

Subtalar Distraction Arthrodesis- An Innovative New Technique

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Abstract

Distraction arthrodesis has been proven to be an effective means of subtalar joint arthrodesis. Our article is aimed to address some of the issues that have been associated with the traditional method of distraction arthrodesis by suggesting a new modification to this technique; using healing plugs as structure support rather than the traditional autograft techniques and hence avoiding the inherit issues of collapse, malunion, donor site complications etc.

Keywords: Distraction; Arthrodesis; Healing Plugs; Subtalar Joint; Double Block; Autograft

Introduction

Calcaneal malunion is a common cause of multiple mid and hind foot issues including; traumatic subtalar arthritis, peroneal tendinitis and entrapment, anterior ankle impingement syndrome and varus or valgus hindfoot deformity [1]. The main stay of treatment has been a subtalar arthrodesis, which is capable of relieving subtalar arthritic pain very effectively [1,2]. However, the issue arises when arthritis is accompanied by severe deformity, in which case it becomes very difficult to correct for calcaneal height, talar declination angle or talo-calcaneal angle which may have developed due to malunion [6,12,17,19,22,28].

Previous authors reported the results of subtalar distraction arthrodesis using a single bone block; [1,2,4,5,8,10,18,23] however, there isn't much research looking at double bone blocks for this technique and the little research that does address this tends to only describe autograft bone blocks. By modifying the initially described subtalar distraction arthrodesis technique using healing plugs instead of autograft using the method below we believe that we have much better intra-operative control of the various talocalcaneal angles.

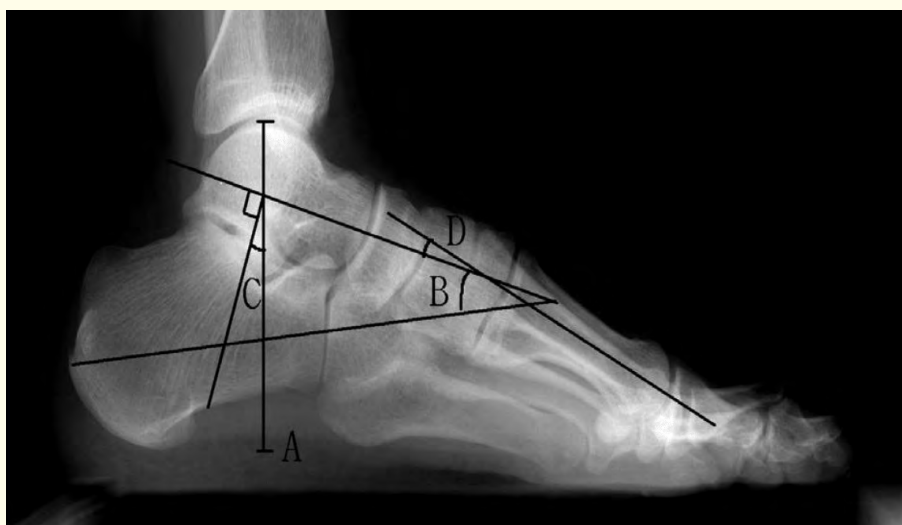


Figure 1: A: talo-calcaneal height; B: talo-calcaneal angle; C: talar declination angle; D: talo-1st metatarsal angle [29].

Operative Technique

The patient was placed in a supine position on the operating table. A tourniquet was applied and leg exsanguinated. Standard prepping and draping applied. Intravenous antibiotics were given on induction and a regional block administered using 10mls of a mixture of Marcaine and steroid in a spinal needle.

An incision was made over the lateral aspect of the hind foot. Blunt dissection was made down to the flexor digitorum brevis musculature and this was elevated without difficulty. The underlying subtalar joint was exposed and a capsulotomy was performed. Advanced osteoarthritis of the subtalar joint surface was noted. Using a lamina spreader, the subtalar joint was exposed, and then the residual cartilage was debrided and the subchondral surface prepared.

Multiple drill points (spot Welds) on the posterior facet. Interosseous ligaments were cleared.

While holding the subtalar joint in distraction, we paid attention to maintain the hind-foot in a neutral or a little everted position after the medial articular capsule of the subtalar joint was separated enough.

The degree of distraction was determined by measuring the loss of height in comparison with an unaffected site.

Two Integrant Fuse it’s were inserted into the fusion site.

Position was confirmed using fluoroscopy.

Lateral wall clearance was performed, prominent calcaneal bone was removed from the lateral gutter. Synovitis was removed and the peroneal tendons checked, and glide freely.

Case Report

We also present the case of a 68-year-old female that presented with a malunited calcaneal fracture treated with a distraction arthrodesis using the aforementioned surgical technique.

Ms X was reviewed a year post a comminuted intraarticular calcaneal fracture that had previously been managed non-operatively. She sustained the injury post a fall off a ladder. She was initially managed with immobilisation in a controlled ankle movement (CAM) boot with no active range of movement (ROM) for six weeks. This was followed by a further six weeks of touch weight bearing in the same boot. On presentation, she complained of chronic pain on the lateral side of her hind foot, which was exacerbated by prolonged periods of weight bearing or ambulating on uneven surfaces. Pain was described as severe.

Ankle

Swelling			Yes						
Alignment			Varus	Valgus	Neutral				
Gait			Antalgic						
Tenderness			Medial	Anterior	Lateral				
Pulses									
Sensation									
Tib Fib Joint Tenderness			Yes	No					
	ER		(+)ve	(-)ve					
	Squeeze Test		(+)ve	(-)ve					
Peroneal Tenderness			Yes	No					
Stork Test			(+)ve	(-)ve					
Too Many Toes’ Test			(+)ve	(-)ve					
Peroneal Strength			Grade I	Grade II	Grade III	Grade IV	Grade V		
Tib Post			Grade I	Grade II	Grade III	Grade IV	Grade V		
Anterior Drawer Test			0°	Grade I	Grade II	Grade III	Grade IV	Grade V	
			30°	Grade I	Grade II	Grade III	Grade IV	Grade V	
ROM			R	L					
Ankle		DF							
		PF							
		Inv							
		Ev							
Subtalar Joint		Inv							
		Ev							

Mid Foot

Alignment	Normal		
Pain	Normal	TMT	Sinus Tarsi
Swelling	Yes	No	

On examination, she had an antalgic gate, a mild degree of hind foot misalignment compared to the contralateral side and an irritable subtalar joint. The hind-foot was broad and swollen. Her range of movement was significantly decreased compared to the contralateral side. Radiographs and MRI on presentation demonstrated a mal-united calcaneal fracture, oedema across the subtalar joint and degenerative change of this joint.



Figure 2: Pre-Op CT scan.



Figure 3: Pre-Op MRI.

She was managed with a distraction arthrodesis with synthetic bone graft and healing plugs of her right subtalar joint using the aforementioned surgical technique. She started active range of movement after the wounds had healed and began to weight bear in a range of movement boot at two months post surgery. Radiographs at three months post surgery demonstrated fusion of the subtalar joint. After her four month review the patient was asked to increase her activity as tolerated.

Discussion

Symptomatic subtalar arthritis after intra-articular calcaneal fractures can be treated by subtalar arthrodesis *in situ* [10,19,23,30-33]. Often this is combined with decompression of the lateral wall to relieve symptoms from calcaneofibular abutment and subfibular impingement. *In situ* subtalar arthrodesis cannot, however, restore physiological heel height, the talocalcaneal angle, or the talar declination angle in injuries or deformities which involve collapse at the subtalar joint [9,11,13,14,15,20,21,25,27]. Carr, *et al.* [4] introduced subtalar bone block distraction arthrodesis to restore satisfactory orientation of the hind-foot in an attempt to improve function. The concept was that substantial loss of heel height may lead to symptomatic anterior tibiotalar impingement, and they recommended that this deformity be corrected.

Although a satisfactory outcome may be obtained using subtalar bone block distraction arthrodesis, the complexity of the procedure introduces a number of potential complications such as wound healing [4,23] neuralgia [8,19,23] prominent metalwork [4,19,32] and varus malunion. [6,19,23,31,32] are all well documented.

We suggest a modification to this technique described by Carr, *et al.* [4] of using healing plugs as a means of structural support. Two Fuse It (integrant) plus were used with Wright Synthetic bone graft to all distraction at the fusion site. The Fuse It plugs maintain the distraction, allow for bony ingrowth and act as a container for bone graft. Patient was mobilized NWB in a camwalker 6/52, moving to graduated to weight bearing for a further 6/52.

No preprevious research has looked into the use of healing plugs as a means of structural support. Use of structural autograft with a bone block carries risk of collapse of the graft and loss of position with rates reported in the literature to be in the range of 25 - 35% [4,5,7,10,16,18,19,24].

There is also the significant risk of donor site morbidity; including wound infections and donor site pain [26].

All these issues are completely resolved when using our suggested healing plugs technique; there is no longer a need for a donor site to be used and the risk of collapse of the bone block is also completely removed. These integrant heal plugs allow for excellent structure support ensuring that no collapse or loss of position occurs while allowing for integration and ingrowth of bone to take place.

Conclusion

This suggested new technique of distraction arthrodesis that we have discussed is a sound alternative from the more traditional distraction arthrodesis technique of using bone blocks and autologous grafts. From our experience, we believe that by using healing plugs we are able to provide a more surgically efficient, consistent and re-creatable method of distraction arthrodesis that is well tolerated by patients and produces excellent results. These healing plugs provide adequate structural support, while allowing us to position the foot in the desired position meanwhile allowing for the graft to take. It removes the need for autologous bone grafts and hence any associated complications and is a sound alternative for subtalar distraction arthrodesis.

Conflict of Interest

There is no financial or any other conflict of interest that exists.

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