

ORIGINAL RESEARCH

TO EVALUATE THE FUNCTIONAL OUTCOME OF MODIFIED BLAIR'S ARTHRODESIS FOR INJURIES OF TALUS IN A STUDY CONDUCTED AT TERTIARY CARE CENTRE OF INDIA

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ABSTRACT

Aim: To study the functional outcome of modified Blair's arthrodesis for injuries of Talus

Methods: The Department of Orthopedics conducted this prospective investigation. This research includes 30 instances of non-union and osteonecrosis treated with modified blair's arthrodesis. The average time between injury and index surgery was 6 to 18 weeks. All patients had preoperative roentgenograms to determine fracture conformation and were treated with modified blair's arthrodesis utilising a sliding graft from the anterior tibia.

Results: Among the 30 patients, 20 (66.67%) were men and 10 (33.33%) were females. The patients' average age was 39.55 ± 3.55 years. In the current research, 13 patients (43.33%) had tibio pedal motion of $10^\circ - 15^\circ$ and 17 patients (56.67%) had tibio pedal motion of $15^\circ - 20^\circ$, resulting in satisfactory to exceptional gait. The American orthopaedic foot and ankle society (AOFAS) and visual analogue scale (VAS) ratings were substantially different one year after surgery as compared to the preoperative period ($p < 0.05$), showing considerable improvement in ankle joint function.

Conclusion: We found that arthrodesis with talus preservation offered improved intraoperative stability and a nearly normal-looking foot with no limb length difference. This approach has a good level of dependability in terms of pain reduction, and the residual tibio pedal movement allows the patient to walk more physiologically and without trouble.

Keywords: Talus, Fracture dislocation Non-union Osteonecrosis, Modified blair's arthrodesis

INTRODUCTION

Talus fractures and fracture dislocations are among the most difficult complications that orthopaedic surgeons face. Problematic injuries include fractures of the talar neck with dislocations, entire dislocations of the talus body, and fractures in which a component of the talus body is lost. In addition to its articular weight-bearing role, the talar body is a key component of the talotibial and subtalar joints, making it crucial for foot rotation and hinge motions.¹ Because of these critical tasks, fractures of the talar body often result in substantial impairment, a condition exacerbated by the talus's specific vascular supply, which increases the likelihood of avascular necrosis.² Because of the crucial roles of these articulations in gait, osteonecrosis of the talus and arthritis of the ankle and subtalar joint develop often and cause crippling discomfort. There are few cases in the literature reporting talus body damage. Blair performed a tibiotalar fusion to avoid this complication. During this procedure, the body of the talus was removed and a sliding cortical tibial bone graft was placed anteriorly between the anterior aspect of the tibia and the head of the talus.² Morris et al. then modified the treatment by inserting a trans-calcaneal Steinmann pin through the calcaneum into the tibia and securing the tibial sliding graft with a cortical screw proximally to avoid proximal sliding graft migration.³ The foot retained its natural look, alignment and shortening were reduced, and the residual subtalar range of motion was enhanced.

METHODS AND MATERIALS

The Department of Orthopedics conducted this prospective research with the agreement of the protocol review committee and the institutional ethics committee. Following informed permission, a complete history was obtained from the patient or family members. This research includes 30 instances of non-union and osteonecrosis treated with modified Blair's arthrodesis. The average time between injury and index surgery was 6 to 18 weeks. All patients had a preoperative roentgenogram to confirm the fracture, which was treated with a modified Blair's arthrodesis utilising a sliding graft from the anterior tibia. Serial radiographs were taken on all patients for a year, and tibio pedal motions were examined postoperatively. The American orthopaedic foot and ankle society score and visual analogue scale were evaluated both before surgery and during the one-year follow-up. Statistical investigation Statistical analysis was carried out using the medical software programme Statistical package for social sciences 23.0. Data were evaluated using t- test. P0.05 was regarded as statistically significant.

METHODOLOGY

The anterior approach creates a gap between the extensor hallucislongus and the extensor digitorumlongus. After joint exposure, the tibial articular surface is denuded, the foot is placed in 0 degrees of dorsiflexion, 5 degrees of valgus, and 10 degrees of external rotation, and a sliding bone graft of size 5 cm 2.5 cm from the anterior aspect of the tibia is inserted in the talar neck and the proximal part of the graft is fixed with a 4.5 mm cortical screw. A transcalcaneal Steinmann pin is introduced through the calcaneum into the tibia to promote stability at the arthrodesis site and to avoid varus and valgus deformities of the foot.

MANAGEMENT AFTER SURGERY

For 6 weeks after surgery, a lengthy leg cast with the knee at 30 degrees flexion was used. After 6 weeks, the Steinmann pin was removed, and a short leg walking cast was inserted. Nonweight bearing walking is permitted up to 12 weeks following surgery, and weight bearing is permitted if graft healing is confirmed by radiography. Tibio pedal movement was clinically evaluated. Tibio pedal movement is described as the arc of movement from maximum dorsiflexion to maximum plantar flexion, as well as the angles subtended by the tibia's long axis and the foot in lateral projection.

RESULTS

Among the 30 patients, 20 (66.67%) were men and 10 (33.33%) were females. The patients' average age was 39.55 ± 3.55 years.

Table 1: Age and gender distribution of patients

Gender	Number	Percentage
Male	20	66.67
Female	10	33.33
Age	39.55 ± 3.55 years	

In the current research, 13 patients (43.33%) had tibio pedal motion of $10^\circ - 15^\circ$ and 17 patients (56.67%) had tibio pedal motion of $15^\circ - 20^\circ$, resulting in satisfactory to exceptional gait. In practise, the outcomes were evaluated based on the degree of tibio pedal mobility and the patient's ability to do complete activities without experiencing any problems. We consider the patient to have had an excellent outcome if the degree of tibio pedal movement is $15^\circ - 20^\circ$ and he is able to do his daily activities without any symptoms. We consider the patient's outcome to be GOOD if the degree of tibio pedal movement is $10^\circ - 15^\circ$ and there is occasional discomfort but no restriction of daily activities. If the tibio pedal mobility is less than 10° and the patient's daily activities are limited due to acute discomfort, the outcome is deemed poor. The final result was shown in (Table 2).

Table 2: Outcome assessment

Out come	No of patients	Percentage
Excellent	17	56.67
Good	13	43.33
Poor	0	0

Clinically, ankle arthrodesis is fused in 0 degree dorsiflexion in all patients, and radiologically, fusion is determined by development of trabeculations across tibia, talus, and sliding graft. Postoperative ankle function was satisfactory in all patients. The American orthopaedic foot and ankle society (AOFAS) and visual analogue scale (VAS) ratings were substantially different one year after surgery as compared to the preoperative period ($p < 0.05$), showing considerable improvement in ankle joint function (Table 3).

Table 3: AOFAS and VAS before and after operation

Parameter	* AOFAS	* VAS
Preoperative	51.44± 12.87	2.84±1.21
Postoperative	85.39 ±5.71	0.37 ±0.69
T	5.87	6.36
P-Value	0.0002	0.0001

*AOFAS - American Orthopaedic foot and ankle society score *VAS - Visual analog scale
*n= total number.

There was no shortening of the limbs when measured. In all situations, the heel height and contour were kept the same. Gait was evaluated and found to be physiologically normal. There is no limp, and the patient can walk more physically.

DISCUSSION

Blair's arthrodesis is the most often recommended therapy for fractures that do not heal and osteonecrosis of the talus. Blair described tibiotalar arthrodesis as the mainstay of therapy for talus fractures with nonunion and osteonecrosis in 1943.² This procedure involves removing talar body pieces and inserting a sliding tibial graft into the talus neck. Morris et al. updated this procedure in 1971 by attaching the graft to the tibia with a screw proximally and the tibia to the calcaneum with a transcalcaneal Steinmann pin.³ These changes helped to stabilise the ankle. Linsy et al. and Patterson et al. both conducted modified blair's fusion, but neither attempted to preserve the talus body.⁴ Kitaoka et al. described talar body removal for the first time.⁵ According to these findings, when blair's arthrodesis is done with talar body excision, loads of three to four times body weight occur in the ankle joint during normal walking. With the removal of the posterior facet, the forces acting on the subtalar joint and the contact characteristics of the anterior and middle facet alter significantly, resulting in degenerative arthritis of the subtalar joint. In this research, the tibial articular surface is denuded rather than excised, which promotes not only intraoperative stability but also reduces the risks of varus and valgus. This procedure uses cortical bone with extra cancellous bone from the lower end of the tibia to create sound fusion in all instances while also maintaining normal heel height.

The majority of patients had a satisfactory clinical outcome, with practically normal foot alignment relative to ankle and leg seen. The talus, graft, and tibia were all radiologically integrated, and sound fusion was obtained in all instances. Dunn et al. were the first to notice revascularization of the talar body after fracture, and it took several years for revascularization to occur.⁶ 10-20 tibiopedal movements are required for appropriate physiological gait.⁷ With tibiotalar arthrodesis limited and talus preserved, hind foot function is preserved.

Table 3: Shows the comparative functional outcomes of pre-Op and post-Op AOFAS and VAS scores of various studies

Study	Preop AOFAS	Postop AOFAS	Preop VAS	Postop VAS
Wang Shuangli et al.	45.38±3.21	83.13±3.76	8.01±0.63	2.31±1.05
	51.44± 12.87	85.39 ± 5.71	2.84 ± 1.21	0.37 ±0.69
Our study				

Load distribution to the anterior and centre facet of the subtalar joint had little effect. Four patients (43.33 percent) in the current research had tibio pedal motion of 10°- 15° and five patients (56.67 percent) had tibio pedal motion of 15°-20°, resulting in satisfactory to exceptional gait. There was no clarity in the location of arthrodesis since various writers had differing ideas on the ideal position for arthrodesis. For arthrodesis, Barr and record advised 5° equinus,⁸ Watson-jones as 10° equinus.⁹ Anthony A. Mascioli recommended neutral dorsiflexion for arthrodesis.¹⁰In this research, the ankles were fused at 0 degrees of dorsiflexion, allowing the patient to walk more physically and without trouble. This approach greatly boosted AOFAS while decreasing VAS.

CONCLUSION

We found that arthrodesis with talus preservation offered improved intraoperative stability and a nearly normal-looking foot with no limb length difference. This approach has a good level of dependability in terms of pain reduction, and the residual tibio pedal movement allows the patient to walk more physiologically and without trouble.

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