgery reduced wound complications but did not provide detailed functional or strength outcomes[13]. These results add to the sparse comparative literature by incorporating validated PROMs, dynamic heel-rise testing, and quantitative dorsiflexion measurements and using longitudinal modeling strategies similar to those advocated in recent IAT and gastrocnemius recession studies[8,10,12,14,15]. Collectively, the findings support a treatment algorithm in which nonoperative care is initially exhausted, followed by standard open insertional surgery for refractory cases, with the addition of GR in patients with clinically significant gastrocnemius contracture[2,4,7,12,22]. Surgical strategies that address the bony impingement (Haglund deformity) and soft-tissue tension (gastrocnemius tightness) are increasingly emphasized, and endoscopic GR is a safe and effective adjunct in this context[4,12,22].

This study has several limitations. Its retrospective design introduces inherent risks of selection bias and residual confounding, despite efforts to include consecutive patients and adjust for key covariates in the statistical models, as recommended in observational orthopaedic research on IAT and gastrocnemius recession[8,10-12,14,15]. The sample size is modest, which may limit the power to detect small differences in rare complications or secondary outcomes[8,10,12,14,22]. All procedures were performed at a single center by a fellowship-trained foot and ankle surgeon, which may restrict generalizability but enhances the consistency of surgical techniques and rehabilitation protocols[6,8,10,11,22]. The observed benefits of endoscopic GR apply to patients with a positive

Silfverskiöld test and should not be extrapolated to those without demonstrable equinus. Objective isokinetic strength testing was excluded, which would have provided additional insight into muscle performance. Side-to-side heel-rise height difference, measured thrice per limb by a single fellowship-trained foot and ankle surgeon with the mean value used for analysis, was used as a functional surrogate of plantarflexion strength. No formal inter- or intrarater reliability testing was performed, and some degree of measurement bias cannot be excluded; however, any such bias may be nondifferential between groups because all measurements were obtained by the same examiner using a standardized protocol(12). Furthermore, the study excluded advanced imaging or biomechanical analyses to characterize structural changes postoperatively(16,17). Follow-up was limited to 12 months; longer-term studies would be valuable to confirm the durability of the observed benefits and better define long-term strength, reoperation rates, and late complications(8,10-12,14).

CONCLUSIONS

For patients with refractory insertional Achilles tendinopathy and clinical evidence of gastrocnemius tightness, combining standard open debridement and Haglund resection with endoscopic GR offers earlier pain relief, faster functional improvement, and sustained dorsiflexion gains without increasing overall complication rates or compromising midterm plantarflexion function(4,11,12,14,15). This approach may favorably modify the pattern of complications concerning wound-related events(12,14,22). These findings align with current evidence that standard open insertional Achilles surgery yields excellent pain relief after failed conservative care and suggest that, in patients with IAT and marked gastrocnemius tightness on Silfverskiöld testing, selectively adding endoscopic gastrocnemius recession can further enhance early outcomes in appropriately selected, often active patients while maintaining an acceptable safety profile.

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