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Calcaneal stop versus subtalar arthroereisis in treatment of pediatric flexible flat foot

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Abstract

Deformities of the foot, such as flatfoot, may develop over time or become apparent due to trauma. The forefoot may also be abducted, depending on whether it's acquired or developing. Treatment of flexible flat foot in children aged 5 to 15 years is being studied to evaluate the advantages and results of calcaneal stop surgery with subtalar arthroereisis. Methods: A total of 30 people with flexible flat feet were included in this research. The calcaneus stop treatment was used on 15 patients, while the arthroereisis procedure was used on another 15 patients. AOFAS, VAS, and radiographic indicators like Meary's angel and calcaneal pitch angle in a standing lateral ankle view are some of the assessment methods used. Results: After Subtalar arthroereisis (0.47 0.52), the postoperative mean visual analogue pain scale (VAS) was substantially better than after the Calcaneal stop operation (1.1 0.88) (p=0.03). It should be noted that following Subtalar arthroereises, the average Calcaneal valgus angle was substantially better than after the Calcaneal stop treatment (p=0.004). The likelihood of complications was very low (10 percent) One patient (3.3 percent) had Talar osteolysis, one (3.3 percent) had Subluxation of screw, talar osteolysis, and one (3.3 percent) had Aseptic Loosening, Pain, Minute Peri screw Fracture. Only three patients had major problems. As a consequence of this, we suggest the calcaneus stop technique owing to its lower cost and similar outcomes (p = 1; no statistically significant difference between the two operations).

Keywords: Calcaneal stop, Subtalar, Arthroereisis, Flexible, Flat foot.

1. Introduction

Plantar medial rotation of the talus, decreased medial arch height, and forefoot abduction define flatfoot, whether it is inherited or acquired. Baby flatfoot is a common birth defect, and the arch develops over a 10-year period before it can be corrected. Most flexible flatfoot cases resolve spontaneously or remain asymptomatic. Flexible flatfoot symptoms include discomfort along the medial side of the foot, in the sinus tarsi, and in the legs. A flatfooted person has less stamina and is more prone to injury due to gait abnormalities. Pronation of the subtalar joint during the propulsive phase of gait is mostly responsible for major deformities in adult life. This condition is characterised by discomfort in the foot and legs, particularly while standing or walking. It may be exhausting to walk or run, and the symptoms worsen with age as the medial longitudinal arch of the foot diminishes. One of the most prevalent foot abnormalities in children is flexible paediatric flatfoot. While not carrying weight, the medial longitudinal arch maintains its normal structure, while flattening down when the foot is in a standing or weight-bearing position. Having a flexible flatfoot may or may not have any negative consequences. In the treatment of symptomatic flexible flatfoot, several conservative and surgical methods have been described. A stable foot and a long-lasting correction are provided by arthrodesis (extra-articular subtalar arthrodesis for symptomatic Plano-valgus feet and triple arthrodesis for failed surgical therapy). This technique, however, transmits energy to neighbouring joints that are not fused, increasing the risk of early onset arthritis. Calcaneal stop surgery involves inserting a screw into the sinus tarsi and into the calcaneus to stop the bleeding. A previous study reported for better short-term outcomes for pedographic parameters [7], clinical evaluation, podoscopic examination, and radiologic assessment in patients who were treated using the calcaneal stop procedure. An arthroereisis treatment involves inserting an implant screw between the posterior and anterior subtalar joints within the sinus tarsi. Arthro means joint in Greek and ereis means raising up. In this procedure, the screw is inserted into the subtalar joint and extends vertically, raising the talus head to realign the foot's longitudinal arch and thus reducing flatfoot deformity. Implants have included bone, polyethylene disc and silastic as well as vitalium staples. A titanium screw with soft-threaded design has been utilised more recently to prevent extrusion. This minimally invasive treatment for symptomatic flatfoot does not need any drilling of the bone or the use of cement. [9].

With this study, the researchers wanted to see how well the calcaneal stop surgery and subtalar arthroereisis worked in treating flexible flat feet in children and teenagers.

2. Patients and methods

During the period from June 2019 to June 2021, 30 patients with flexible flat feet presenting to Benha University Hospital, Behna Health Insurance Hospital, and Benha Pediatric Specialty Hospital underwent randomization into 15 groups of 15 individuals for each treatment. The calcaneus stop treatment was used on 15 patients, while the arthroereisis procedure was used on another 15 patients. Twenty-one male and nine female patients, ranging in age from 5 to 15, were chosen and needed to be followed up every 18 months, with a mean age of 9.5 years.

Inclusion criteria

- Age of patient is between ages of 5 years to 15 years old.
- Patient without arthritic foot and ankle.

- Patient complaining from ankle and foot pain on normal activities due to flexible flat foot and resistant to conservative treatment for a period not less than six months.

Exclusion criteria

- Age of patient less than 5 years old and above 15 years old
- Patient with rigid flat foot.
- Patient have neurological or neuromuscular disorders.
- post-traumatic cases.
- cases with other deformities of limb alignment e.g. genu valgus.

Patients were informed about the study after fulfilling inclusion and exclusion criteria according to local hospital authorities and after informed written consent to participate in our study. And the study was approved by the Ethical Committee of Benha Faculty of medicine.

Method of evaluation:

- The American orthopedic foot and ankle score. (AOFAS)
- Visual analogue scale for pain. (VAS)
- Radiographic indices as Meary's angel and calcaneal pitch angle in standing lateral ankle view.
- Clinical photos of patient while standing.

Follow up

Every 2 months for the first 6 months via AOFAS and VAS, Then every 6 months. The patients are followed up for 18 months.

Assessment and final outcome evaluation:

The patient's data will include AOFAS, VAS scores and radiological assessment for the Meary's angel, calcaneal pitch angle, lateral talometatrasal angle, lateral talocalcaneal angle and the calcaneal pitch angle. Evaluation of presence of pain pre and post-operatively, improvement in walking and standing, formation of medial longitudinal arc, subtalar motion, post-operative family satisfaction, improvement in shoe wear and level of activity.

A frequently used instrument for assessing outcome after ankle and hind foot is the American Foot and Ankle Society (AOFAS) Ankle-Hind Foot Score. This clinical rating system, developed by Kitaoka et al, combines subjective scores of pain and function provided by the patient with objective scores based on the surgeon's physical examination of the patient (to assess sagittal motion, hind foot motion, ankle–hind foot stability and alignment of the ankle–hind foot. [10]**.**

The patients were also evaluated using the American Orthopedic Foot and Ankle Society (AOFAS) criteria on the ankle and hind foot scale. Applying this questionnaire allowed us to analyze the data regarding pain, limitation of activities, need for support, stride length and abnormalities, sagittal and hind foot mobility, ankle stability, and stability of the hind foot and its alignment, as well as degree of satisfaction and complications. [11].

The AOFAS questionnaire is a standard method of reporting clinical status of the ankle and foot. The system incorporates both subjective and objective factors into numerical scales to describe function, alignment, and pain of the ankle–foot complex. AOFAS describes 4 similar questionnaires used to evaluate 4 different anatomical sites of the foot, each graded from 0 to 100. For our purpose, only the ankle–hind foot grading scale was used because it evaluates the functionality of the ankle, subtalar, talo-navicular, and calcaneo-cuboidal joint levels and can be applied to CF. A grade from 0 to 100 is given: <70 = poor, 70–79 = fair, 80–89 = good, 90–100 = excellent. [23].

Arthroereisis is one of the most commonly used procedures in Europe for FF correction in pediatric patients (7,8). This procedure is so common because it is a minimally invasive alternative compared with the other surgical procedures such as tendon stretching and transfer, bone excision, osteotomy, arthrodesis, and bone or synthetic material interposition in the sinus tarsi. [12].

Surgical technique

Subtalar Arthroereisis operative procedure:

An implant screw is placed between the posterior and anterior subtalar joints in the sinus tarsi during Subtalar Arthroereisis (from the Greek arthro meaning joint and ereisis meaning raising up). Screw placement increases vertical subtalar joint expansion, raising the head of the talus to maintain appropriate talar alignment in flexible pes planus and realigns the foot's longitudinal arch, reducing flatfoot. This corrects the talus' planter-flexed posture. Implants have included bone, polyethylene disc and silastic as well as vitalium staples. A titanium screw with soft-threaded design has been utilised more recently to prevent extrusion. Arthroereisis is a viable minimally invasive technique for treating symptomatic flatfoot since no bone drilling or cement is required. [9] A 0.5–1 cm distal to the lateral malleolus transverse incision of 2 centimetres was made across the sinus tarsi for a minimally invasive procedure. Figure 1 shows what I mean.

Blunt dissection was used to incise the deep fascia and sinus tarsal capsule. A probe was used to expand the tarsal sinus, and the axis of the subtalar joint was found. A K-wire was inserted percutaneously into the talus body after palpating the sinus tarsi with a fluoroscopic probe. An anterior-to-posterior guide pin was placed into the sinus tarsi floor and exited via a percutaneous incision on the medial side of the foot. The guide pin was then removed. While the foot is kept in 1° to 2° of valgus, the size guides and trial implants are placed, and the correct location of the trial implant is confirmed by fluoroscopy After that, the arthroereisis screw is placed and the x-ray is used to ensure that it is centred. They flipped the subtalar joint and placed the experimental implants that way. When the implant is the correct size, the calcaneal subtalar joint will evert by 2 to 4 degrees and the tail will extend 1 to 1.5 cm beyond the lateral calcaneal wall after placement. Graph 2.3

A crepe bandage was used to provide a compression dressing over the incision after it had been stitched shut. Weight-bearing was permitted after two days and sports activity was permitted after three months without the need of a cast immobilisation.

Calcaneus stop operative procedure:

It is a simple technique, which is the calcaneal block, to prevent calcaneal eversion and talus medial rotation, This technique is a simple, easy, and a cheap technique. The correction offered by these techniques is not only mechanical and passive but also mostly active. [13]**.**

It is helped by the stimulation impressed onto the receptors of sinus tarsi whose action is to activate the muscular and tendon structures and to normalize the pronation of subtalar joint. [14].

An incision of 2 cm was made under the skin lines on the lateral aspect of the sinus tarsi. Fig(4)

The periosteum over the upper surface of the anterior part of calcaneus was elevated. A 2.7 drill hole was done vertically at this anterior part of the calcaneus just posterior to the lateral process of the talus, while a 3.5mm screw was inserted in a vertical manner with a washer to prevent calcaneal eversion and talar medial rotation. The screw is advanced under image control while the subtalar joint is inverted. Incision was closed in layers with application of bivalved cast. fig. 5

Postoperative bivalved cast is removed within the first 2 weeks in order to exercise. Partial weight bearing started after 2 weeks, full weight bearing after 1month, and sport activities permitted after 12 weeks

Radiological evaluation

Preoperative and postoperative radiographs were recorded from standardized weight bearing radiographs, including lateral calcaneal pitch, lateral talometatarsal angle and anteroposterior talonavicular coverage angle.

Statistical analysis

The collected data were summarized in terms of mean ± Standard Deviation (SD) and range for quantitative data and frequency and percentage for qualitative data. Comparisons between the different study groups were carried out using the Chi-square test (χ^2) and the Fisher Exact Test (FET) to compare proportions as appropriate. The Independent t-test (t) was used to detect difference between quantitative data of two independent groups. The paired t-test was used to evaluate the statistical significance between the preoperative and postoperative measurements of the same group. After the calculation of each of the test statistics, the corresponding distribution tables were consulted to get the "P" (probability value). Statistical significance was accepted at P value <0.05. A P value <0.001 was considered highly significant while a P value >0.05 was considered non-significant.The statistical analysis was conducted using SPSS version 21 software (SPSS Inc., Chicago, ILL Company).

3. Results

The current study included 60 feet of 30 patients who underwent calcaneal stop procedure (15 patients) or subtalar arthroereisis (15 patients) for the treatment of symptomatic flexible flat foot. This study included 21 males (70%) and 9 females (30%). The mean age at surgery was (9.5 ± 3.44 years); range from (5–15 years). Table (1)

Table (2) shows no significant difference between the two groups regarding demographic and clinical data (p > 0.05).

Table (1) Demographic and clinical data of the operated patients.

Variable		**(n =30)**
Age (years)	Mean ±SD	9.5 ± 3.44
	Range	5 - 15
Sex	Male (no. , %)	21 (70%)
	Female (no. ,%)	9 (30%)
Side affected	Unilateral (no. , %)	0 (0%)
	Bilateral (no. , %)	30 (100%)
Operation	Subtalar arthroereisis (no. , %)	15 (50%)
	Calcaneal stop procedure (no. , %)	15 (50)

Table (2) Comparison between the two groups regarding demographic and clinical data.

Variable		**Subtalar arthroereisis (n =15)** Mean ±SD (range)	**Calcaneal stop procedure (n =15)** Mean ±SD (range)	**Test**	**p**
Age (years)		10.13 ± 3.64 (5 – 15)	8.87 ± 3.23 (5 – 14)	t= 1	0.3
		No. (%)	No. (%)		
Sex	**Male**	11 (73.3%)	10 (66.7%)	χ^2=	0.7
	Female	4 (26.7%)	5 (33.3%)	0.16	
Side affected	**Unilateral**	0 (0%)	0 (0%)	-	-
	Bilateral	15 (100%)	15 (100%)		

Table (3) shows that the average AOFAS preoperative score was 71.53 ± 3.81. The mean visual analogue scale for pain (VAS) preoperative was 3.03 ± 1.54. The average preoperative Meary's angle was 21.63 ± 6.35 on the right side and 21.93 ± 6.11on the left side. The mean preoperative Calcaneal pitch angle was 11.63 ± 2.76 on the right and 12.73 ± 3.2 on the left. The average preoperative Calcaneal valgus angle was 15.13 ± 5.93 on the right and 16.4 ± 6.82 on the left. The mean Talo-calcaneal angle preoperative was 33.77 ± 6 on the right and 35.5 ± 7.22 on the left. There were significant differences between the two groups regarding the mean Meary's angle on the left, Calcaneal pitch angle on the left and Talo-calcaneal angle on the left (p = 0.017, 0.001 and 0.033 respectively)

Table (4) shows that the final postoperative average AOFAS score significantly improved postoperative to 93.1 ± 4.36 (p = 0.001). The postoperative mean visual analogue scale for pain (VAS) was significantly improved (0.77 ± 0.77) (p=0.001). The average postoperative Meary's angle significantly improved postoperatively to 12.5 ± 3.9 on the right side and 12.63 ± 4.58 on the left side (p=0.001,0.001). The postoperative mean calcaneal pitch angle was significantly improved (19.2 ± 4.63 on the right side and 23.2 ± 4.66 on the left side) (p=0.001, 0.001). The average Calcaneal valgus angle significantly improved postoperatively to 6.1 ± 2.64 on the right and 5 ± 3.3 on the left (p=0.001, 0.001). The mean Talo-calcaneal angle significantly improved postoperatively to 24.57 ± 5.46 on the right and 26.3 ± 5.55 on the left (p=0.001, 0.001).

Table (5) shows the postoperative mean visual analogue scale for pain (VAS) was significantly more improved after Subtalar arthroereisis (0.47 ± 0.52) than Calcaneal stop procedure (1.1 ± 0.88) (p=0.03). Also, the average Calcaneal valgus angle was significantly better postoperatively after Subtalar arthroereisis (3.33 ± 2.99) than Calcaneal stop procedure (6.67 ± 2.77) (p=0.004).

Table (3) Clinical features of the study groups (pre-operative assessment)

Variable		**Subtalar arthroereisis (n =15)**	**Calcaneal stop procedure (n =15)**	**Total (n= 30)**	Test	p
		Mean ±SD	Mean ±SD	Mean ±SD		
AOFAS		70.87 ± 3.68	72.2 ± 3.94	71.53 ± 3.81	t= 0.96	0.35
VAS		3.33 ± 1.54	2.73 ± 1.53	3.03 ± 1.54	t=1.07	0.3
Meary's angle	Right	22.87 ± 7.62	20.4 ± 4.7	21.63 ± 6.35	t=1.07	0.3
	Left	24.53 ± 7.39	19.33 ± 2.89	21.93 ± 6.11	t=2.54	0.017*
Calcaneal pitch angle	Right	10.67 ± 3.37	12.6 ± 1.55	11.63 ± 2.76	t=2.02	0.053
	Left	10.47 ± 1.46	15 ± 2.85	12.73 ± 3.2	t=5.48	0.001**
Calcaneal valgus angle	Right	15.6 ± 6.03	14.67 ± 6	15.13 ± 5.93	t=0.43	0.67
	Left	15.87 ± 6.7	16.93 ± 7.13	16.4 ± 6.82	t=0.42	0.68
Talo-calcaneal angle	Right	35.13 ± 6.27	32.4 ± 5.62	33.77 ± 6	t=1.26	0.22
	Left	38.27 ± 7.12	32.73 ± 6.4	35.5 ± 7.22	t=2.24	0.033*

AOFAS=American orthopedic foot and ankle score
VAS = Visual analogue scale for pain
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table (4) Preoperative and postoperative radiographic measures of the study patients.

Variable		**Preoperative (n =30)**	**Postoperative (n =30)**	**Test**	**p**
		Mean ±SD	Mean ±SD		
AOFAS		71.53 ± 3.81	93.1± 4.36	t= -25.5	0.001**
VAS		3.03 ± 1.54	0.77 ± 0.77	t=8.4	0.001**
Meary's angle	Right	21.63 ± 6.35	12.5 ± 3.9	t=10.8	0.001**
	Left	21.93 ± 6.11	12.63 ± 4.58	t=9.6	0.001**
Calcaneal pitch angle	Right	11.63 ± 2.76	19.2 ± 4.63	t= -8.7	0.001**
	Left	12.73 ± 3.2	23.2 ± 4.66	t= -9.8	0.001**
Calcaneal valgus angle	Right	15.13 ± 5.93	6.1 ± 2.64	t=9.1	0.001**
	Left	16.4 ± 6.82	5 ± 3.3	t=8.6	0.001**
Talo-calcaneal angle	Right	33.77 ± 6	24.57 ± 5.46	t=11.7	0.001**
	Left	35.5 ± 7.22	26.3 ± 5.55	t=7.4	0.001**

**** Significant at the 0.01 level (2-tailed).**

Table (6) shows that as regards postoperative complication, the complication rate was low (10%) only 3 patients developed minor complications, one patients (3.3%) showed Talar osteolysis, one patient (3.3%) developed Subluxation of screw, talar osteolysis and one (3.3%) developed Rt aseptic loosening, Pain, Minute Peri screw Fracture. There is no significant difference between the two types of operation regarding complications (p = 1).

Table (5) Comparison between the two groups regarding postoperative radiographic measures

Variable		Subtalar arthroereisis (n =15) Mean ±SD	Calcaneal stop procedure (n =15) Mean ±SD	Test	p
AOFAS		94.2 ± 3.53	91.93 ± 4.92	t= 1.45	0.16
VAS		0.47 ± 0.52	1.1 ± 0.88	t= - 2.3	0.03*
Meary's angle	Right	12 ± 4.5	13 ± 3.25	t= - 0.7	0.5
	Left	11.93 ± 5.82	13.33 ± 2.91	t= - 0.8	0.4
Calcaneal pitch angle	Right	20.47 ± 4.75	17.93 ± 4.3	t= 1.5	0.14
	Left	22.87 ± 5.49	23.53 ± 3.81	t= - 0.4	0.7
Calcaneal valgus angle	Right	5.53 ± 3.23	6.6 ± 2.77	t= - 1.1	0.3*
	Left	3.33 ± 2.99	6.67 ± 2.77	t= - 3.2	0.004*
Talo-calcaneal angle	Right	26.13 ± 4.91	23 ± 5.69	t= 1.6	0.1
	Left	27.93 ± 5.2	24.67 ± 5.58	t= 1.7	0.1

*** Significant at the 0.05 level (2-tailed).**

Table (6) Post-operative complications**.**

Variable	Subtalar arthroereisis (n =15) No. (%)	Calcaneal stop procedure (n =15) No. (%)	Total (n=30) No. (%)	Test	p
No	14 (93.3%)	13 (86.7%)	27 (90%)	FET= 2.8	1
Talar osteolysis	0 (0%)	1 (6.7%)	1 (3.3%)		
Subluxation of screw	1 (6.7%)	0 (0%)	1 (3.3%)		
aseptic loosening, Pain, Minute Peri screw Fracture.	0 (0%)	1 (6.7%)	1 (3.3%)		

Fig.(1) Incision for approach to sinus tarsi**.**

Fig.(2) lateral view showing the screw in sinus tarsi.

Fig. (3) Anteroposterior view showing the screw in sinus tarsi.

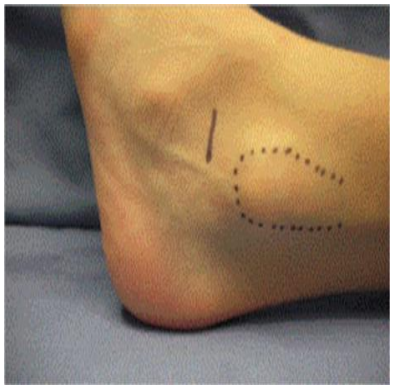

Fig. (4) The minimally invasive skin incision at the level of the sinus tarsi was 2 cm.

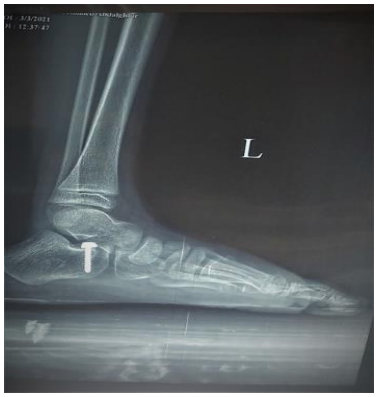

Fig. (5) Lateral view of the foot showing calcaneus-stop

4. Discussion

According to our findings, the average pre-operative calcaneus stop operation valgus angle was 14.67° on the right and 16.93° on the left. The right side's postoperative Calcaneal valgus angle was 6.6° 2.77°, whereas the left side's was 6.67° 2.77°.

Preoperative heel valgus angle reduced substantially from 12.2 4.48 to 5.2 3.28 at follow-up, according to previous study [15].

Following arthroereisis, the average Calcaneal valgus angle improved substantially on both the right and the left side, respectively, from 6.12° to 2.64° after surgery (P=0.001, 0.001). After Subtalar arthroereisis, the average Calcaneal valgus angle was better (3.33 2.99) than after the Calcaneal stop operation (6.67 2.77; P = 0.004).

According to our findings, the average pre-operative right and left Talo-calcaneal angles were 35.13° 6.27° for arthroereisis surgery and 38.27° 7.12° for right arthroereisis surgery. There was a 26.13° 4.91° improvement in the right side and a 27.93° 5.2° improvement in left side Talo-calcaneal angle after the operation. It was shown that the mean talo-calcaneal angle improved substantially after surgery, going from 24.57° to 26.3° on the right and left, respectively (P = 0.001 and 0.001, respectively).

Pre-operative Talo-calcaneal angles were found to be 29.06° on the right and 28.69° on the left in a recent

research [16]. Post-operative angles were found to be 16.06° on the right and 17.43° left.

Before calcaneus stop surgery, the average preoperative Talo-calcaneal angle was 32° 5.62° on the right and 32.73° 6.4° on the left, according to our research. Right after the operation, the Talo-calcaneal angle was 23° 5.69°, left was 24.67° 5.58°, and both were good. It was shown that the mean talo-calcaneal angle improved substantially after surgery, going from 24.57° to 26.3° on the right and left, respectively (P = 0.001 and 0.001, respectively).

An investigation carried out in 2018 [17] found substantial improvement (P 0.001) in this angle measurement with a mean decrease of 8.75° in angle measurement, with a mean of 30°5 preoperative, 21.3°3.2 postoperative and the same outcomes in the final follow-up.

According to this study, the mean Talo-Calcaneal angle improved substantially postoperatively on both the right and the left (p value =0.001, 0.001) after arthroereisis with and without calcaneus stop operation.

Only three individuals in our research had mild problems, and one of those patients (3.3 percent) revealed One patient (3.3%) had Talar Osteolysis, while the other two (3.3% each) had Rt Aseptic Loosening, Pain, and a Minute Peri Screw Fracture.

One patient (6.7%) has a problem from the arthroereisis operation, whereas two individuals have complications from the calcaneus stop (13.4 percent).

There is no statistically significant difference in the number of complications between the two kinds of surgery (p = 1).

One instance of subtalar arthroereisis complications described by screw subluxation was talar osteolysis, according to our research.

Complications of the arthroereisis surgery may be classified as either general or implant-specific. The most frequent general consequence is discomfort in the sinus tarsal region (in front of the ear). Implant-specific problems include misalignment and deterioration. Overcorrection or a big implant may cause sinus tarsi discomfort, although this is usually alleviated once the implant is removed. If the implant isn't placed correctly, it may cause arthritis in the subtalar joint, which is painful. [18].

According to a research published in 2012 [18], the complication rate for subtalar arthroereisis ranges from 30% to 40%. Osteonecrosis, subtalar joint arthrosis, overcorrection, a loosened or fractured implant, implant subluxation, improper fixation, and fracture are among the most serious consequences. When implant-related problems arise, the first line of treatment is implant removal.

Another research [19] found that the implant's mechanical irritation of soft tissues and bone is the primary source of sinus tarsi discomfort after arthroereisis surgery, a frequent consequence. Sinus tarsi discomfort may be caused by an implant that is either improperly fixed or inappropriately sized.

The premature removal of the implant has not affected foot position, as shown by previous studies (12,20), but rather retains a certain degree of correction and therefore enables excellent clinical outcomes.

Neurovascular damage, delayed wound healing, infection, or fracture were not found in a research done in 2021 [21]. There were 17/113 (15%) implant-related problems, including malpositioning of the implant, secondary dislocation, and implant fracture.

One patient (3.3%) experienced reactional synovitis, which was followed by implant loosening and extrusion after a three-month debridement and reinsertion of a smaller-sized implant, according to a research published in 2011 (9). Unintentional removal rates vary from 7.1 percent to 19.3 percent for all kinds of device, with an average complication rate of 4.8 percent to 18.6 percent.

Two instances of screw subluxation, talar osteolysis, aseptic loosening, discomfort, and a minute peri-screw fracture were described in our research as complications of the calcaneus stop operation.

According to a recent research [22] the complication rate is very high (0.07 percent) It was found that under treatment of deformity had occurred in one of our patients (0.02 percent), who complained of widespread ligamentous laxity. Drilling into the distant cortex resulted in a buried screw in one of our patients (0.02%). One of the screws had to be removed because of synovitis (0.02%).

Another research (20) discovered problems in the first 11 feet of study participants (9 screw breakages and 2 incorrectly positioned screws; 12 percent). Because the correction stayed in seven of the nine feet where the screw broke, they achieved excellent or satisfactory outcomes in 91 percent of cases. Despite the screw being positioned improperly, the deformity was corrected after five feet. The screw had not loosened or become inflamed. In only two feet, the screw had sunk into the calcaneus (2 percent). Six percent of the youngsters had their screws removed after experiencing discomfort from prolonged weight bearing, although the pain was far less intense than it had been before to surgery.

Another group of researchers [8]found that in 0.83 percent of patients, screws were mobilised, resulting in discomfort and limited mobility in the subtalar joint. In these individuals, the implant had to be removed and a replacement screw used for arthroereisis. 11.98 percent of our patients had minor problems. Most of these symptoms were restricted to the surgical incision and were alleviated by medicating the surgical wound properly during the delayed times of reloading. After undergoing physiotherapy to address the tightness in the peroneal muscles, the patient underwent gait re-education and muscular strengthening exercises.

We found that the tow method is efficient in treating FFF deformity without the occurrence of related symptoms or deformity components recurrence if it is used carefully in the appropriate indication of pure flexible flat foot. All patients and their parents

were satisfied with the surgery's result, as shown by their return in all instances with bilateral abnormalities to repair the contralateral foot after a lengthy period of time. It is suggested that these patients be closely monitored in the future to make sure there are no recurrences.

5. Conclusion

Idiopathic flatfoot in children may be corrected with the Calcaneus stop operation, which has been shown to be an effective, worthwhile, essential, and safe treatment option. If we take into account the long-term stability, ease of use, speed of recovery, and lack of problems, the findings seem extremely good. There is no need for such a low-cost implant in this operation. One-day surgery, less postoperative edoema, early weight bearing and the option of further bone or soft tissue operations are some of the advantages of this minimally invasive method

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Author contribution

Authors contributed equally in the study**.**

Conflicts of interest

No conflicts of interest

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