

# Achilles Tendon Repair Using the InternalBrace™ Principle

GRAEME P. HOPPER, MBChB, MSc, MRCS  
SPECIALITY REGISTRAR  
WEST OF SCOTLAND ORTHOPAEDICS  
GLASGOW, SCOTLAND, UK

GORDON M. MACKAY, MD, FRCS(ORTH), FFSEM(UK)  
PROFESSOR  
UNIVERSITY OF STIRLING  
STIRLING, SCOTLAND, UK

## ABSTRACT

**D**espite extensive research, the management of acute ruptures of the Achilles tendon remains an area of controversy and there is no consensus regarding the optimal treatment. An InternalBrace™ (Arthrex, Inc., Naples, Florida) is a ligament augmentation repair using high strength sutures/tape and knotless bone anchors which encourages healing and allows early mobilization. This article describes, with video illustration, a knotless Achilles tendon repair technique using the InternalBrace™ principle.

**INTRODUCTION**

The Achilles tendon is the most frequently ruptured tendon in the body and its incidence is increasing.<sup>1,2</sup> Nevertheless, management of acute ruptures of the Achilles tendon remains an area of controversy despite extensive research, and there is no consensus regarding optimal management. Non-operative management avoids the risk of surgery which includes infection, wound complications, and nerve injury. However, operative management has been shown to significantly reduce the risk of re-rupture and allow patients to return to sport and work quicker when compared with conservative measures.<sup>3-12</sup>

The primary goal of treatment in patients with acute ruptures of the Achilles tendon remains tendon healing with restoration of function. Recent studies have demonstrated the influence that early mobilization has on the tendon healing process.<sup>5</sup> In this technical note, we describe a knotless Achilles tendon repair (Video 1) which uses the principles of the InternalBrace™ Ligament Augmentation Repair (Arthrex, Inc., Naples, Florida), ensuring the restoration of the musculo-tendinous length which is key as this dictates functional outcome.<sup>13,14</sup> Furthermore, it provides a repair that allows early weight bearing and mobilization. This accelerates healing, minimizes muscle wasting, reduces pain, and restores function (Table I).

**SURGICAL TECHNIQUE**

The initial skin incision is made percutaneously with a transverse incision just proximal to the palpable rupture. The Percutaneous Achilles Repair System (PARS) jig (Arthrex, Inc., Naples, Florida) is then applied with the inner arms inside the paratenon (Fig. 1).

High strength sutures (FiberWire®, Arthrex, Inc., Naples, Florida) are then passed in a stepwise manner using the numbered holes on the side of the jig. The jig is then removed, which pulls the sutures out of the incision. Two stab incisions, 1.5cm apart, are made directly down to the calcaneus at the level of the insertion of the Achilles tendon. The 3.5mm drill is then used with the drill guide followed by the tap to pre-

<b>Table I</b>	
<b>Advantages and Disadvantages of this technique</b>	
<b>Advantages</b>	<b>Disadvantages</b>
Simple and reproducible	Risks of surgery – infection, nerve injury etc.
Minimal surgical morbidity	Limited exposure of tendon
Stronger knotless fixation	Dependent on jig for suture placement
Restores musculotendinous length	Heel pain during early rehab
Facilitates rehab	

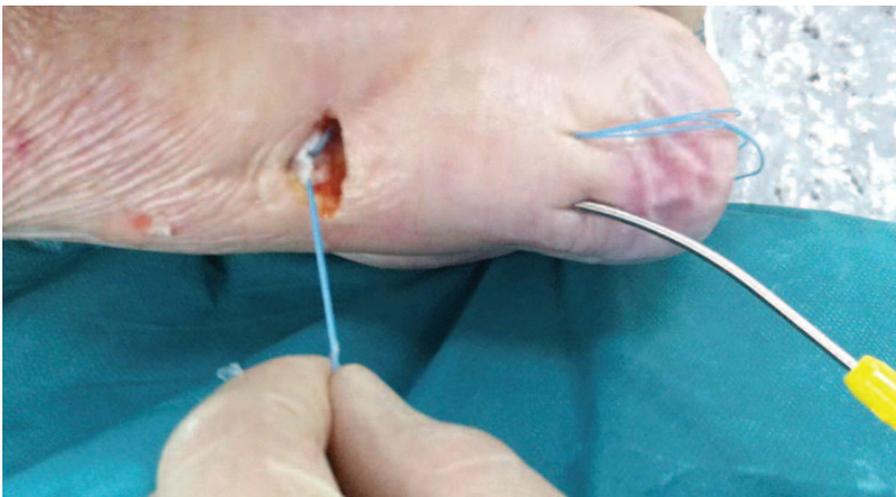
pare two holes for the suture anchor. A Banana SutureLasso™ (Arthrex, Inc., Naples, Florida) is then passed through the distal Achilles and out through the rupture site. The sutures from the proximal stump are then passed through the

distal stump and out the stab incision distally (Fig. 2).

The 4.75mm SwiveLock® (Arthrex, Inc., Naples, Florida) are then inserted and tensioned in comparison with the contralateral foot to restore the muscu-



**Figure 1: PARS jig with the inner arms inside the paratenon and high strength sutures being passed through the holes on the side of the jig.**



**Figure 2: Banana SutureLasso being passed through the distal Achilles to bring the suture from the proximal stump back through the stab incision**

lo-tendinous length. This results in a secure knotless repair of the Achilles tendon rupture (Fig. 3a and b). Once the musculotendinous length is established, a fine 3'0 suture could be used to approximate any displaced strands restoring a column of soft tissue. The paratenon is then closed to minimize the risk of soft tissue scarring and adherence.

The patient is placed in a soft walking boot for the first two weeks postoperatively to allow for satisfactory wound healing. Partial weight bearing, as tolerated, can safely be encouraged within the boot; although, a 1cm heel raise may be initially required to compensate for the slight equinus associated with soft tissue swelling. The walking boot can be removed for rehabilitation and gentle mobilization over the next four weeks and full weight bearing as tolerated. Imaging suggests that satisfactory provisional healing for functional activities is restored by 12 weeks. However, it would be a further eight weeks before a return to sport could be considered. Pearls and pitfalls of the technique are outlined in Table II.

**DISCUSSION**

Despite the increasing incidence of acute Achilles tendon ruptures and the substantial volume of papers in the literature, optimal treatment is unknown. The most recent systematic review by Holm et al.<sup>5</sup> reiterates this point and also highlights the importance of early rehabilitation following this injury to

Table II Pearls and Pitfalls of this technique	
Pearls	Pitfalls
Ideal repair within first fortnight after rupture	Avoid excessive tension
If possible avoid cast preoperatively	Leave number 1 pin in situ during percutaneous fixation or the jig may be unstable
Cyclically load proximal sutures 10 times to allow for creep	Ensure jig positioned within the paratenon as this will minimize risk of sural nerve injury
Ensure calcaneal anchors flush with bone	
Minimize soft tissue dissection and close paratenon if possible	

achieve the best possible outcome. The technique described in this technical note using the principles of the InternalBrace™ allows for earlier weight bearing and mobilization and, therefore, faster rehabilitation and an improved functional outcome. Additionally, soft tissue problems have been one of the main complications described in the literature following operative management. The minimally invasive technique, with a knotless repair described in this technical note, intends to reduce this complication.

The principles of the InternalBrace™ have been described in recent literature for the anterior talofibular ligament (ATFL), calcaneonavicular ligament, medial collateral ligament (MCL) of the knee, ulnar collateral ligament (UCL) of

the elbow, and the anterior cruciate ligament (ACL).<sup>15-23</sup> The most recent paper in the literature by Yoo et al.<sup>20</sup> demonstrated a quick return to activity and sports using the InternalBrace™ for chronic lateral instability. Furthermore, Schuh et al.<sup>15</sup> demonstrated biomechanically superior results with the InternalBrace™ used for augmentation of the ATFL compared to other reconstruction methods. Viens et al.<sup>16</sup> revealed the ATFL with InternalBrace™ augmentation was biomechanically as strong as the native ATFL. Smith et al.<sup>22</sup> described pediatric ACL repair using the InternalBrace™ with excellent outcomes, avoiding the potential morbidity of graft harvest. Additionally, Acevedo et al.,<sup>17</sup> Lubowitz et al.,<sup>18</sup> and Dugas et al.<sup>21</sup> have described techniques using the



Figure 3. (a) Knotless repair of Achilles tendon rupture (b) Animation demonstrating finished repair

InternalBrace™ for the spring ligament, MCL of the knee, and UCL of the elbow, respectively. Gilmer et al.<sup>24</sup> demonstrated MCL repair with the InternalBrace™ was biomechanically superior to repair alone and similar to allograft reconstruction.

## CONCLUSION

This technical note describes a knotless Achilles tendon repair using the principles of the InternalBrace™. This technique provides a repair that allows early weight bearing and mobilization at the same time as accelerating healing, reducing muscle wasting, reducing pain, and restoring function. **STI**

## AUTHOR'S DISCLOSURES

Professor Mackay is a consultant for, and receives royalties from, Arthrex, Inc. All other authors have no conflicts of interest to disclose.

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