ARTHROSCOPIC POST TRAUMATIC SUBTALAR JOINT FUSION

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ABSTRACT

Objectives: The aim of the study is to evaluate short term results of posterior arthroscopic post traumatic subtalar joint fusion.

Methods: It is a prospective case series study of 20 patients suffering from post-traumatic subtalar joint arthritis admitted to orthopedics and traumatology department of Kasr ALAiny school of medicine, Cairo university from January 2018 till January 2020. these patients were managed by arthroscopic fusion.

Results and conclusions: The present study results demonstrate that arthroscopic technique is effective for the treatment of post traumatic subtalar joint arthrodesis with minimal complication. In our study there was marked improvement in The American orthopedic foot and ankle society (AOFAS) score in arthroscopic technique with P value (0.0001). In our study the mean time for union in arthroscopic method was (14.05±1.53).

Key words: subtalar arthritis, arthroscopic fusion

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Introduction

Isolated subtalar arthritis most commonly occurs secondary to calcaneus or talus fractures, but it can also occur with inflammatory arthritic conditions or primary osteoarthritis**.** Treatment options range from non-operative bracing to subtalar fusion[(1).]

Hindfoot arthroscopy is now a reliable procedure for diagnosing and treating many articular and extra-articular conditions. Subtalar arthrodesis is used to treat degenerative and inflammatory hindfoot lesions, as well as congenital tarsal coalitions [(2).] After open subtalar arthrodesis with or without cancellous bone grafting, the fusion rate varies widely, from 55% to 98%, depending on the indication. Complications mainly involve the skin and nerves and occur in up to 17% of patients [(3).]In the hope of facilitating the immediate postoperative course and limiting the morbidity associated with the surgical approach, arthroscopic techniques for subtalar arthrodesis were developed [(4).] Lateral approaches with the patient in lateral decubitus were described initially. Most of the available studies, however, focused on a technique using posterior portals with the patient in the prone position. Anatomical and clinical studies have confirmed that arthroscopic subtalar arthrodesis reliably produces high-quality joint surface preparation and high fusion rates, with little morbidity and a rapid recovery [(5).]

Aim of the Work

The purpose of this study is to evaluate the short term clinical , radiological and functional results of patients suffering from post traumatic subtalar joint arthritis whose undergoing posterior arthroscopic arthrodesis.

Material and methods

The current study is a prospective case series study of patients admitted to orthopedics and traumatology department of Kasr ALAiny school of medicine, cairo university. The study was conducted on 20 patients suffering from post-traumatic subtalar joint arthritis from January 2018 till January 2020. These 20 patients were managed by posterior arthroscopic fusion .

Patient included in the study were post traumatic subtalar arthritis (Type 1 and 2 according to Zwipp and Rammelt classification of malunited fracture calcanus [(6)] Right , left or bilateral and male or female **.** With exclusion of patients with Inflammatory arthritis , Neuromuscular dysfunction , Talo calcaneal coalation , Subtalar impingement ,deformity , local sepsis and Skeletally immature patients .

Operative Technique

Surgical Instruments and Implants :

The arthroscopic equipment necessary to perform this procedure includes a 4 mm, 30 degree arthroscope with camera and appropriate video equipment, shavers, burrs, curettes, osteotomes, an image intensifier, and 6.5or 7.3 cannulated compression screws.

Anesthesia and positioning

The patient was brought to the operative theater and placed prone on the table. Preoperative prophylactic antibiotics were administered within 1 h of incision time. Patient received either general or spinal anaesthesia. A thigh tourniquet was placed.

Portals

Two portals was created on either side of the Achilles tendon .The distal tip of the lateral malleolus was identified, and a line was drawn parallel to the sole of the foot from the lateral malleolus across the Achilles tendon. The portals were placed immediately proximal to this line just medial and lateral to the Achilles .

Exploration and joint surface preparation

Identification of the joint line starting on the posterolateral portal which was performed with a skin incision and a blunt dissection of the subcutaneous tissue with a mosquito clamp or a trocar directed towards the big toe. Then posromedial portal was performed **.**The most important anatomical landmark was the flexor hallucis longus tendon, which marks the medial boundary of the working area with this technique. This tendon was easier to visualize after first identifying the belly of the muscle immediately proximal to the posterior talar process **.**

The cartilage was resected by alternating between the blade, burrs, curette, and chisels. The entire posterior subtalar surface is progressively visualized, in a posterior to anterior direction, until inter-osseous talo-calcaneal ligament was reached. The surfaces were prepared down to the subchondral bone. Once fully prepared, the surfaces were perforated to promote bone fusion

Figure (1): Intraoperative photography showing portals of posterior artroscope , FHL tendon and joint preparation

Fixation

fixation was achieved with two cannulated screws 6.5 or 7.3 inserted into the calcaneus and talus in a neutral position or 5 degree valgus .Two pins were inserted into the calcaneal tuberosity , in an upwards and anterior direction, to the superior surface of the calcaneus, under fluoroscopic guidance. The goal was to obtain a direction perpendicular to the posterior subtalar surface in order to maximize the compressive forces. The position of the arthrodesis and pins is checked on anteroposterior and lateral fluoroscopic views. Two cannulated screws are then inserted to apply compression to the subtalar joint line.

Figure (2): lateral and axial view final follow up (6 month) case (1)

Figure (3) Ap, lateral view final follow up (6 month) case (2)

Postoperative Protocol:

the patient is immobilized and kept non–weight bearing in a short leg splint. The wounds are checked at 10 to 14 days and the sutures removed. It is standard to limit weight-bearing until evidence of union following subtalar arthrodesis. Usually 6 weeks of limited weight-bearing followed by 6 weeks of protected weight-bearing in a cast or walking boot is prescribed. If radiographic union is appreciated at the 12-week point, the patient is weaned out of the walking boot and begins gentle range-of-motion exercises and the patients could return to daily activities. Follow up x-ray is done at 6 weeks, 12 weeks and 6 months.

Postoperative assessment is done using AOFAS scoring system after 6 months as a final assessment of patient post operatively.

Results:

Statistical analysis

Data was analyzed using STATA version 14.2 (Stata Statistical Software: Release 14.2 College Station, TX: Stata ++Corp LP.). Quantitative data was represented as mean, standard deviation, median and interquartile range. Data was analyzed using student t-test to compare means of two groups if data was normally distributed. When the data was not normally distributed, or data was ordinal scale Kruskal Wallis test for comparison Mann-Whitney test was used. Wilcoxon matched pairs signed rank test was used to compare preoperative and post-operative data. Qualitative data was presented as number and percentage and compared using either Chi square test or fisher exact test. Graphs were produced by using Excel or STATA program. P value was considered significant if it was less than 0.05.

Table (1): Characteristics of studied population

Variable	**N=20**
Age/years	
Mean (SD)	33.25±11.80
Median (IQR)	31.5 (25:41)
Gender	
Female	6 (30.00%)
Male	14 (70.00%)
Smoking	
No	12 (60.00%)
Yes	8 (40.00%)
Side of fracture	
Left	9 (45.00%)
Right	11 (55.00%)

The mean age of our study was 33.25±11.80 ranging from 17 years to 55 years. 14 patients (70 %) were males and 6 patients (30 %) were females .

In this study 8 patients only were smokers and 9 patients were suffering from subtalar joint arthritis in left side and 11 patients in right side.

Table (2): Operative time, Time till union and Total (AOFAS) score

	Arthroscopic surgery N=20
operative time	98.75±6.04 100 (95:100)
Pre-operative total score Mean (SD) Median (IQR)	 36.95±12.88 32 (25:49)
Post-operative total score Mean (SD) Median (IQR)	 83.15±8.16 85 (76.5:91)
P value compared post-operative and pre-operative	0.0001
Time till union/week Mean (SD) Median (IQR)	 14.05±1.53 14 (13:15)

The mean operative time was 98.75±6.04 ranging from (90 in to 110 min). In our study there was marked improvement in the American orthopedic foot and ankle society (AOFAS) with significant p value (0.0001) . In our study the mean time for union in arthroscopic method was (14.05±1.53) ranging from (12 to 18 weeks).

Table (3): Comparison between pre operative and postoperative arthroscopic pain score:

Variable	**Arthroscopic surgery N=20**
Pre-operative pain score Mean (SD) Median (IQR)	 10±11.70 0 (0:20)
Post-operative pain score Mean (SD) Median (IQR)	 35±6.07 40 (30:40)
P value compared post-operative and pre-operative	0.0001

In our study there was a significant improvement in the pain score between preoperative and final follow with P value (0.0001).

Table (4): Comparison between pre operative and postoperative arthroscopic activity limitation score

Variable	**Arthroscopic surgery N=20**
Pre-operative activity score Mean (SD) Median (IQR)	 2.75±2.17 4 (0:4)
Post-operative activity score Mean (SD) Median (IQR)	 8.2±1.51 7 (7:10)
P value compared post-operative and pre-operative	0.0001

In our study the patients showed marked improvement in the (activity limitation , support requirement). The mean score in arthroscopic preoperative was (2.75±2.17) ,and final follow up was (8.2±1.51) with p value showed significant variation (0.0001) .

Table (5): Comparison between pre operative and postoperative arthroscopic walking distance score:

Variable	Arthroscopic surgery N=20
Pre-operative walking distance score Mean (SD) Median (IQR)	 1.6±1.23 2 (0:2)
Post-operative walking distance score Mean (SD) Median (IQR)	 4.45±0.51 4 (4:5)
P value compared post-operative and pre-operative	0.0001

The mean preoperative (walking distance) score in arthroscopic method was (1.6±1.23) and became (4.45±0.51) post-operative with P value (0.0001).

Table (6): Complications occur in arthroscopic subtalar fusion

Variable	Arthroscopic surgery N=20
Complication No Yes	 16 (80.00%) 4 (20.00%)
Delayed union	2 (10.00%)
Infection	0
Nerve injury	0
Painful scar	0
Painful screws	2 (10.00%)

In our study 16 cases no complication. While 4 cases (20.00%) showed complication in the form of Delayed union (2 cases) and Painful screws (2cases)

Discussion

Subtalar fusion is the treatment of choice for subtalar arthritis when conservative management fails. The procedure can be performed arthroscopically or through the open lateral sinus tarsi approach. The arthroscopic technique is less invasive and is associated with rapid recovery, but it is more technically challenging [(7)] .

The present study results demonstrate that arthroscopic techniques are effective for the treatment of post traumatic subtalar joint arthritis. In our study the mean time for union was (14.05±1.53 weeks) ranging from (12 to 18 weeks).

These results are against ***Davies etal*** , ***Flemister,etal*** and ***Mann,etal*** that reported a union time of 12 to 16 weeks with the open technique [(8,9,10)] and ***Amendola,etal, Beimers,etal , Lee,etal , Oliva,etal , Rungprai,etal and Tasto,etal*** reported that union time was 6 to 15 weeks with the arthroscopic technique [(11,12,13,14,15,16)]. This may be due to The sinus tarsi approach yielded significantly greater total subtalar joint preparation compared to the arthroscopic approach.

This is not surprising due to the nature of the open technique, which provides greater accessibility to the joint. This may be a consequence of a lack of distraction applied to the joint, limited visualization with use of only two portals during the arthroscopic procedure, or inherent difficulty with reaching the anterolateral corner of the calcaneus for preparation due to its topographic irregularity and in open method we can use bone graft to enhance fusion rate **.**

In the present study, The mean operative time as regard arthroscopic surgery 98.75±6.04 min ranging from (90 in to 110 min).

The longer operative time with the arthroscopic technique can be attributed to the debridement of the posterior soft tissue or large osteophyte that blocks the entry to the posterior part of the subtalar joint which is very common in cases of post traumatic arthritis and The learning curve might be steep during early periods of practice; however, the feasibility of performing the procedure

with appropriate operative time increases as surgeons gain experience [7].

In our study there was marked improvement in The American orthopedic foot and ankle society (AOFAS) hind foot score where the mean score pre-operative was in arthrocopic group the mean score was (36.95±12.88) and became (83.15±8.16) . ***Amendola,etal, Lee,etal, Albert,etal, Bevernage,etal*** reported that the mean improvements following the arthroscopic technique were 31 to 75 points in the AOFAS hindfoot score [11,13,17,18].

Lee,etal , ***Thaunat , etal*** , ***Easley,etal*** and ***Scranton PE Jr*** reported that arthroscopic subtalar fusion have a wound complication rate of up to 6% [13] tibial nerve injury rate of 7%, [19] and screw head irritation rate of 6% to 13% [20,21] **.**

In the present study (10%) patients experiencing hardware irritation in the arthroscopic group required hardware removal but all patients were pain free after screw removal and another (10%) showed delayed union.

No neurovascular injuries or other wound complications following arthroscopic fusion were observed in this study. To prevent injury to the neurovascular structures while performing posterior subtalar arthroscopy, surgeons must always identify and use the FHL tendon as the medial-most boundary and not pass any instruments, use cautery, or perform debridement beyond this tendon. In addition, screw head irritation can be prevented by using a countersunk screw and inserting it into non weight bearing areas; however, screw head irritation remains the most common complication and is correlated with the type and level of postoperative activity [7].

Conclusion:

The present study results demonstrate that arthroscopic techniques are effective for the treatment of post traumatic subtalar joint arthrodesis. The union rate was 100% but. Arthroscopic techniques led to significant improvements in all functional outcomes , including the American Orthopedic Foot & Ankle Society (AOFAS) hind foot score , compared to the preoperative status .Arthroscopic arthrodesis is successful treatment for post traumatic subtalar arthritis and are associated with minimal complications.

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