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ORIGINAL ARTICLE

Clinical and Radiological Outcomes of a Modified Kidner Procedure after Symptomatic Accessory Navicular Excision

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Background The accessory navicular (AN) is a common anatomical variant that can become a source of chronic pain and discomfort. While conservative modalities are often the first-line management, surgical intervention may be necessary for persistent symptomatic cases. This work aimed to evaluate the outcomes of reattaching the posterior tibial tendon (PTT) to the primary navicular bone using an interference screw after AN excision after the failure of conservative treatment.

Patients and Methods This prospective cohort study was conducted on 29 patients aged greater than or equal to 10 years old, diagnosed with AN bone via clinical and radiological examinations. All included patients were managed conservatively for at least 6 months but failed to provide adequate symptoms relief. Excision of the accessory navicular bone and reattaching the PTT to the primary navicular bone using an interference screw was done in all cases. Patients were assessed preoperatively and at 1-year follow-up using the visual analog scale for pain and the American Orthopedic Foot and Ankle Society Ankle-Hindfoot Scale for functional outcomes and radiologically to evaluate foot alignment.

Results Visual analog scale and American Orthopedic Foot and Ankle Society scores showed significant improvement at 1 year follow-up (P<0.001). radiologically calcaneal pitch angle slightly improved as well as talo-navicular coverage angle.

Conclusions Interference screw fixation of the PTT after excision of the AN achieved favorable outcomes as it facilitates significant pain relief, functional improvement and supports an accelerated rehabilitation program.

Keywords Accessory navicular bone, Kidner procedure, Modified kidner procedure, Pes planus.
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INTRODUCTION

The accessory navicular (AN) bone is a common skeletal variation that results from the disturbed union of a secondary ossification center located medial to the primary navicular tuberosity present in up to 21% of the population, usually bilateral (50–80%) and frequently asymptomatic [1].

AN can be classified according to its attachment to the primary navicular into three main types; (I) small sesamoid bone with no attachment to the primary navicular, (II) a large ossicle which forms a synchondrosis with the primary navicular made of fibrocartilaginous or fibrous tissue, (III) large bony protuberance with solid bony connection to the primary navicular (Figure 1) [2].

Type II AN is the most problematic since chondro-osseous disruption may occur after the injury of the synchondrosis. This injury could occur after traumatic episode e.g., foot eversion, or repetitive stress caused by strenuous activities in young athletes, and since the posterior tibial tendon (PTT) has a broad attachment to the AN, shear and tension by the PTT may prevent it from healing [3].

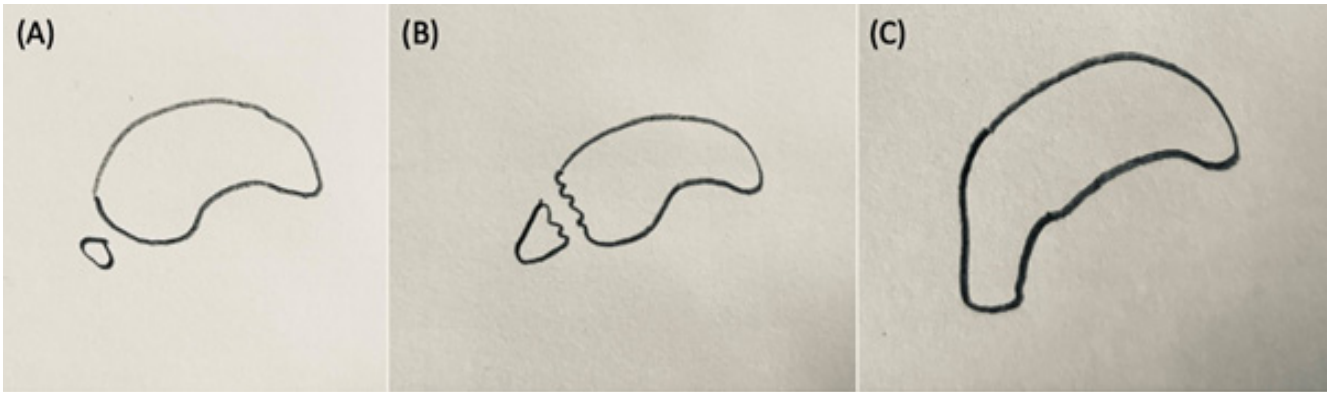

Figure 1: Classification of accessory navicular bone; (A): Small sesamoid bone with no attachment to the primary navicular; (B): A large ossicle which forms a synchondrosis with the primary navicular made of fibrocartilaginous or fibrous tissue; (C): Large bony protuberance with solid bony connection to the primary navicular.

Symptomatic AN bones can cause swelling, acute or chronic localized pain over the medial arch of the foot aggravated by mobility or wearing a narrow shoe [3]. Treatment options for painful AN bones can range from conservative measures [4] such as immobilization, physical therapy, and nonsteroidal anti-inflammatory drugs to more invasive surgical procedures after the failure of conservative measures to relieve the pain.

Various surgical techniques have been described to treat painful AN bone with no consensus reached in the literature regarding the optimal surgical method. The described techniques involve simple excision of the AN bone [5], percutaneous drilling to stimulate healing and bony union [6], fixation to the primary navicular after synchondrosis excision as well as excision of the AN and PTT reattachment to the medial or plantar-medial edge of the primary navicular [7].

This work aimed to evaluate a modification of the kidner procedure in which an interference screw was used to reattach the PTT to the primary navicular bone after AN excision in persistent symptomatic cases instead of suture anchors or simple stitching.

PATIENTS AND METHODS

This prospective cohort study was carried out in the period between May 2020 and June 2023 Patients older than 10 years who were diagnosed with symptomatic type II AN bone via clinical and radiological examination and underwent a period of conservative treatment for at least 6 months with no adequate symptom's relief were included in the study. The initial conservative treatment was a combination of immobilization in a cast, partial weight bearing, anti-inflammatory medication, steroid injections, and shoes or activity modification.

All patients were subjected to history taking, clinical examination and radiological evaluation. Chef complain was persistent localized pain at the medial aspect of the foot during or after exercise with localized tenderness at medial navicular tuberosity. Diagnosis of AN was confirmed by plain anteroposterior (AP) radiographs of the affected foot which revealed an accessory ossicle at the tuberosity of the navicular, type II only was included. Weight-bearing AP and lateral foot radiograph were obtained to detect and grade pes planus deformity using both the Talo-navicular coverage angle and Talo–first metatarsal angles preoperatively as well as at the time of the final follow-up. Radiographic measurements were done by two orthopaedic specialist and mean values were recorded.

Exclusion criteria were previous foot surgery history, symptomatic pes planus, moderate and severe pes planus deformity (lateral Talo-first metatarsal angle <15) [8]; concomitant procedures such as pes planus correction, gastrocnemius recession or Achilles lengthening; combined foot deformities such as tarsal coalition, vertical talus or neuromuscular disorders.

The American Orthopedic Foot and Ankle Society Ankle Hindfoot Scale (AOFAS) [9] score was used for functional evaluation preoperatively and at the time of the final follow-up while the visual analog scale (VAS) was used to evaluate pain severity preoperatively, 6 weeks, 3, and 12 months postsurgery.

The study was done with the approval from the Local Ethical Committee (approval code: xxxxxxxx81/7) An informed written consent was obtained from the patients or their parents.

Surgical technique

The patient was placed in the supine position on the operating table under regional or general anesthesia. A pneumatic tourniquet was placed around the thigh and inflated when needed. A transverse small incision 1cm anterior to the tip of the medial malleolus directed toward the base of the first metatarsal was made at the skin crease directly above the medial prominence of the AN. The AN was exposed by careful dissection of the PTT and its connection, following adequate exposure, the AN was removed after complete detachment of the PTT. In case of residual protrusion of the primary navicular medial edge trimming was done utilizing a rongeur or a curette.

For reinsertion of the PTT, A guidewire was then inserted from the medial plantar to the lateral dorsal surface of the primary navicular, positioning it nearly perpendicular to the PTT's effective lever arm and checked using fluoroscopy. The PTT was then whipstitched, tubularized, and sized. The guide pin was then over-drilled to the corresponding size creating a socket of 1.5–2cm length. The foot was held in neutral hindfoot rotation with 20º plantarflexion and the detached PTT was then pulled through the bone tunnel using a passing stitch and secured with an interference screw (Smith and Nephew, Andover, USA) sized usually 6 mm similar to the socket diameter (Figure 2).

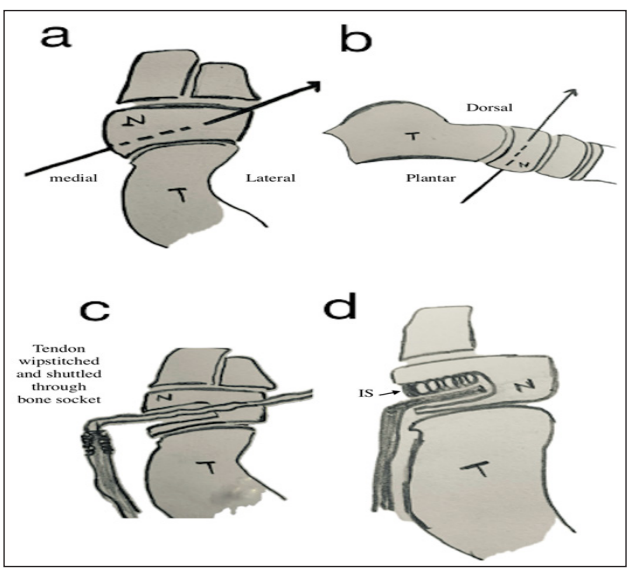

Figure 2: A guidewire is inserted from the medial plantar lateral to the lateral dorsal surface of the primary navicular; (A, B): The posterior tibial tendon is whipstitched, tubularized and sized. The guide pin was then over-drilled to the corresponding tendon size creating a socket of 1.5–2cm length; (C): Posterior tibial tendon is then secured with an interference screw similar to the socket diameter; (D): N= Primary navicular, T= Talus, IS= Interference screw.

Following the procedure, patients were placed in a short leg splint for two weeks after which active and passive range of motion (ROM) exercises were allowed. Partial weight bearing was allowed 4 weeks postsurgery followed by progression to full weight bearing without crutches at 6–8 weeks. After 12 weeks, patients were encouraged to return to sports activities as tolerated.

Statistical analysis:

Statistical analysis was done using SPSS v26 (IBM Inc., Chicago, Illinois, USA). Quantitative variables were presented as mean and SD and unpaired Student's t-test was used to compare between both values. Qualitative variables were presented as frequency and percentage (%). Statistically significance was determined by a two-tailed *P* value less than 0.05. Additionally, the intra-observer and interobserver reliability were statistically analyzed and calculated using the intraclass correlation coefficients, with a score of 0.97, 0.83, and 0.92 for the lateral Talo-first metatarsal angle, Talo-first metatarsal angle (AP) and talo-navicular coverage angle respectively.

RESULTS

A total of 29 patients (31 feet); 17(58%) males 12(41.3%) females, with a mean age of 16.2±4.11 years were included in the study. History of trauma to the foot was present in 21(72.4%) patients, and flatfoot deformity was observed in nine (31%) patients. The mean duration between the initial complain and surgery was 7.5 months (range 6–9), and the mean follow-up period was 16 months (range, 12–20), patient demographics are shown in Table (1).

The AOFAS score improved from a mean of 57.2±11.21 to 90.6±6.89 (P<0.001) at the time of the final follow-up. The VAS score improved gradually over the first 12 month from a median of 7 (IQR 5.75–8) preoperatively to a median of 5 and 3, 6- and 12-weeks postsurgery respectively and median score of 1 (IQR 1-2) at 1-year follow-up (P<0.001). Radiologically, the lateral Talo-first metatarsal angle improved significantly from a mean (6.3±1.3) preoperatively to a mean of (3.7±0.8) postoperatively at the time of final follow-up (Table 2).

28(96%) patients were able to return to their normal daily activity at 10 (range 8–12) weeks postsurgery. There were no significant differences between patients with normal hindfoot alignment and patients with pes planus at the final follow-up regarding AOFAS, VAS scores and postoperative complications (Table 3).

Table 1: Patient demographics:

	Total number of patients (*N*=29)
Age (mean-range) in years	16.2 (12–26)
Sex, [*n* (%)]	17(58%) males 12(41.3%) females
History of trauma	21 patients (72.4)
Asymptomatic Pes-planus deformity	9 patients (31)
Duration from symptoms to surgery (mean-range) in months	7.5 months (6–9)
Follow up period (mean-range) in months	16 months (12–20)

Table 2: Clinical and radiological outcomes at the final follow up:

	Preoperative	postoperative	*P* value
AOFAS (mean±SD)	57.2±11.21	90.6±6.89	0.001
VAS (Median)	7	6 weeks 5 12 weeks 3 Final follow-up 1	0.001
Lateral Talo-first metatarsal angle (mean±SD)	6.3±1.3	3.7±0.8	0.043
Talo-first metatarsal angle (AP) (mean±SD)	10.7±2.6	8.4±0.8	0.148
TN coverage angle (mean±SD)	11.3±0.7	9.8±1.2	0.119

Table 3: Comparison between pes planus and non pes planus patients regarding functional and radiological outcomes:

	Pes-planus group	Non Pes-planus group	*P* value
AOFAS			
Preoperatively (mean±SD)	56.8±9.5	57.5±3.2	0.618
Postoperatively (mean±SD)	89.6±1.2	91.6±0.7	0.314
VAS score			
Preoperatively (median-range)	7 (6–8)	7 (6–8)	0.437
Postoperatively at ١٢ months (median-range)	1 (0–2)	0 (0–1)	0.218
Lateral Talo-first metatarsal angle			
Preoperatively	9.4±3.7	3.2±0.5	0.007
Postoperatively	6.2±1.3	1.3±0.8	0.002
Talo-first metatarsal angle (AP)			
Preoperatively	13.6±6.2	7.9±6.8	0.07
Postoperatively	10.7±2.4	6.1±8.7	0.09
Talo-navicular coverage angle			
Preoperatively	15.5±6.8	7.2±5.2	0.031
postoperatively	11.8±5.3	7.8±3.2	0.047

Complications

In all three (10.3%) patients had transient superficial inflammation at the incision site that was treated with oral antibiotics, two (6.8%) patients had sensitive scar with mild tenderness at the final follow up, six (20.6%) patients had pain on tip toeing 3-month postsurgery, five out of the six had significant improvement at the final follow-up with only occasional pain with no restriction of daily activity and only one patient had persistent pain that required revision surgery to relieve the tension of the PTT in form of medial displacement calcaneal osteotomy.

DISCUSSION

The most important finding of this study is that AN excision and posterior tibial tendon reinsertion in the primary navicular using an interference screw results in high functional scores and early return to daily activities in a selected cohort of patients. However, it may pose a risk of PTT over tensioning with early postoperative pain that usually resolves gradually.

Patients with symptomatic AN who complain of prolonged symptoms after adequate period of conservative treatments are indicated for operative intervention to relieve the pain and improve their function [3]. Surgical options vary from simple AN excision [10], percutaneous drilling of the synchondrosis to promote bony healing [6], AN fixation to the primary navicular after synchondrosis excision [11] and excision of the AN and reinsertion of

the PTT as described by kidner which is considered the standard procedure with high satisfaction rates as reported in the literature [12,13].

To avoid dysfunction of the PTT after AV excision, a suture anchor is commonly used to reattach the PTT to the primary navicular [14]. A potential disadvantage of this technique is prominent subcutaneous knots that may cause skin irritation with residual tenderness and the dependence on surface tendon to bone healing which does not permit early mobilization and may be inadequate. In this study, an interference screw fixation was used to fix the PTT in an inlay fashion to a bone tunnel drilled through the primary navicular from medial plantar to the dorsal lateral direction perpendicular to the direction of the PTT lever arm as described by Miyamoto *et al.,* [15].

Initial fixation strength as well as tendon to bone healing is known to be better with bone tunnels and interference fixation rather than surface fixation using anchors or stables [16]. Bone tunnels allow for wider circumferential healing surfaces and more rigid fixation that allows for early mobilization. In the present study, free range of motion was allowed after 2 weeks and the majority of the patients returned to their normal daily activities at 10 weeks postsurgery which is similar or even better than other reported surgical techniques ranging from 8 to 16 weeks [6,17,18].

The mean AOFAS score at the final follow-up was 91 which is similar to scores reported in the literature for AN fixation [19], kidner procedure, and modified kidner surgery [17,20], this suggests that interference screw fixation may be an effective surgical option based on the improvement of functional scores and low complication rates.

In the present study, patients experienced pain in the early postoperative phase particularly during exercises and walking (median VAS score at 6 weeks= 5), the VAS scores gradually decreased overtime in the majority of cases at the time of final follow-up (median VAS score at final follow-up= 1), this may be attributed to the initial over tensioning of the PTT, it has been shown that the PTT has limited excursion to approximately 2cm [21]. therefore, the advancement of the PTT tendon inside the bone tunnel may have created excessive tension at the reattachment point. This could also be exacerbated by the position of the foot during fixation and hence, we recommend fixing the tendon while the heel is kept in neutral rotation and the foot plantarflexed to avoid PTT over tensioning. Only one patient had persistent pain with tip-toeing and sports activity 6 months postsurgery, this patient received a MDCO to relieve the tension on the PTT. It was shown biomechanically that MDCO decreases medial column pressure by displacing pressure to the lateral side [22]. Kim *et al.,* [23] showed that patient with residual pain after kidner procedure resulting from excessive PTT tension could benefit from corrective alignment procedures without attacking the PTT insertion site, he even recommended corrective bony modalities at the time of initial intervention when PTT tension is expected after excision of larger AN. Two (6.8%) patients had sensitive scars with mild tenderness at the final follow-up, this is consistent with previous literature reporting a small incidence of painful scar due to subcutaneous fibrous tissue formation, neuromas or sensitive scar tissue as well keloid formation [24,25].

There is a well-known correlation between AN and pes planus with nearly one-third of the ANs are associated with pes planus [13,25,26]. Despite being linked with residual pain after AN excision there is no consensus reached in the literature on whether pes planus deformity should be corrected in patients with symptomatic AN [20,23]. In the present study, subgroup analysis revealed no difference between patients with pes planus deformity and normally aligned patients regarding the outcomes, these findings are in line with those from Nian *et al.,* [19] who concluded that asymptomatic mild to moderate flatfeet do not require concomitant correction surgery when treating painful type II ANs. It is worth noting that in the present study, only asymptomatic mild pes planus deformity were included and thus this finding may be of limited significance.

There are conflicting results in the literature regarding the progression of pes-planus after AN surgery, some authors stated progression of the deformity due to chronic overload on the PTT [23] while others described a stationery medial arch after surgery [12] or even improvement of the lateral Talo-first metatarsal angle [19,20]. In the current study radiological evaluation showed improvement of both talo-first metatarsal angles and talo-navicular coverage angles at the final follow-up in our relatively young population (mean age 16.2 – range 12–26). These findings are similar to those reported by other literature. Cha *et al.,* [20] in a pediatric population (mean age 11 years) showed postoperative improvement of the medial arch as well as Zeng *et al.,* [14]who reported a significant increase of the calcaneal pitch angle after both kidner and fixation surgeries in a cohort of patients with a mean age of 16.5. In the contrary, Lee *et al.,* [12] reported unchanged calcaneal pitch angle after kidner procedure in a relatively older population (age range 8–48). These conflicting results may be attributed to the age of the studied group since the medial arch development could be more pronounced and evident in the young skeletally immature patients after surgery.

Interference screw fixation for painful AN appears to be an effective surgical option based on the significant improvements in VAS and AOFAS scores observed in this study. We recommend considering this technique as a reliable treatment for patients who have failed conservative management as it provides a stable fixation and promotes reliable osseous integration allowing early weight-bearing and rehabilitation, which can facilitate a faster return to normal activity.

We acknowledge several limitations of the study including; a relatively small sample size of 29 patients, a single-arm, prospective cohort design without a control group, and a short follow-up period. Larger, multicenter studies would be beneficial to further validate the outcomes of this surgical technique and provide more robust data. Comparative studies evaluating interference screw fixation against other surgical techniques (e.g., Kidner procedure) would help elucidate the relative merits of this approach. Longer-term follow-up data would be valuable to assess the durability of the surgical outcomes and any potential for late complications.

CONCLUSION

Interference screw fixation of the posterior tibial tendon to the primary navicular after excision of the AN bone in persistent symptomatic cases achieved favorable outcomes as it provides significant pain relief, functional improvement, and supports an accelerated return to daily activities.

Ethical approval

Approval was obtained from the ethics committee of the Tanta, Faculty of Medicine. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Informed consent

All patients submitted their written informed consent to participate in this investigation.

Authors' contribution

A.H.: Writing, statistical analysis, performing surgeries, and radiological evaluation. **A.E.:** Writing, statistical analysis, performing surgeries, and radiological evaluation. **M.R.E.T.:** Data collection and patients recruitment. **A.M.S.:** Data collection and patients recruitment.

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Nil.

LIST OF ABBREVIATION

AN: accessory navicular; **AOFAS:** The American Orthopedic Foot and Ankle Society Ankle Hindfoot Scale; **AP:** anteroposterior; **MDCO:** Medial displacement calcaneal wedge osteotomy; **PTT:** posterior tibial tendon; **ROM:** range of motion; **SD:** standard deviation; **VAS:** visual analog scale.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCE

1. Ugolini PA, Raikin SM. (2004). The accessory navicular. Foot Ankle Clin. 9:165–80.
2. Golano P, Fariñas O, Sáenz I. (2004). The anatomy of the navicular and periarticular structures. Foot Ankle Clin 9:1–23.
3. Campbell JT, Jeng CL. Painful Accessory Navicular and Spring Ligament Injuries in Athletes. Clin Sports Med 2020; 39:859–876.
4. Wynn M, Brady C, Cola K, Rice-Denning J. (2019). Effectiveness of Nonoperative Treatment of the Symptomatic Accessory Navicular in Pediatric Patients. Iowa Orthop J. 39:45–49.
5. Kopp FJ, Marcus RE. (2004). Clinical outcome of surgical treatment of the symptomatic accessory navicular. Foot Ankle Int. 25:27–30.
6. Nakayama S, Sugimoto K, Takakura Y, Tanaka Y, Kasanami R. (2005). Percutaneous drilling of symptomatic accessory navicular in young athletes. Am J Sports Med. 33:531–5.
7. Prichasuk S, Sinphurmsukskul O. (1995). Kidner procedure for symptomatic accessory navicular and its relation to pes planus. Foot Ankle Int. 16:500–3.
8. Ueki Y, Sakuma E, Wada I. (2019). Pathology and management of flexible flat foot in children. J Orthop Sci. 24:9–13.
9. Alhadhoud M, Alsiri N, Alsaffar M, Glazebrook M. (2020). Cross-cultural adaptation and validation of an Arabic version of the American Orthopedics Foot and Ankle Score (AOFAS). Foot Ankle Surg. 26:876–882.
10. Kopp FJ, Marcus RE. (2004). Clinical outcome of surgical treatment of the symptomatic accessory navicular. Foot Ankle Int. 25:27–30.
11. Chung J-W, Chu I-T. (2009). Outcome of Fusion of a Painful Accessory Navicular to the Primary Navicular. Foot Ankle Int. 30:106–109.
12. Lee KT, Kim KC, Park YU, *et al.* (2012). Midterm outcome of modified kidner procedure. Foot Ankle Int. 33:122–127.
13. Fang K, Bi T, Hong A, Li X, Gong H, Li B, *et al.* (2023). Efficacy of modified kidner procedure combined with subtalar arthroereisis treating adolescent type 2 painful accessory navicular with flexible flatfoot. Front Pediatr. 11:1258032.
14. Zeng G, Hu X, Chen Y, Yang T, Qiu X, Li C, Song W. (2020). Comparison of outcomes of arthrodesis and reconstruction (advancement), posterior tibial tendon with excision of accessory tarsal navicular bone (Kidner procedure) in type 2 accessory navicula. Foot Ankle Surg 2020; 26:930–934. (Kidner procedure) in type 2 accessory navicula. Foot and Ankle Surgery. 26:930–934.

15. Miyamoto W, Takao M, Yamada K, Yasui Y, Matsushita T. (2012). Reconstructive surgery using interference screw fixation for painful accessory navicular in adult athletes. Arch Orthop Trauma Surg. 132:1423–7.
16. Sequeira SB, Imbergamo C, Gould HP. (2022). Interference Screws Are Biomechanically Superior to Suture Anchors for Medial Patellofemoral Ligament Reconstruction: A Systematic Review and Meta-Analysis. Arthrosc Sports Med Rehabil. 4:e1581–e1588.
17. Gong H, Xie Y, Song Z, Tang Z, Wen J, Xiao S. (2023). A modified method for reconstruction of posterior tibial tendon after resection of juvenile painful type II accessory navicular. J Orthop Surg Res. 18:912.
18. Wang Y, Hao Y, Sun X, Jiang L, Pu X, Zhang Y, Kang Q. (2024). Clinical Effects of Tibial Posterior Tendon Reconstruction in the Treatment of Young Athletes With Accessory Navicular Bone Syndrome. J Musculoskelet Neuronal Interact. 24:159–167.
19. Sun N, Chen J, Chen Z, Zeng C, Guo H. (2023). Clinical Outcomes of Fusion in Type II Accessory Naviculars With or Without Asymptomatic Flatfeet. Foot Ankle Int Feb; 44:139–147.
20. Cha SM, Shin HD, Kim KC, Lee JK. (2013). Simple excision vs the Kidner procedure for type 2 accessory navicular associated with flatfoot in pediatric population. Foot Ankle Int; 34:167–172.
21. Khan MI, Ahmed O, Yasmeen S, Saadique R, Beg MSA. (2021). Tibialis Posterior Transfer for Foot Drop: The Difference in Outcome for Two Different Attachment Sites. Cureus. 13:e18461.
22. Arangio GA, Salathe EP. (2009). A biomechanical analysis of posterior tibial tendon dysfunction, medial displacement calcaneal osteotomy and flexor digitorum longus transfer in adult acquired flat foot. Clinical Biomechanics. 24:385–390.
23. Kim J, Day J, Seilern und Aspang J. (2020). Outcomes Following Revision Surgery After Failed Kidner Procedure for Painful Accessory Navicular. Foot Ankle Int. 41:1493–1501.
24. Wariach S, Karim K, Sarraj M, Gaber K, Singh A, Kishta W. (2022). Assessing the Outcomes Associated with Accessory Navicular Bone Surgery- a Systematic Review. Curr Rev Musculoskelet Med. 15:377–384.
25. Gan TJ, Liu X, Li YX, *et al.* (2023). Is Kidner procedure necessary during subtalar arthroereisis for pediatric flexible flatfoot that combined with symptomatic type 2 accessory navicular? A retrospective comparative study. Foot Ankle Surg. 29:393–400.
26. Stolarz K, Osiowski A, Preinl M, *et al.* (2024). The prevalence and anatomy of accessory navicular bone: a meta-analysis. Surg Radiol Anatomy. 46:1731–1743.