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REVIEW

SURGICAL TREATMENT OF SYMPTOMATIC ACCESSORY NAVICULAR BONE (OS TIBIALE EXTERNUM) IN PEDIATRIC PATIENTS. A SYSTEMATIC REVIEW

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ABSTRACT

Objective: A symptomatic accessory navicular bone can cause foot pain and, in some instances, a painful flatfoot with functional limitations. Treatment is generally conservative, but in selected patients, surgical management may be necessary. The purpose of this study was to analyze a series of selected papers to identify the best surgical treatment for symptomatic accessory navicular bone.

Methods: A literature search was performed in MEDLINE database, Chocrane Library and Scopus database. The research was performed following the PRISMA guidelines. Articles published from 1998 to 2023 reporting clinical outcomes of pediatric patients affected by accessory navicular bone surgically treated were included.

Results: From an initial pool of 76 studies, 8 were included in this review. These encompassed 228 patients (294 feet), with an average age at surgery of 12.4 years; 147 patients were female (64.5%) and 81 male (35.5%). The follow-up ranged from 10 months to 12 years. Most cases involved type II os tibiale externum (246 feet). Treatments varied: 57 simple excisions, 62 Kidner procedures, 22 excisions with suture anchor stabilization, 31 percutaneous drillings, 37 subtalar arthroereisis alone, 35 combined with Kidner procedure, and 50 with medial soft tissue reconstruction.

Conclusions: While a definitive surgical treatment of choice for symptomatic accessory navicular cannot be indicated, simple excision without detachment of the tibialis posterior tendon appears to be a valid treatment option for resolving this syndrome. Associated procedures may be performed when a flexible flatfoot is present and symptoms persist.

KEYWORDS

Accessory navicular bone, tarsal navicular bone, tibialis posterior tendon, surgical excision, Kidner procedure, suture anchor, percutaneous drilling, subtalar arthrodeisis

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INTRODUCTION

The accessory navicular, also known as os tibiale externum, os naviculare, os naviculare secundarium, accessory scaphoid, accessory tarsal scaphoid, divided navicular, bifurcated hallux and preallux[1,2], is the most common supranumerary bone of the foot (incidence 10% to 14%)[3,4]. It is located on the medial side of the tarsal navicular at the insertion of the posterior tibial tendon (PTT). An autosomal dominant inheritance pattern has been suggested[5]. An association with flat foot deformity has been observed (50%)[4]. The os tibiale externum happens because of a failure of the secondary ossification center of the navicular bone to fuse, remaining isolated from navicular bone[2]. This supernumerary bone usually completes its ossification at skeletal maturity. The posterior tibial tendon surrounds the accessory navicular and inserts into it navicular[6-8]. The os tibiale externum is usually asymptomatic. It manifests itself between the ages of 9 and 11 years old, and generally is seen earlier in the female gender. The symptoms can develop following trauma, repeated microtraumas due to activities such as sports, prolonged walking, or friction against a shoe. When symptomatic, the accessory navicular can cause a painful bump in medial side of the foot leading to limitation of daily and sport activities. Symptomatic accessory tarsal navicular is commonly seen in young athletes and it can significantly affect their sports performance[7,9,10].

The most common classification adopted by the majority of authors was proposed by Weitch in 1978 on the basis of the accessory navicular bone's morphology and position[11-14]. This classification includes three types of accessory navicular bone. In type I (30%), the accessory navicular bone is small, generally 2-3 mm in diameter, within the posterior tibial tendon without any bony attachment to the navicular, and it is rarely symptomatic. Type II (50-60%), in which the accessory navicular bone is much larger (8-12 mm) with a gap of approximately 2 mm made of a fibrocartilaginous tissue interposed between the ossicle and the body of the navicular[15]. Finally, type III, in which the accessory navicular is connected to the navicular by a bony bridge, causing a prominent navicular tuberosity known as a "cornuted navicular"[16] which is rarely symptomatic. In 1986, Sella et al.[16] divided type II into two subtypes (IIa and IIb) on the basis on its position (dorsally in type IIa or plantarly in type IIb) and on the angle formed between the synchondrosis and the talar lateral process. This angle averaged 56° in type IIa was more acute in IIb.

Diagnosis usually is made with radiographic examination which includes standard anteroposterior and lateral radiographs of the foot, and a 45 external oblique view. Magnetic resonance imaging (MRI) can help in differential diagnosis with a tuberosity fracture, by identifying the presence or absence of bony edema. Computed tomography (CT) can be helpful to better delineate the bony anatomy. Differential diagnosis should also be made with arthritis, posterior tibial tendon tears or tendinopathies[1, 17-20].

The treatment of choice is usually conservative, and involves rest and the use of a shoe insert designed to relieve pressure on the medial midfoot and reduce inflammation. At the same time, the patient should refrain from all sports and any activities that place stress on the posterior tibial tendon. Nonsteroidal anti-inflammatory drugs may be used as an adjunctive treatment to help alleviated pain and reduce swelling in the accessory navicular region[2]. When conservative treatment fails, surgical management may be necessary[21-26].

This study aimed to identify the optimal surgical treatment

	Inclusion criteria	Exclusion criteria
Population	• Exclusively children patients (< 18 y) affected by symptomatic accessory navicular bone • Patients affected by associated lesion	• Exclusively adult patients or a mix of adult and pediatric patients
Intervention	• Simple excision of the accessory navicular bone • Modified simple excision • Kidner procedure • Excision and suture anchor stabilization • Percutaneous drilling • Subtalar arthroereisis	• Nonoperative treatment
Comparison group	• Studies reporting patients treated with different surgical techniques will be compared	• Not applicable
Outcome	• Studies reporting clinical and radiographic scores	• Not reporting clinical results
Time	• Studies published from 1998 to 2023	• Studies older than 1998
Study type	• Original articles • Clinical trials • Cohort studies • Observational studies • Randomized control trials	• Letters • Case reports • Experimental studies
Language	• English	• Other languages

Table 1. *Inclusion and exclusion criteria (PICOT).*

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for patients affected by symptomatic accessory navicular bone with or without flexible flatfoot, in which conservative treatment had failed. We analyze a series of selected papers published from 1998 to 2023,

MATERIALS AND METHODS

This systematic review incorporates studies that have investigated surgical interventions for symptomatic accessory navicular bone in children. The selection of these studies adhered to the PICOT (population, intervention, comparator, outcome and time) methodology. The detailed outcomes are reported in *Table 1*.

The research utilized Scopus, Cochrane Library, and the MedLine database via PubMed. Each author independently performed the search in June 2023, following a strategy that adheres to the PICOT guidelines. The initial search identified keywords and Medical Subject Headings (MeSH) terms, which were then selected via collaborative discussion. The search strategy comprised of keywords, their synonyms, or MeSH terms arranged in many combinations to maximize the relevancy of the articles sourced. These included "surgical treatment", "accessory navicular bone", "os tibiale externum", and "children". The complete list of terms, along with the Boolean operators used for their combination, is as follows: ("surgical procedures, operative"[MeSH Terms]) OR ("surgical"[All Fields] AND "procedures"[All Fields] AND ("operative"[All Fields]) OR ("Excision" [All Fields]) OR ("fixation"[All Fields]) OR ("osteosynthesis"[All Fields]) OR ("kidner"[All Fields]) OR ("operative surgical procedures"[All Fields]) OR ("surgical"[All Fields] AND "treatment"[All Fields]) OR ("surgical treatment"[All Fields])) OR ("excision" [All Fields]) OR (("surgical procedures, operative"[MeSH Terms] OR ("surgical"[All Fields] OR ("surgical methods"[All Fields]) AND "procedures"[All Fields] AND "operative"[All Fields]) OR ("sur-gery"[All Fields] AND "procedure"[All Fields] AND "operatives"[All Fields]) OR"operative surgical procedures"[All Fields] OR "surgical"[All Fields] OR "surgically"[All Fields] OR "surgicals"[All Fields]) OR ("surg*"[Title]) OR ("operativ*"[Title])) AND ("os tibiale externum"[Title/Abstract] OR "naviculare secundarium"[Title/Abstract] OR "accessory navicular bone"[Title/Abstract] OR "accessory navicular bones"[Title/Abstract] OR "accessory navicular"[Title/Abstract] OR "accessory tarsal scaphoid"[Title/Abstract]).

In addition, a manual search was performed of the references cited in the studies included. A language restriction filter was implemented to include only articles written in English. Each chosen study underwent an independent analysis by the reviewers. In case of any disagreement, resolution was sought under the guidance of a senior investigator. The selection of articles adhered to specific inclusion criteria: the study must involve exclusively pediatric patients who have undergone surgical treatment for symptomatic accessory navicular bone, provide a satisfactory level of evidence, and the full text must be

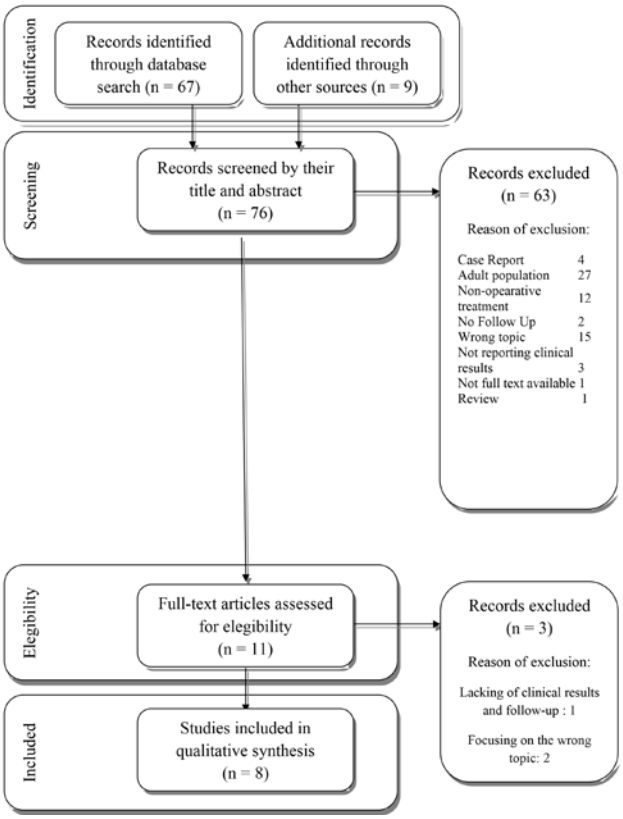


Figure 1. *Flow diagram of search progress*

available. Exclusion criteria were also set: studies focusing on nonoperative treatment, case reports, reviews, and studies not providing clinical results were omitted.

The articles were evaluated based on the following inclusion criteria: pediatric patients (age <18 years) suffering from symptomatic accessory navicular bone, either as an isolated condition or associated with a flexible flatfoot. Regarding interventions, the studies considered involved simple excision of the accessory navicular bone with tendon suture, modified simple excision, Kidner procedure, surgical stabilization with suture anchor, percutaneous drilling, and subtalar arthroereisis. Additionally, only studies that reported both clinical and radiographic score results were included.

Exclusion criteria were defined as follows: studies involving exclusively adult patients or those including both adult and pediatric populations; articles published more than 25 years ago; studies focusing on non-surgical treatments; studies without reporting clinical or radiographic results; formats such as letters, case reports, or experimental studies; and articles published in languages other than English. The risk of bias was assessed through the MINORS score (Methodological Index for Non-Randomized Studies[27]. For non-comparative studies, a score of 15-16 is considered good, 9-14, moderate and <9, poor, while for comparative studies, a score of 23-24 is considered good, 15-22, moderate and <15, poor.

RESULTS

The initial search produced 76 studies, screened by the title

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and abstract of the articles. After a preliminary screening, by analyzing the title and abstract and evaluation based on inclusion and exclusion criteria, articles were selected and 11 studies fulfilled the eligibility criteria of our study. The reasons for exclusion were the following: case reports (n = 4), adult population (n = 27), conservative treatment (n = 12), absence of follow-up (n = 2), wrong topic (n = 15), absence of clinical results (n = 3), unavailable full text (n = 1), review (n = 1). After screening the full text of the remaining 11 articles, we excluded 3 more articles which lacked follow-up measures, clinical outcomes or that were focused on the wrong topic. In conclusion, a total of 8 published articles were enrolled in the present review (*Fig. 1* shows the flowchart for study selection)[28-35]. Of these, one was a prospective comparative study, 2 were retrospective comparative studies, 4 were retrospective studies, and one was a case series.

The total number of patients included was 228 (294 feet) with an average age at surgery of 12.4 years; 147 patients were female (64.5%) and 81, male (35.5%); six of the study included, showed female prevalence[28-33], while the remaining 2 studies showed prevalence for male[34,35]. Most of the feet presented with type II accessory navicular (246 feet), 30 feet were classified as type I and 18 as type III. In five of the selected articles the number of associated flatfoot was reported[28-32], while in three papers it was not reported[33-35]. The total number of flatfeet was 199 out of 228 total feet (87.3%). Simple excision was performed in 44 feet; modified simple excision in 13 feet; Kidner procedure in 62 feet; surgical excision and suture anchor stabilization in 22 feet, percutaneous drilling in 31 feet; subtalar arthoereisis alone in 37 feet; subtalar arthroereisis and Kidner procedure in 35 feet; subtalar arthroereisis and medial soft tissue reconstruction in 50 feet. The follow-up ranged from 10 months to 12 years *(Table 2)*. For the study included in the revision, MINORS score[27] was calculated, it ranges from 12 to 23 with a mean value of 16.6 *(Table 3)*.

Cha et al. (2013)[28] reported a prospective comparative study involving 50 consecutive feet with symptomatic type II accessory navicular, all associated with flexible flatfoot. The treated feet were divided into two groups: in group 1 (25 feet), the accessory bone was excised through sharp dissection from the fibrocartilaginous tissue, avoiding damage to the tibialis posterior tendon, which was reattached to its original insertion if partially injured; in group 2 (25 feet), the Kidner procedure was performed, involving excision of the accessory bone and rerouting of the tendon to a more plantar position. At a three-year follow-up, no statistically significant differences were observed between the two groups regarding the AOFAS scale, VAS, and radiographic parameters ($p > 0.05$). The authors concluded that both techniques are effective surgical options for resolving accessory navicular syndrome, even in the presence of flexible flatfoot.

Pretell-Mazzini et al. (2014)[29] conducted a retrospective comparative study involving 32 feet with painful accessory navicular, of which 18 were associated with flexible flatfoot. Of these, 26 cases were classified as type II. In 14 feet, the tendon was split, and after excising the accessory bone, it was repaired; the remaining 18 cases underwent the Kidner procedure. Their findings indicated successful outcomes with both procedures, showing no statistically significant differences ($p > 0.05$). Occasional complications, such as painful surgical scars, were noted, especially following the Kidner procedure.

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Yang et al.[30], in a recent retrospective study without a control group, reported operative outcomes in 24 feet with symptomatic accessory navicular (4 type II, 12 type I, and 8 type III), of which 9 had an associated flexible flatfoot. In most cases[19], the Kidner procedure was performed, while only 5 feet underwent simple excision. The majority of patients were female (95.5%), and 15 were athletes (68.1%). The authors concluded that 91% of cases showed good results, and all the athletes returned to their previous level of athletic performance, with no statistically significant difference between the procedures ($p > 0.05$).

Micheli et al.[31] described the treatment of 13 feet (70% female patients) with type II os tibiale externum, surgically treated by excising the accessory bone through a double incision of the posterior tibialis tendon while preserving its insertion. At a mean follow-up of 7.2 years, they reported excellent or good outcomes.

Kakihana et al.[32] reported positive outcomes in a series of 22 feet with type II accessory navicular (15 patients, 11 female and 4 male) treated with a suture anchor stabilization technique. The procedure involved resection of the fibrocartilaginous tissue while preserving the attachment of the tibialis posterior tendon, followed by a wedge osteotomy of the distal navicular body and curettage of the accessory navicular, which was attached to the bone using a suture anchor (metal in 16 cases, soft in 6). Radiographically, despite the resolution of preoperative symptoms in all cases, bone union was achieved only in 64% of cases (81% when using metal anchors). A statistically significant improvement was observed in talar tilt angle and talo-first metatarsal angle ($p < 0.001$).

Nakayama et al.[33] reported outcomes for 31 feet (29 patients) treated with percutaneous drilling for symptomatic type II os tibiale externum, achieving excellent or good results in 96.8% of cases, with only one foot achieving a fair result. Conversely, bone union was achieved in only 58% of cases, with a significantly higher rate ($p = 0.001354$) in patients who had incomplete skeletal maturity.

Gan et al.[34] in a comparative study reported satisfactory results in two groups of patients treated by subtalar arthoereisis alone or in combination with Kidner procedure (37 and 35 feet respectively). Statistically significant improvement of radiographic parameters for flatfoot and clinical scores was observed at follow up ($p < 0.001$) but no difference was observed between the groups ($p > 0.05$).

Shi et al.[35] reported statistically significant good functional

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Table 2. *Summary of the literature data on surgical treatment of symptomatic accessory navicular bone.*

Author (year)	Title	Study type	Number of patients	Number of feet	Age (y)	Sex	Classification	Associated flatfoot	Surgical treatment	Follow-up	Results and conclusions
Cha et al. (2013)[28]	Simple excision vs the Kidner procedure for type 2 accessory navicular associated with flatfoot in pediatric population	Prospective study	50	50	11.3 (simple excission) and 12.6 (Kidner procedure)	29F 21M	Type II	50 feet	Simple excision (25 feet) or Kidner procedure (25 feet)	3.2 years (36-52 months)	At follow-up, improvement of AOFAS and VAS scores were observed in both groups ($p<0.01$). The satisfaction rate was 86% and 82% in groups 1 and 2 respectively. The authors concluded that simple excision and Kidner procedure are both reliable surgical procedures to resolve the accessory navicular syndrome.
Pretell-Mazzini et al. (2014)[29]	Surgical treatment of symptomatic accessory navicular in children and adolescents	Retrospective comparative study	27	32	13.2	22F 5M	Type I (2); Type II (26); Type III (4)	18 feet	Simple excision (14 feet) or Kidner procedure (18 feet)	Not reported	No significant differences between the procedures was found for complications, reoperations, functional status, or failure of treatment. The authors reported successful results with both procedures with occasional complications such as painful surgical scar, especially observed after Kidner procedure
Yang et al. (2022)[30]	Operative outcomes for accessory navicular in adolescents	Retrospective study	22	24	13	21F 1M	Type I (12); Type II (4); Type III (8)	9 feet	Simple excision (5 feet) or Kidner procedure (19 feet)	1 year	All patient were able to return to sport without complications. There was residual pain after surgery only in 2 patients (one minimal and one persistent). The authors concluded that 91% of cases showed good results and all the athletes returned to their previous athletic performance.
Micheli et al. (2008)[31]	Treatment of painful accessory navicular: a modification to simple excision	Retrospective study	10	13	13.5	7F 3M	Type II	not reported	Modified simple excision	7.2 years (18 months to 12 years)	All patients reported an improvement of symptoms. All feet had excellent (11) or good (2) results.
Kakihana et al. (2020)[32]	Suture anchor stabilization of symptomatic accessoy navicular in adolescents: clinical and radiographic outcomes	Retrospective study	15	22	12	11F 4M	Type II	not reported	Accessory navicular excision + suture anchor stabilization	2.6 years (24-37 months)	Despite a resolution of preoperative symptoms observed in all cases, the union rate was achieved only in 64% of cases (81% in metal anchor cases and 12% in soft anchor cases). All patients were able to return to sport without complication.
Nakayama et al. (2005)[33]	Percutaneous drilling of symptomatic accessory navicular in young athletes	Case series (LOE IV)	29	31	13	14F 15M	Type II	not reported	Percutaneous drilling	2.8 years (24-37 months)	Excellent or good results were reported in 96.8% of cases, although bone union was achieved in only 58%, especially in immature patients. The authors concluded that percutaneous drilling was effective in type II accessory navicular especially in immature feet.
Gan et al. (2023)[34]	Is Kidner procedure necessary during subtalar arthoereisis for pediatric flexible flatfoot that combined with symptomatic type 2 accessory navicular? A retrospective comparative study	Retrospective comparative study	40	72	11.8	19F 21M	Type II	72 feet	Subtalar arthroereisis alone (37 feet) or subtalar arthroereisis + Kidner procedure (35 feet)	2.1 (subatalar athroeresis alone) 2.7 years (subtalar arthroeresis + Kidner procedure)	No statistically significant differences were found between the two groups as concerned for radiographic parameters and clinical scores ($p>0.05$). The authors concluded that correction of pediatric flexible pes planus alone has a high possibility of relieving the pain of the medial midfoot.
Shi et al. (2023)[35]	Subtalar arthoereisis combined with medial soft tissue reconstruction in treating pediatric flexible flatfoot with accessory navicular	Retrospective study	35	50	11.6	24F 11M	Type I (16); Type II (28); Type III (6)	50 feet	Subtalar arthroereisis + medial soft tissue reconstruction	3 years (30±9.3 months)	At last follow-up significant improvement in AOFAS score and decrease of VAS score were found ($p<0.0001$). Also radiological parameters had significant changes ($p<0.0001$). The authors concluded that these procedures are simple, minimally invasive and valid to relieve pain and improve function.

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Study	Stated aim	Inclusion of patients	Collection of data	Endpoints appropriate to the aim	Unbiased assessment of the study endpoint	Follow-up	Loss to follow up less than 5%	Prospective calculation of the study size	Control group	Contemporary groups	Baseline equivalence of groups	Statistical analyses	Total
Cha et al. (2013)[28]	2	2	2	2	1	2	2	2	2	2	2	1	22
Pretell-Mazzini et al. (2014)[29]	2	2	2	2	1	0	0	1	2	2	2	1	17
Yang et al. (2022)[30]	2	1	2	2	1	1	2	1	2	2	2	1	19
Micheli et al. (2008)[31]	2	1	1	2	1	2	2	1	/	/	/	/	12
Kakihana et al. (2020)[32]	2	2	2	2	1	1	2	1	/	/	/	/	13
Nakayama et al. (2005)[33]	2	2	2	2	1	2	2	1	/	/	/	/	14
Gan et al. (2023)[34]	2	2	2	2	1	1	2	1	2	2	2	2	23
Shi et al. (2023)[35]	2	2	2	2	1	1	2	1	/	/	/	/	13

Table 3. *Methodological index for non-randomized studies (MINORS).*

outcomes (p >0.001) in a single series of 50 feet treated by subtalar arthroereisis combined with medial soft tissue reconstruction consisting of excision of accessory bone in type I, osteotomy and stabilization of accessory bone with 2 cannulated screws in type II, and excision with reconstruction of tibialis posterior tendon insertion with suture anchors in type III.

DISCUSSION

Various surgical techniques have been proposed in literature for the treatment of symptomatic os tibiale externum. Simple surgical excision of the accessory tarsal navicular, first described by Geist in 1925[36], has the advantage of causing less trauma of the tibialis posterior tendon that can be sutured after the ossicle's removal. Some years later, Kidner[37,38] suggested that in this syndrome a medial displacement of the tibialis posterior tendon is present, which causes weakness of the medial longitudinal arch. He proposed that after excision of the accessory navicular, a rerouting of the posterior tibialis tendon to the plantar surface of the navicular should be performed. His surgical operation would restore the normal line of pull of the tibialis posterior tendon. Kidner recommended operative intervention for patients younger than 10 to 12 years with symptomatic flexible pes planus who were unrelieved by conservative measures. For symptomatic accessory navicular, other authors proposed an arthrodesis of the accessory ossicle to the navicular bone[39]. However, this technique seems to be more indicated in late adolescence and adult patients. More recently, other authors reported subtalar arthroereisis as a treatment option for accessory navicular in patients with flexible flatfoot. Subtalar arthroereisis is a less invasive surgical operation that blocks the abnormal subtalar eversion of the foot through the insertion of a spacer (usually a screw) into the sinus tarsi. The purpose of this treatment is to restrict the subtalar joint pronation and the spacer should provide a realignment of the hindfoot during skeletal growth[40-43].

From the analysis of our selected studies, all authors agree that surgical treatment is indicated only in symptomatic patients, when conservative management fails, and that type II bones represent the most common symptomatic variant of the accessory navicular. However, in two of the analyzed studies, type I and III were also found to be painful and were surgically treated[29,35]. Several studies report a predominance of a painful accessory navicular in females[28-32,35] and in athletes[30,32].

The most common surgical procedures are the excision of the accessory bone. Due to its position in the fibers of the tibialis posterior tendon different techniques had been proposed. Simple excision refers to the surgical procedure that involves detaching the tibialis posterior tendon, excising the accessory bone, and then reattaching the tendon to its anatomical position. Some authors prefer the reinsertion of the tibialis posterior tendon in a more

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distal and plantar position than its anatomical insertion, this technique is named "Kidner procedure". Only two of the studies included in this review reported comparative results between simple excision of the accessory navicular and the Kidner procedure, both performed in patients during skeletal growth[29,30]. The other studies included in our review reported a modification of simple excision procedure[31], or different types of treatment as surgical stabilization with a suture anchor[32], percutaneous drilling of accessory navicular synchondrosis[33] (whose goal is to obtain a bone union between the accessory bone and the navicular body) and subtalar arthroereisis alone or associated to other procedures[34,35].

Some authors believe that the accessory navicular bone may interfere with the normal activity of the tibialis posterior causing a weakness of the medial arch of the foot[39,40]. On the other hand, other authors report no correlation between the presence of the accessory navicular and the development of flatfoot, noting no differences in radiographic parameters used to assess flatfoot, such as medial foot arch index[7,44]. Conversely, Park et al.[45], in their radiologic study, concluded that the presence of an accessory navicular is associated with radiographic parameters indicative of flatfoot. However, they found no correlation between the severity of flatfoot and the degree of pain in individuals with an accessory navicular[45].

Therefore, no firm correlation has been demonstrated between the presence of the accessory navicular bone and the development of a weakness of the medial arch of the foot (flexible flatfoot). Flexible flatfoot is not present in all cases, and a simple excision of the accessory navicular may fully relieve the symptoms in patients that do have flexible flatfoot. On the contrary, other authors report that restoration of the medial arch through a subtalar arthroereisis may relieve the pain of the medial portion of the foot.

In conclusion, in patients with a symptomatic accessory navicular without an associated pes planus, the treatment of choice should be a simple excision, that represents an easy to perform surgical technique, which has the advantage of preserving the original insertion of the tibialis posterior tendon. However, all the other surgical techniques proposed showed satisfactory results in most cases.

When a symptomatic accessory navicular is associated with a flexible pes planus, it would be necessary to verify whether the pain symptoms are related to the presence of the accessory bone or to the collapse of the medial arch and then decide consequentially the correct treatment option (surgery for the accessory navicular or surgery for the flatfoot deformity). In our opinion, a good approach to treatment is to first perform a simple excision of the supernumerary bone, and to consider an arthroreisis only in cases when symptoms persist.

The study has the following limitations: heterogeneity of studies, variations in follow-up periods, potential for bias in individual studies. Further high-quality studies, possibly comparative and randomized with a long-term follow-up, will be necessary to confirm our results.

CONCLUSIONS

Based on our findings, we propose the following treatment algorithm in os tibiale externum:

1) Surgical management is indicated only in symptomatic cases, not responding to conservative treatment.
2) Excision alone of the accessory navicular represents a simple technique with the advantage of preserving the original insertion of the tibialis posterior tendon.
3) Associated procedures may be performed when flexible flatfoot is present and symptoms persist.

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