

Treatment for Neglected Achilles Tendon Rupture: Combined Gastrocnemius Turndown Flap and Flexor Hallucis Longus Transfer in Young Active Patients Using Dual Incision

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Abstract: Neglected achilles tendon ruptures are a surgical challenge due to tendon retraction, poor tissue quality and a tendon gap that cannot be repaired by end-to-end anastomosis. Multiple techniques have been described for addressing this issue, however soft tissue complications are frequently presented mainly secondary to the use of longer incisions. We present a dual incision combined technique for gastrocnemius turndown flap and flexor hallucis longus transfer in young active patients, being a reliable and reproducible technique that offers both functional improvement and less soft tissue complications.

Level of Evidence: Level 5

Key Words: neglected achilles tendon injury, gastrocnemius turn-down flap, flexor hallucis longus transfer, dual incision

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HISTORICAL PERSPECTIVE

The achilles tendon despite its strength is one of the mostly affected in the human body, leading to recreational and spontaneous acute injuries that can be misdiagnosed in up to 20% of the cases leading to chronic ruptures.^{1,2}

Surgical management for neglected achilles tendon ruptures is challenging. Treatment aims to recover function with minimal complication rate.

In large defects, end-to-end anastomosis is not feasible to perform and other techniques are implemented, such as V-Y lengthening, turndown flap, tendon transfers and tendon grafts.^{3,4} However, soft tissue complications can be up to 11% to 25%^{1,5-7} and those are the ones that determine the successfulness of the procedure.^{8,9}

In the past years, surgeons have been researching the most effective and safe surgical technique.¹ Open surgeries were originally used and in the last years replaced by minimally invasive type procedures when possible.¹⁰

Flexor hallucis longus (FHL) transfer has gained popularity because of the improved function recovery with low donor morbidity and low rate complication.⁵ Nonetheless, several comparative functional studies concluded that patients recover strength but not endurance.¹¹

Combination of FHL tendon transfer with additional achilles reconstruction technique has demonstrated functional superiority with a 95.25 AOFAS score and 0.74 complications compared to isolated FHL tendon transfer.⁶

In the current paper, we present a surgical technique which employs dual incision to avoid extensive approach in order to minimize soft tissue problems.

INDICATIONS AND CONTRAINDICATIONS

Dual incision for combined gastrocnemius turndown flap and FHL transfer technique is indicated for young active patients with a chronic injury (more than 4 wk) and above 6 cm achilles tendon gap observed in the MRI.

Relative contraindications would include level of activity, since a less active patient may benefit with an isolated FHL transfer, also severe fatty infiltration would lead to surgical failure of the gastrocnemius flap.¹²

Absolute contraindications will be avulsion of the achilles tendon and active infection which would lead to a significant surgical failure risk.

Previous achilles surgery is not a contraindication to perform this procedure. Patients must be advised regarding tobacco use, as it can result in soft tissue hypoperfusion and wound dehiscence.

PREOPERATIVE PLANNING

Patients should have a history of decreased strength and endurance in the affected limb after an chronic achilles tendon rupture and should have a physical examination to determine medical fitness for surgery.

Preoperative planning will include, in order to compensate the loss of achilles function, a planned rehabilitation treatment program to strengthen the remaining flexor muscles. Also, an open discussion with the patients about the risks and benefits of a combined surgical repair technique for the achilles tendon.

Patients should be examined for discontinuity in the achilles tendon at midsubstance area, ankle dorsiflexion in resting position compared with contralateral side (Matles sign), calf-squeeze test negative or decreased compared with contralateral side (Thompson sign), inability to perform single heel rise.

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MRI is assessed to confirm FHL integrity, achilles rupture gap size > 6 cm, and gastrocnemius with no fatty infiltration.

OPERATIVE TECHNIQUE

Landmark and Patient Positioning

The patient is positioned in prone decubitus with bony prominences padded. Affected limb is exsanguinated and a tourniquet is applied and inflated to 250 mmHg.

Anatomic landmarks should be drawn on the patient's skin before starting surgery. These landmarks will be the achilles tendon palpated gap and the distance measured from the medial malleolus proximally to identify the myotendinous junction.¹³

Incisions

First distal longitudinal approach is performed with a 8-cm-incision slightly medial to midline from the proximal achilles tendon stump (measured in the MRI) to the proximal border of the calcaneal posterior tuberosity (Fig. 1A). Subcutaneous tissue dissection is performed until scar tissue is identified and resected identifying healthy tendon stumps. At this stage, gap is measured to acknowledge the size of the gastrocnemius flap.

A 6-cm-second proximal approach is made 14 cm proximal to the medial malleolus in a transverse manner across the leg¹³ (Fig. 1A). The sural nerve is identified and separated, myotendinous junction is recognized (Fig. 1B), with a blunt dissection gastrocnemius, from myotendinous junction to the proximal achilles stump, is brought through this incision out of the skin (Fig. 2A, B).

Gastrocnemius Flap Exposure and Preparation

A rectangular shaped flap is drawn with a sterile pen, starting 1 cm proximal to the edge of the proximal achilles tendon stump, quantifying the same size of the defect previously measured (Fig. 2C). Fascia is incised with a sharp blade and separated from the muscle (Fig. 3A), when the full length is obtained the flap is prepared with a Krackow technique with non-absorbable high resistance sutures.

Gastrocnemius muscle defect is reconstructed with a continuous mattress with absorbable monofilament suture (Fig. 3B).

Prepared flap is left outside of the skin covered by a saline-solution impregnated gauze.

FHL Harvest, Transfer and Fixation

Attention is turned back to the distal incision, FHL tendon is identified by performing passive flexion and extension of the hallux (Fig. 4A). With blunt dissection tendon is isolated from the nearby tissue. Subsequently, the FHL tendon is harvested distally, keeping the hallux and ankle flexed plantarly, then a Krackow technique is again applied to FHL with non-absorbable high resistance sutures.

FHL tendon diameter is measured with a regular tendon graft sizer to confirm calcaneal tunnel length, the distal threads of the krackow suture are passed through a titanium button in opposite ways (Fig. 4B).

FHL transfer tunnel is performed 1 cm anterior to the achilles insertion in the calcaneus midline. A 4 mm cannulated guidewire is drilled bicortically 45 degrees from dorsal to plantar keeping the direction of the tip anterior to the plantar aspect of the posterior calcaneal tuberosity (Fig. 5A, B), then interference screw reamer is used over the cannulated drill, reamer size is determined according to FHL tendon measure, 0.5 cm higher than the interference screw selected, until the full screw length is reached (Fig. 5C). Screw size selection will depend on tendon diameter measurement.

The button is passed through the calcaneal tunnel, deployed and turned with the applicator to keep it horizontal and stable in the plantar aspect, sutures are pulled in a synchronized way to maintain tension, then an interference screw is applied for double fixation (Fig. 5D).

Position for fixation should be physiological plantar flexion which is achieved comparing with contralateral side (Fig. 5E).

Gastrocnemius Flap Turndown and Fixation

Prepared gastrocnemius flap is passed from transverse proximal incision to the distal incision under the skin flap.

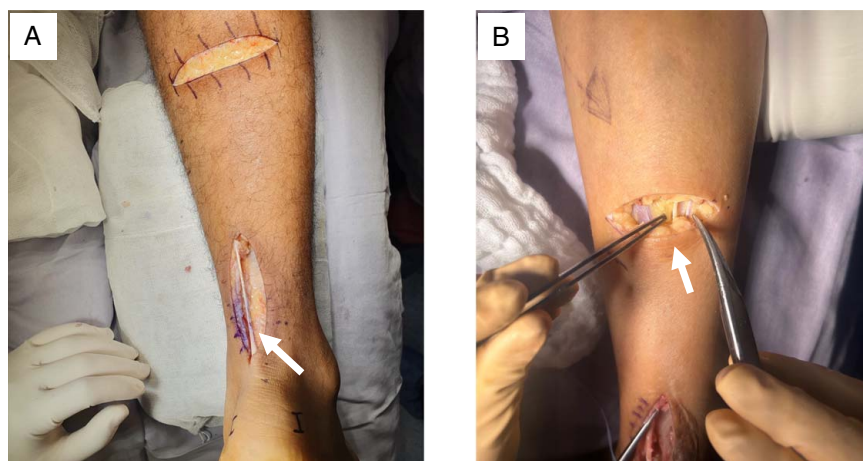


FIGURE 1. (A) First distal longitudinal 8 cm incision performed slightly medial to the midline identifying tendon gap, plantaris muscle tendon is marked with an arrow. Second transverse proximal incision performed 14 cm proximal to medial malleolus. (B) Sural nerve [marked with an arrow] is identified in second proximal incision.

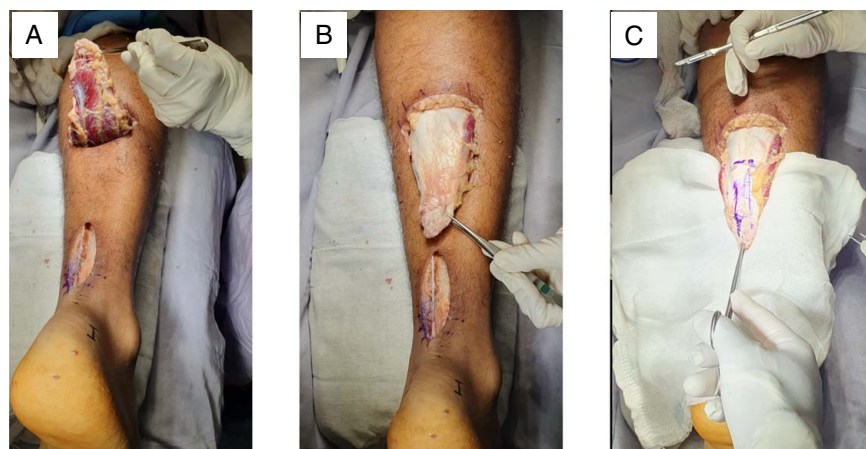


FIGURE 2. (A, B) Gastrocnemius brought out through second transverse incision. (C) Gastrocnemius length marked for turndown flap.

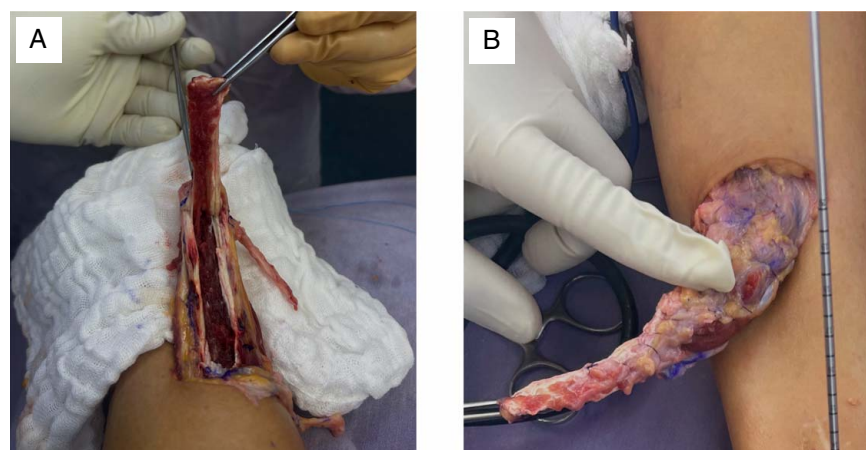


FIGURE 3. (A) Separated fascia from muscle prepared for turndown flap. (B) Reconstructed gastrocnemius muscle with continuous mattress, and distal end prepared with non-absorbable high resistance sutures.

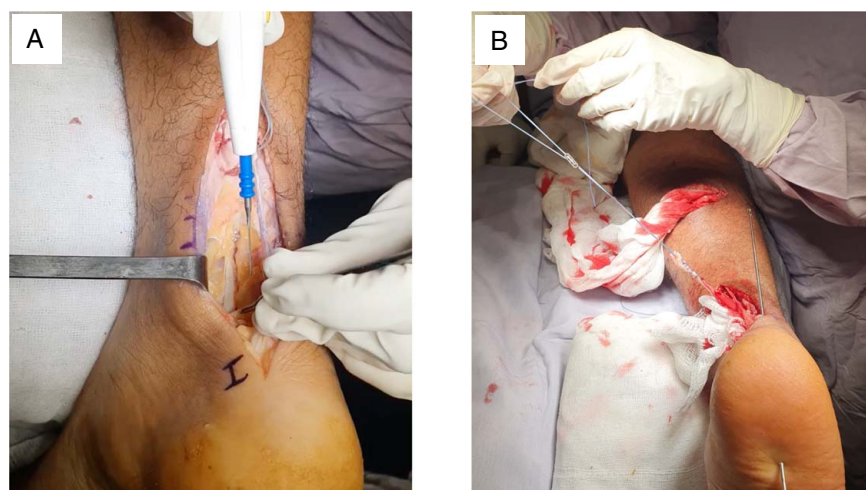


FIGURE 4. (A) Flexor hallucis longus tendon harvesting with ankle and hallux in plantar flexion. (B) FHL tendon preparation for transfer with non-absorbable high resistance sutures in a Krackow manner, titanium button is installed.

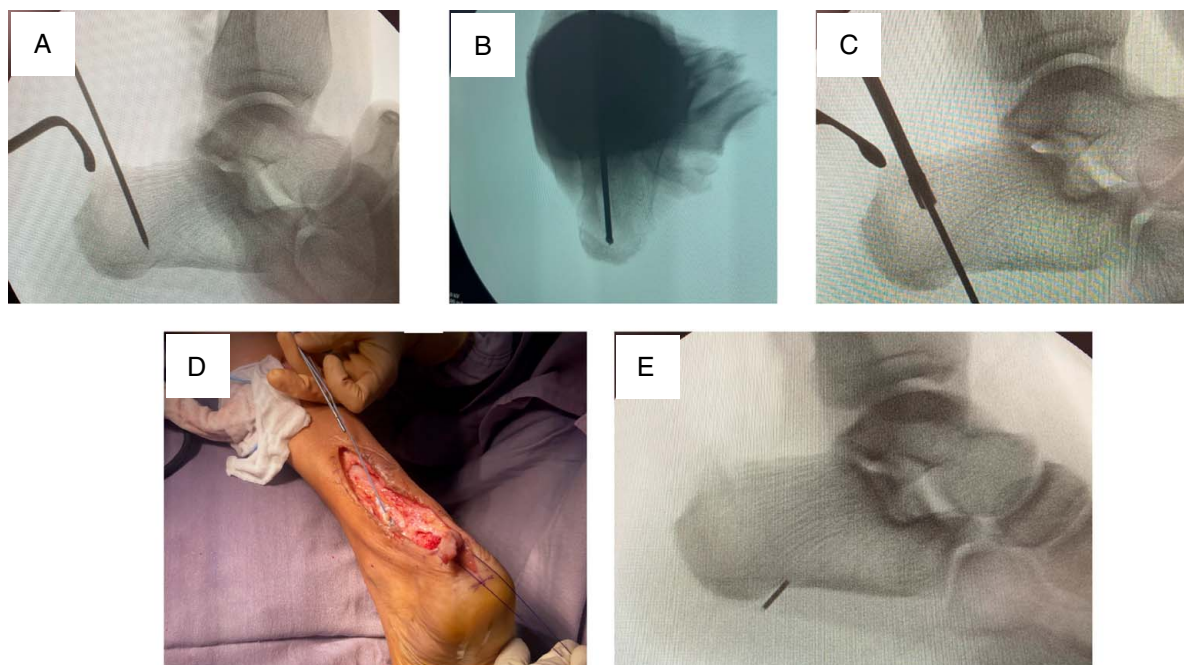


FIGURE 5. (A) 4 mm cannulated guide wire bicortically drilled 45 degrees from dorsal to plantar. (B) Confirmed centered position of the guide wire in Harris view. (C) Interference screw reamer drilled until full screw length is reached. (D) Button applicator ready to pass through the calcaneal tunnel. (E) Final button position in physiological plantar flexion.

Two poke holes are made on each side of the calcaneus, sutures are brought out on the distal incision and a suture passer is entered along the distal achilles tendon stump from distal to proximal, one on each side of the tendon through the poke-holes-incisions (Fig. 6A, B).

An anchor drill is used at 45 degrees from midline on each side, then knotless 4.75 mm anchors are used to fix the sutures on the calcaneus, with the achilles tendon in apposition.

Physiological plantar flexion should be kept during all the fixation part.

Closure and Dressing

The peritenon, if preserved, is repaired with Monocryl 3.0 continuous mattress, subcutaneous tissue is closed with Vycril 3.0 and skin with Nylon 3.0. The operated limb is kept on a below-knee anterior splint in physiological plantar flexion for 2 weeks.

COMPLICATIONS

Combined turnaround flap with FHL tendon transfer complications are reported up to 11.67%, these can be re-ruptures, deep vein thrombosis, superficial wound infections, wound healing complications and nerve damage.⁶

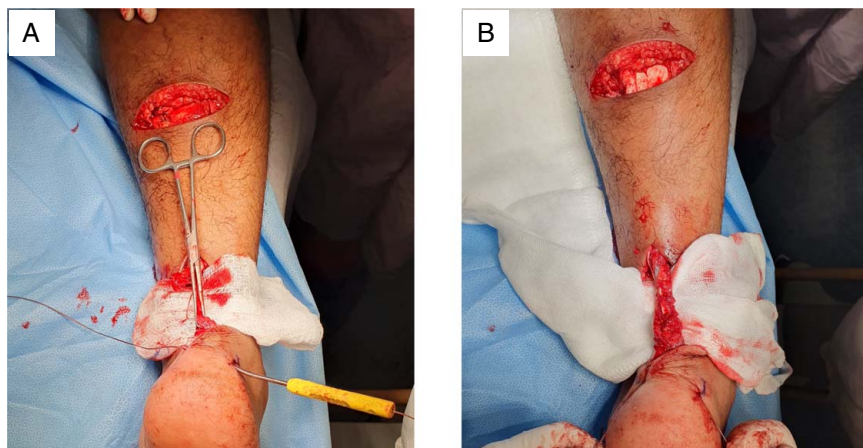


FIGURE 6. (A) Prepared tendon deployed from second to first incision. Suture passer used from proximal to distal achilles tendon stump. (B) Sutures passed on each side of the calcaneus through two poke holes incisions.

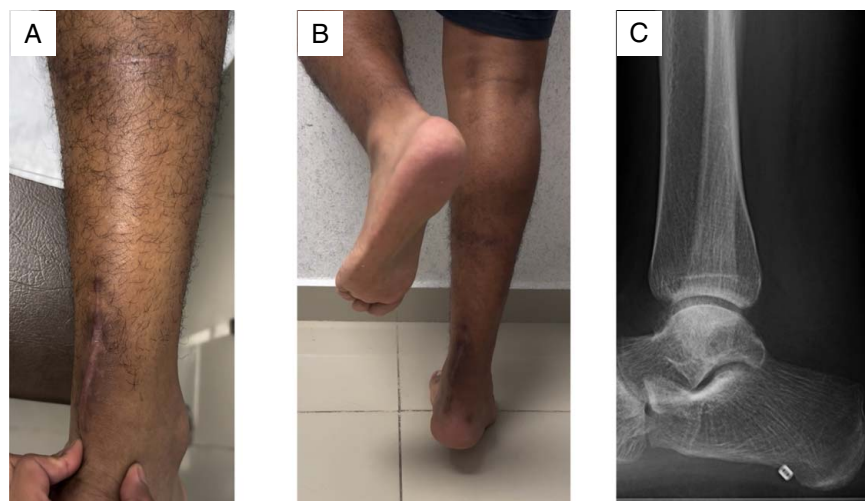


FIGURE 7. (A) Scars without complications. Adequate tendon continuity and consistency. (B) Single heel rise at 16 weeks postoperatively. (C) Adequate button position in radiographic control.

The presented technique attempts to avoid this complication rate by minimizing the approach extension.

POSTOPERATIVE MANAGEMENT

Wound inspection and sutures removal are performed after 2 weeks and an achilles boot with heel wedges is placed. After that, functional rehabilitation for achilles tendon is performed.¹⁴ Progressive weightbearing of 25% per week is initiated until full weightbearing with boot is achieved at 6 weeks, then progressive heel wedges removal is performed one by one every 3 days, until plantigrade foot is accomplished at 8 weeks postoperative (Fig. 7A). Then strengthening protocol is applied (Fig. 7B, C), always avoiding forced ankle dorsiflexion, this motion will be naturally acquired by regular gait pattern.

DISCUSSION

Chronic achilles tendon ruptures are challenging injuries and their treatment is technically demanding.¹

In order to restore achilles tendon function, several surgical methods have been described.

For achilles tendon injuries higher than 6 cm gap, open techniques have been described such as V-Y advancement,⁸ turndown flap,^{15,16} combined V-Y advancement and turn-down flap.¹⁷ Also, open or minimally invasive modifications have been performed with autograft or allograft tendons such as semitendinosus,^{4,18} gracilis,¹⁹ achilles,¹⁹ and peroneus brevis^{1,9} with 11% complication rate average, mainly due to soft tissue and graft-related complications.¹⁹

To improve soft tissue breakdown, FHL tendon transfer open or endoscopic⁷ has started to be widely used with good functional results. Ozer et al reported a short-term study hindfoot AOFAS 93.83, however ankle dorsiflexion was not fully recovered when compared to the contralateral side.²⁰

Further studies have been performed, identifying fully recovered strength after FHL tendon transfer with 52% MRI documented muscle hypertrophy,²¹ however endurance is significantly lower compared to contralateral side,¹¹ leading to 32% of patients with lower preinjury level when returning to sports.²²

Apinun et al compared isolated FHL tendon transfer to combined gastrocnemius turndown flap and FHL transfer detecting in their meta-analysis better outcomes with lower complication rates in the combined technique.⁶ Our dual incision technique offers a comparable method with a more limited approach.

FUTURE OF THE TECHNIQUE

Dual incision for combined gastrocnemius turndown flap and FHL transfer is a reproducible technique for neglected achilles tendon ruptures. This procedure attempts to avoid soft tissue complications related to extensive approaches in these patients.

Further comparative studies of this procedure with previously reported are necessary to establish the safety, effectiveness and advantages of this surgical technique over the others.

REFERENCES

1. Maffulli N, Via AG, Oliva F. Chronic achilles tendon rupture. *TOORTH J.* 2017;11:660–9.
2. Hammad ME, Fayed AM, Ayoub MA, et al. Early satisfactory results of percutaneous repair in neglected achilles tendon rupture. *BMC Musculoskelet Disord.* 2023;24:446.
3. Cottom JM, Sisovsky CA. Neglected achilles tendon ruptures. *Clin Podiatric Med Surg.* 2021;38:261–77.
4. Maffulli N, Del Buono A, Loppini M, et al. Ipsilateral free semitendinosus tendon graft with interference screw fixation for minimally invasive reconstruction of chronic tears of the Achilles tendon. *Oper Orthop Traumatol.* 2014;26:513–9.
5. Azam MT, Butler JJ, Weiss MB, et al. Surgical management of chronic achilles tendon ruptures: a systematic review and proposed treatment algorithm. *Foot Ankle Orthopaed.* 2023;8: 24730114231200491.
6. Apinun J, Jenvorapoj S, Arirachakaran A, et al. Clinical outcomes of chronic Achilles tendon rupture treated with flexor hallucis longus grafting and flexor hallucis longus grafting plus additional augmentation: a meta-analysis. *Foot Ankle Surg.* 2020;26:717–22.
7. Syed TA, Perera A. Endoscopic management of chronic achilles tendon rupture. *Foot Ankle Clin.* 2019;24:459–70.
8. Steginsky BD, Van Dyke B, Berlet GC. The missed achilles tear. *Foot Ankle Clin.* 2017;22:715–34.

9. Wang CC, Lin LC, Hsu CK, et al. Anatomic reconstruction of neglected achilles tendon rupture with autogenous peroneal longus tendon by Endobutton fixation. *J Trauma Injury Infect Critical Care*. 2009;67:1109–12.
10. Bertelli R, Gaiani L, Palmonari M. Neglected rupture of the Achilles tendon treated with a percutaneous technique. *Foot Ankle Surg*. 2009;15:169–73.
11. Alhaug OK, Berdal G, Husebye EE, et al. Flexor hallucis longus tendon transfer for chronic Achilles tendon rupture. A retrospective study. *Foot Ankle Surg*. 2019;25:630–5.
12. Eken G, Misir A, Tangay C, et al. Effect of muscle atrophy and fatty infiltration on mid-term clinical, and functional outcomes after Achilles tendon repair. *Foot Ankle Surg*. 2021; 27:730–5.
13. Joannas G, Casola L, Arrondo G, et al. V-Y advancement flap for repair of neglected injuries of the Achilles tendon using 2 mini-incisions. *J Foot Ankle*. 2020;14:123–5.
14. Glazebrook M, Rubinger D. Functional rehabilitation for nonsurgical treatment of acute achilles tendon rupture. *Foot Ankle Clin*. 2019;24:387–98.
15. Seker A, Kara A, Armagan R, et al. Reconstruction of neglected achilles tendon ruptures with gastrocnemius flaps: excellent results in long-term follow-up. *Arch Orthop Trauma Surg*. 2016;136:1417–23.
16. Ibrahim MAA, Abdelkader MG, Nematallah SA, et al. Modified gastro-soleus turn-down flap for chronic or neglected achilles tendon ruptures. *J Orthop Surg Res*. 2024;19:168.
17. Guclu B, Basat HC, Yildirim T, et al. Long-term results of chronic achilles tendon ruptures repaired with V-Y tendon plasty and fascia turndown. *Foot Ankle Int*. 2016;37:737–42.
18. Maffulli N, Longo UG, Spiezia F, et al. Free hamstrings tendon transfer and interference screw fixation for less invasive reconstruction of chronic avulsions of the Achilles tendon. *Knee Surg Sports Traumatol Arthrosc*. 2010;18:269–73.
19. Maffulli N, Bartoli A, Sammaria G, et al. Free tendon grafts for surgical management of chronic tears of the main body of the Achilles tendon: a systematic review. *Knee Surg Sports Traumatol Arthrosc*. 2023;31:4526–38.
20. Ozer H, Ergisi Y, Harput G, et al. Short-term results of flexor hallucis longus transfer in delayed and neglected achilles tendon repair. *J Foot Ankle Surg*. 2018;57:1042–7.
21. Oksanen MM, Haapasalo HH, Elo PP, et al. Hypertrophy of the flexor hallucis longus muscle after tendon transfer in patients with chronic Achilles tendon rupture. *Foot and Ankle Surgery*. 2014;20:253–7.
22. Ahn J, Jeong BO. Return to sports activities after flexor hallucis longus transfer for neglected achilles tendon rupture. *J Foot Ankle Surg*. 2022;61:1263–6.