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Application and Effect Evaluation of Orthopedic Surgery in Treating Adolescent Accessory Bone Pain

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Abstract

Objective: To investigate the application and effectiveness of accessory navicular excision combined with posterior tibial tendon reconstruction in treating adolescent accessory bone pain. **Methods:** A total of 60 adolescent patients with accessory bone pain treated between January 2023 and May 2024 were selected and divided into two groups based on treatment methods: the control group (30 patients receiving conventional anti-inflammatory and analgesic treatment) and the study group (30 patients receiving accessory navicular excision and posterior tibial tendon reconstruction in addition to control group treatment). Pain levels, treatment efficacy, and foot function scores were compared between the two groups. **Results:** Before treatment, no significant difference in VAS scores was observed between the two groups ($P > 0.05$); after treatment, the study group had lower VAS scores than the control group ($P < 0.05$). The treatment effect in the study group was superior to that of the control group, with significant differences noted ($P < 0.05$). Before treatment, no significant difference in foot function scores was observed ($P > 0.05$); after treatment, the study group had significantly higher functional scores than the control group ($P < 0.05$). **Conclusion:** Accessory navicular excision combined with posterior tibial tendon reconstruction significantly improves treatment outcomes, alleviates pain, and enhances foot function in adolescents with accessory bone pain.

Keywords

Accessory navicular excision; posterior tibial tendon reconstruction; accessory bone pain

The accessory navicular is a common type of accessory bone in the foot, often associated with accessory bone pain in patients [1]. This accessory bone results from hereditary variations and its presence is related to genetic factors. Generally, patients with an accessory navicular do not exhibit symptoms, but it can be a contributing factor to various conditions causing foot pain, such as fractures and avascular necrosis, leading to ankle pain [2, 3]. Currently, clinical practice does not involve treatment for asymptomatic accessory navicular; however, if symptoms occur, conservative therapy may be considered, followed by surgical options if conservative measures are ineffective. The choice of surgical intervention remains challenging [4, 5]. This study aims to analyze the surgical effectiveness of treating adolescent patients with accessory bone pain, providing additional clinical evidence for managing this condition. To this end, 60 adolescent patients treated between January 2023 and May 2024 were selected to evaluate the implementation effects of orthopedic surgery.

1. Materials and Methods

1.1 General Information

Sixty adolescent patients with accessory bone pain treated between January 2023 and May 2024 were selected and divided into the control group (30 patients) and the study group (30 patients) based on treatment methods. Control group: Age: 14-18 years, average age: (15.13 ± 0.23) years, gender: 15 males, 15 females. Study group: Age: 13-18 years, average age: (15.23 ± 0.22) years, gender: 14 males, 16 females. There were no significant differences in general data between the two groups ($P > 0.05$). Inclusion and exclusion criteria: (1) All patients had accessory navicular; (2) Weight-bearing lateral radiographs showed rough surfaces with a lack of smoothness between the navicular and accessory navicular, and dense osteophytes were observed; Exclusion criteria: (1) Patients with recurrent accessory bone pain; (2) Patients diagnosed with other diseases causing accessory bone pain through imaging; (3) Patients with poor compliance; (4) Patients with mental disorders.

1.2 Methods

Control group: Conventional anti-inflammatory and analgesic treatment was administered using celecoxib capsules (manufacturer: Qingdao Baiyang Pharmaceutical Co., Ltd.; approval number: National Drug Standard H20203325) at a dosage of 200 mg orally twice daily.

Study group: Accessory navicular excision combined with posterior tibial tendon reconstruction: The procedure was performed under continuous epidural anesthesia, with the patient in the supine position. A tourniquet was applied to the affected limb, and standard disinfection was performed. A longitudinal incision of 2 to 3 cm was made along the medial aspect of the foot, gradually incising through the skin, subcutaneous tissue, and fascia to expose the accessory navicular and posterior tibial tendon insertion. The accessory navicular was excised, and the navicular prominence was trimmed while separating the accessory navicular from the posterior tibial tendon insertion. If posterior tibial tendonitis was present, degenerative tissue could be effectively excised, and a "Z" shaped lengthening technique could be applied to the proximal tendon. If the bone was hard, a drill could be used to create several holes on the medial side of the navicular or to perforate with a Kirschner wire, fixing the posterior tibial tendon and retained periosteum beneath the navicular. Soft tissues were then closed over the fixation points. Postoperatively, antibiotics were given for 1-2 days to prevent infection and deep vein thrombosis. Regular dressing changes were performed, and sutures were removed about two weeks post-surgery based on wound healing. External fixation with plaster was maintained for 3-4 weeks, with gradual rehabilitation exercises starting the day after surgery.

1.3 Observation Indicators

(1) Foot Function: Evaluated using the AOFAS (American Orthopaedic Foot and Ankle Society) scoring system, with a total score of 100 points: pain (max 40), function (max 45), alignment (max 15). Higher scores indicate better foot function.

(2) Treatment Efficacy: (1) Effective: No pain or swelling, able to walk normally and engage in moderate activity; (2) Reduced: Significant alleviation of pain and swelling, able to walk normally; (3) Ineffective: No significant improvement in pain or swelling, possibly worsening. The sum of effective and reduced rates constitutes the total effective rate.

(3) Pain Assessment: Pain levels were evaluated using the VAS (Visual Analog Scale) with a maximum score of 10, where higher scores indicate more severe pain.

1.4 Statistical Methods

Statistical analysis was performed using SPSS 21.0. Measurement data were expressed as ($\bar{x} \pm s$) and analyzed with t-tests, while count data were expressed as percentages and analyzed with chi-square tests; $P < 0.05$ was considered statistically significant.

2. Results

2.1 Comparison of Foot Function Between Groups

Before treatment, there were no significant differences in foot function scores between the two groups ($P > 0.05$). After treatment, the study group had significantly higher functional scores than the control group ($P < 0.05$) (see Table 1).

Table 1. Comparison of Quality of Life [$\bar{x} \pm s$, Points]

Time	Group	Sample Size	Pain Score	Function Score	Alignment Score
Before Treatment	Control Group	30	22.31±1.51	25.91±2.03	6.12±0.32
	Study Group	30	22.32±1.52	25.93±2.61	6.33±0.15
	t	-	0.026	0.033	3.255
	P	-	0.979	0.974	0.002
After Treatment	Control Group	30	30.12±0.32	29.36±2.32	10.32±1.33
	Study Group	30	36.12±1.13	40.36±2.03	12.31±1.23
	t	-	27.982	19.544	6.017
	P	-	< 0.001	< 0.001	< 0.001

2.2 Comparison of Treatment Effects Between Groups

The treatment effect in the study group was superior to that in the control group, with a significant difference ($P < 0.05$) (see Table 2).

Table 2. Comparison of Treatment Effects Between Groups [n, (%)]

Group	Sample Size	Effective	Reduced	Ineffective	Total Effective Rate
Control Group	30	9(30.00)	12(40.00)	9(30.00)	21(70.00)
Study Group	30	12(40.00)	17(56.67)	1(3.33)	29(96.67)
χ^2	-	-	-	-	7.680
P	-	-	-	-	0.006

2.3 Comparison of Pain Levels Between Groups

Before treatment, there was no significant difference in VAS scores between the two groups ($P > 0.05$); after treatment, the study group had significantly lower VAS scores than the control group ($P < 0.05$) (see Table 3).

Table 3. Comparison of Pain Levels Between Groups [$\bar{x} \pm s$, Points]

Time	Group	Sample Size	VAS Score
Before Treatment	Control Group	30	7.31±0.52
	Study Group	30	7.32±0.51
	t	-	0.075
	P	-	0.940
After Treatment	Control Group	30	5.12±0.33
	Study Group	30	2.12±0.11
	t	-	47.238
	P	-	< 0.001

3. Conclusion

The accessory navicular bone is a congenital variation that represents the second ossification center of the navicular tuberosity, located at the posterior and proximal aspects of the navicular bone, typically appearing bilaterally symmetric [6, 7]. Most patients do not experience discomfort after the onset of the condition; however, symptomatic patients present with a prominent medial navicular position and associated pain symptoms, which worsen during ambulation. In severe cases, patients may experience difficulties in walking. Pain factors include posterior tibial tendonitis and flatfoot [8, 9]. For mild symptoms that are not severe, conservative treatments such as physical therapy and non-steroidal anti-inflammatory drugs (NSAIDs) can be implemented. If these methods are ineffective, surgical intervention should be considered. Currently, there is considerable controversy regarding the various surgical treatments for accessory navicular syndrome, and no single surgical method is suitable for all patients with accessory navicular pain.

In adolescents with accessory navicular pain, accessory navicular excision combined with anchor fixation of the posterior tibial tendon to the navicular apex or medial side has shown good stabilization effects. The combination of accessory navicular excision and posterior tibial tendon reconstruction is an excellent surgical option for patients with severe posterior tibial tendonitis and degenerative tendons that are difficult to suture in situ [10, 11]. With the gradual advancement and development of arthroscopic techniques, accessory navicular pain can also be treated through procedures such as adhesion release, accessory navicular excision, and K-wire decompression, which not only help improve patients' pain symptoms but also enable rapid recovery of their condition [12, 13]. Changes in the insertion point of the posterior tibial tendon in adolescents with an accessory navicular can lead to medial arch collapse, subsequently resulting in flatfoot deformity. Since these patients are still in a developmental stage, undergoing early bony surgery to correct flatfoot deformity may cause complications. However, using posterior tibial tendon reconstruction can correct the existing balance issues in the medial soft tissue, resolving not only the pain caused by the bony prominence but also improving tendon balance [14, 15]. If patients have associated posterior tibial tendonitis, excision of the locally degenerated posterior tibial tendon can be performed, utilizing proximal advancement and Z-lengthening techniques to effectively elongate and stabilize the tendon. This study included adolescents suffering from accessory navicular pain, and the results showed that post-treatment, the VAS scores in the treatment group were lower than those in the control group ($P < 0.05$). The treatment group's therapeutic effects were superior to those of the control group, with a significant difference ($P < 0.05$); after treatment, the functional scores of the treatment group were higher than those of the control group, also showing significant differences ($P < 0.05$). This indicates that accessory navicular excision combined with posterior tibial tendon reconstruction can enhance treatment efficacy, relieve patient pain, and improve foot function. This surgical method has the advantages of being simple and having a short operative time, leading to excellent functional recovery postoperatively. Furthermore, since no internal fixation devices are implanted, this reduces the economic burden on patients and eliminates concerns about the loosening or dislodgment of such devices. Retaining some periosteal tissue during the separation of the posterior tibial tendon can promote bone-tendon healing after reconstruction. Post-surgery, the use of arch supports is crucial for the recovery of adolescents with accessory navicular pain.

In summary, accessory navicular excision combined with posterior tibial tendon reconstruction has a significant effect on enhancing treatment outcomes, relieving patient pain, and improving foot function in adolescents with accessory navicular pain.

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