



A Novel Method of Tibiotalar Arthrodesis For Avascular Necrosis Talus

Dr. Naveen Sharma

Assistant professor (NIMS Medical college & Hospital) PN 354, Vivek-Vihar, New Sanganeir Road, Sodala, Jaipur, Rajsthan-302019

Dr. Vaibhav Krishna

Resident Department of orthopaedics(NIMS Medical college & Hospital)

Dr Shailendra Pratap Singh

(D ortho), DNB resident Department of orthopaedics (NIMS Medical college & Hospital)

Dr Agrawal Ashish Rakesh

(D ortho), DNB resident Department of orthopaedics (NIMS Medical college & Hospital)

Dr. Nirmal Jain

Professor & Head Department of orthopaedics (NIMS Medical college & Hospital)

ABSTRACT

INTRODUCTION Fracture of neck and body of talus is a devastating injury; complicated with dislocations of surrounding joints and avascular necrosis of talus. We modified the Blair's fusion procedure to provide extra stability thus achieving a solid union in cases with AVN of talus.

MATERIALS AND METHOD In our series, six cases with osteonecrosis of body of talus were included. Five were male and one was female. Median age was approximately thirty years. Mean follow-up period was 20 months.

RESULT. Tibiotalar fusion was achieved in all the ankles at an average of 22 weeks. Three cases out of six were considered as with excellent outcome, three were with good outcome after follow up.

CONCLUSION Our technique may be opted for patients who present with AVN of talar body. It provides extra rotational stability for graft, normal-appearing foot, no shortening, allowing motion at the talonavicular and anterior subtalar joints.

KEYWORDS : AVN talus, modified Blair's fusion

INTRODUCTION

Fracture of the neck and the body of the talus is one of the most devastating injuries around the ankle. Fractures are very often complicated with dislocation of talo-navicular or subtalar or talo-tibial joint. Fractures that create difficulty in management are talar neck fractures with or without dislocation; dislocations of the body of the talus; and fractures with loss of a segment of the body of the talus because those are commonly complicated with avascular necrosis of the talus. Several treatment options are available to treat osteonecrosis of talar body. Detenbeck and Kelly¹ recommended talectomy and tibio-calcaneal arthrodesis, but disadvantage is of widening of the hind foot and shortening of the foot. Blair² described tibiotalar fusion with excision of the body of the talus and sliding a cortical bone graft anteriorly between the anterior aspect of the tibia and the head of the talus. Thereafter Morris *et al.*³ modified this procedure. They removed the talar body and stabilized calcaneum on the tibia by placing a Steinmann pin through the calcaneum and then a screw is placed in the tibial sliding graft to prevent proximal displacement. Subsequently, Dennis *et al.*⁴ used a similar procedure without Steinmann pin. They concluded that the normal appearance of the foot is retained after these modifications. Most of the authors have advocated resection of the talar body, even though the talar body and subtalar joint shares three to four times load of body weight during normal walking.⁵ This suggests that the resection of the entire body would substantially change the contact characteristic of the remaining anterior and middle facets, therefore this would increase the likelihood of degenerative arthritis. In contrary to the modification presented by Morris, the body of the talus was partially excised in this study with the hope that remained cortical bone with added cancellous bone from lower tibia would make sound fusion with maintenance of height of the heel. We further modified the technique of Morris by using two screws for fixation of anterior sliding tibial graft instead of one to further improve the stability of fixation.

The purpose of this paper is to report the end results of the treatment of six cases of posttraumatic avascular necrosis of the body of the talus by modifying Blair's method of fusion, where the body of the talus is retained and improving stability of fixation.

MATERIALS AND METHOD

In our series, six cases with fracture of the neck of the talus with talar body dislocation were included who presented to us with avascular necrosis of talus. (Figure-1), (figure-2) Study was conducted from May 2012 and Dec 2013, Out of six patients, five were male and one was female. Median age was approximately thirty years. (Range 24 – 40 years) Right ankle was injured in four cases. Mean follow-up period was 20 months

SURGICAL TECHNIQUE

An anterior longitudinal incision beginning 8cm proximal to the ankle and ending at the medial cuneiform was made. Interval between the extensor hallucis longus and extensor digitorum longus was dissected. Capsule and periosteum in line with the skin incision incised. Then using a power saw and drill, a rectangular graft 5cmx 2cm from the anterior aspect of the distal tibia was cut. (figure-3) A transverse slot 2cm deep in the superior aspect of the talar neck was made and the tibial graft was slid into it. Then the proximal part of the graft was fixed to the tibia with two cancellous screws after holding the foot in 10 degrees of plantar flexion and neutral rotation. Then a Steinmann pin (4.5mm) was inserted vertically through the calcaneum and 3to 10 cm into the distal tibia. Below knee cast was applied. (figure-4) Steinmann pin was removed after 6 weeks.

MODIFICATION

1. We have used two cancellous screws instead of one.
2. Position of ankle was in 10 degree plantar flexion and neutral rotation.

RESULT

The patients were followed up at 6 weeks, 3 months, 6 months, 1 year and then at regular interval of 6 months. The operated ankle was assessed with serial roentgenograms to look for progress of fusion with proper bony alignment and measurement of tibiopedal movement. Tibiopedal motion is defined as the curve of motion between maximum dorsiflexion and maximum plantar flexion of ankle and the angles were subtended by the long axis of the tibia and that of the foot in the lateral projection. The tibiopedal motion was measured with use of a goniometer between the axis of the tibia and the foot in positions of maximum dorsiflexion and plantar flexion. In our study, results were considered excellent if the patient had completely asymptomatic foot and ankle and comfortable in Activities of Daily Life (ADL) and if tibiopedal movement ranged from 15 to 20 degrees. If there was occasional discomfort which caused no restriction in ADL and tibiopedal movement ranged from 10 to 15 degrees, then results were considered good. Poor result was with less than 10 degree tibiopedal movement and painful ankle to limit ADL.

According to the above mentioned protocol all six patients were followed up and evaluated after surgery. Three cases out of six were considered as with excellent outcome, three were with good outcome after follow up according to the mentioned criteria

Tibiotalar fusion was achieved in all the ankles at an average of 22 weeks. (Range 18-30 weeks). The position of the fused ankle was assessed clinically in all the patients. All the cases were radiologically and clinically assessed after 9 months where lower end of the tibia and entire talus become one single block. Limb length discrepancies were also measured and shortening of an average of 0.5 cm was noted. Gait was assessed and desired compensation in the heel was provided in the foot wear. With this modification, the gait improved and no noticeable limp was found.

Table 1

S. NO.	AGE/SEX	INITIAL TREATMENT	TIME FROM INJURY TO FUSION	FOLLOW UP	RANGE OF MOVEMENTS	RESULT
1.	24/M	PLASTER	6 MONTHS	6 WEEKS, 3 MONTHS, 6 MONTHS, 1 YEAR, 18 MONTHS	18	EXCELLENT
2.	30/F	PLASTER	3 MONTHS	6 WEEKS, 3 MONTHS, 6 MONTHS, 1 YEAR, 18 MONTHS, 24 MONTHS	12	GOOD
3.	36/M	CLOSE MANIPULATION	4 MONTHS	6 WEEKS, 3 MONTHS, 6 MONTHS, 1 YEAR, 18 MONTHS, 24 MONTHS	17	EXCELLENT
4.	40/M	PLASTER	3 MONTHS	6 WEEKS, 3 MONTHS, 6 MONTHS, 1 YEAR, 18 MONTHS	16	EXCELLENT
5.	26/M	CLOSE MANIPULATION	6 MONTHS	6 WEEKS, 3 MONTHS, 6 MONTHS, 1 YEAR, 24 MONTHS	11	GOOD
6.	30/M	PLASTER	5 MONTHS	6 WEEKS, 3 MONTHS, 6 MONTHS, 1 YEAR	12	GOOD

DISCUSSION

Avascular necrosis of the body of the talus, treated with Blair fusion or with its different modifications, has been published in few journals in different times. In our series six cases of avascular necrosis of talar body were operated with a new technique of tibiotalar arthrodesis. In

1943, Blair used a distal tibial sliding cortical graft without fixation in two patients with acute fracture of the neck of the talus. At the time of follow-up (minimum, four months), both fractures had united in follow-up (minimum, four months)⁶. Morris et al., in 1971 modified the procedure. They used a cortical screw up to posterior cortex of tibia to fix the sliding graft and a Steinmann pin traversing calcaneum into the tibia by 10 to 12 centimeters. Four of their ten patients had a talar fracture with avascular necrosis, and six had an acute fracture. Seven had an excellent result and three, a good result⁷. Later, Morris reported a series of four patients with a minimum two months follow-up after modified Blair procedure for the treatment of a fracture and osteonecrosis⁸. Result was excellent in those two cases.

MD Dennis and HS Tullos, in 1980, performed a retrospective clinical and roentgenographic study on seven patients who underwent Blair tibiotalar arthrodesis with the average follow-up was 3.9 years. Results were good in five patients, fair in one and poor in one. In two patients, pseudoarthrosis developed, painful in one and asymptomatic in one⁹.

In 1982, Lionberger, et al., described arthrodesis of the distal aspect of the tibia to the talar neck with use of a pediatric hip-compression screw. Five patients were treated and followed up for a mean of one year, one developed a delayed union¹⁰. Canale and Kelly reported a series of seventy-one fractures through the neck of the talus. Blair procedure was used for two fractures but both had poor result¹¹.

In the reported series six cases were included presenting with avascular necrosis of talus. Morris and associates, in 1971 advocated immediate excision of the extruded body for patients with comminuted fractures of the talar body as well as those with closed Group- III fracture-dislocation of talar neck since avascular necrosis occurs in over 90 per cent of these injuries. In this reported series, the modification was also after those of Morris. (i.e. one cortical screw and one thick k-wire were used). Which was further modified by using two screws for fixation of anterior sliding tibial graft instead of one to further improve the stability of fixation.

In contrary to the modification presented by Morris, the body of the talus was partially excised in this study group with the hope that remained cortical bone with added cancellous bone from lower tibia would make sound fusion with maintenance of height of the heel. Steinman pin inserted through calcaneum into the tibia enhanced the stabilization of ankle construct for first four weeks. That helped the fusion process to take place initially.

CONCLUSION

In essence, our technique of arthrodesis may be opted for patients who present with avascular necrosis of talar body. It has the advantage of giving an extra rotational stability for anterior tibial graft, normal-appearing foot, producing no shortening, and allowing motion to remain at the talonavicular and anterior subtalar joints thus helping the patients to walk with comfort.



Figure 1 showing preoperative clinical photograph



Figure 2 showing preoperative x ray of ankle joint.



Figure -4 post operative x ray showing sliding graft fixed with screws.



Figure -3 showing graft harvesting technique

REFERENCES

1. Detenbeck LC, Kelly PJ. Total dislocation of the talus. *J Bone Joint Surg Am.* 1969;51:283-8.
2. Blair HC. Comminuted fractures and fracture dislocations of the body of the Astragalus, operative treatment. *Am J Surg.* 1943;59:37-43.
3. Morris HD, Hand WL, Dunn AW. The modified Blair fusion for fractures of the talus. *J Bone Joint Surg Am.* 1971;53:1289-97.
4. Dennis MD, Tullos HS. Blair tibio-talar arthrodesis for injuries to the talus. *J Bone and Joint Surg Am.* 1998;80:370-9
5. Kitaoka HB, Patzer GL. Arthrodesis for the treatment of arthrosis of ankle and osteonecrosis of the talus. *J Bone and Joint Surg Am.* 1998;80:370-9
6. Blair HC. Comminuted fractures and fracture dislocations of the body of the astragalus. Operative treatment. *Am J Surg* 1943. 59: 37-47.
7. Morris HD, Hand WL, Dunn AW. The modified Blair fusion for fractures of the talus. *JBJS* 1971 53A: 1289-1297
8. Morris HD. Aseptic necrosis of the talus following injury. *Orthop Clin North America* 1974 5: 177-189.
9. Dennis MD, Tullos HS. Blair tibiotalar arthrodesis for injuries to the talus. *JBJS* 1980 62A: 103-107.
10. Lionberger DR, Bishop JO, Tullos HS. The modified Blair fusion. *Foot and Ankle* 1982. 3: 60-62.
11. Canale ST, Kelly, FB Jr. Fractures of the neck of the talus. Long-term evaluation of seventy-one cases. *JBJS* 1978 60A: 143-156.