

+ Modified Lemaire tenodesis with an iliotibial band graft and BIOSURE[◇] REGENESORB[◇] Interference Screw fixation

A knee technique
guide as described by

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based on collaboration with

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**ACUFEX[◇] DIRECTOR
ELITE[◇]**

ACL Drill Guide System

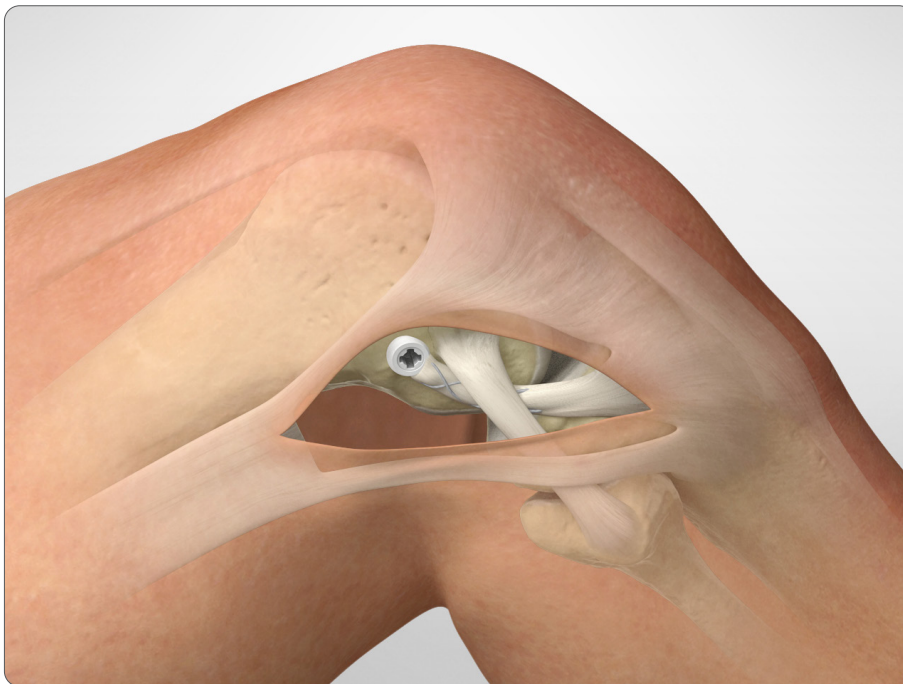


**BIOSURE[◇]
REGENESORB[◇]**
Interference Screw

Scope

The aim of the modified Lemaire anterolateral tenodesis is to improve anterolateral rotational stability, either as a supplement to an anterior cruciate ligament (ACL) reconstruction in a knee with a high degree of rotational instability, or as an addition during ACL revision surgery.

The technique herein described is a modified Lemaire procedure, using a less invasive approach, with a transposed iliotibial band graft fixed by a BIOSURE REGENESORB Interference Screw.



For illustrative purposes only.

This surgical technique was prepared with the guidance of Dr. Eivind Inderhaug in collaboration with Mr. Andy Williams and Prof. Andrew Amis and contains a summary of techniques and opinions based upon their training and expertise in the field, along with their knowledge of Smith+Nephew products.

S+N does not provide medical advice and recommends that surgeons exercise their own professional judgement when determining a patient's course of treatment. This surgical technique is presented for informational and educational purposes only. **For more information on the products in this surgical technique, including indications for use, contraindications, precautions and warnings, please consult the products' Instructions for Use (IFU).**

Introduction

Anterolateral procedures were traditionally used as the sole procedure for ACL insufficiency. Although efficient in reducing rotational instability at the time of surgery, clinical results at the time were variable¹. With the introduction of the intra-articular ACL reconstruction, the popularity of these procedures declined. However, the extra-articular procedures in combination with intra-articular ACL reconstruction were still being used, and several clinical studies have shown improved knee stability and better patient-reported outcomes when the combined approach is used,²⁻⁵ as opposed to an intra-articular ACL reconstruction alone.

A rationale for the additional effect of anterolateral procedures can be found in studies that investigate the role of anterolateral structures of the knee.^{1, 6, 7} While a common perception has been that the ACL is paramount for rotational control of the knee (additional to its role in controlling anterior translation of the knee), recent biomechanical studies have shown that the anterolateral structures are in fact the primary stabilisers of internal rotation.⁷ Concurrently, clinical findings – at both the time of surgery and during radiological examinations – indicate that these anterolateral structures are commonly injured when an ACL tear is present.⁸⁻¹⁰ In sum, evidence is building up to support the fact that injuries to anterolateral structures of the knee are a non-negligible factor of the anterolateral rotational instability (ALRI) or pivot shift – the hallmark clinical sign that is seen in an ACL insufficient knee. It has been shown in a recent biomechanical study, that when performing only an intra-articular ACL reconstruction in a knee presenting with combined ACL and anterolateral injuries, residual laxity for both anterior translation and internal rotation of the knee remained.⁶ When a modified Lemaire anterolateral tenodesis was added, normal knee laxity was, however, restored.⁶

A long-standing fear with the anterolateral tenodesis has been the perceived risk of lateral compartment osteoarthritis associated with such procedures.¹¹ A suggested mechanism for the development of lateral compartment osteoarthritis is over constraint of the lateral compartment, leading to an increase in tibiofemoral cartilage contact pressures. Although there is no clear evidence that supports such a link, this has been a prevailing opinion amongst knee surgeons. In a cadaveric study investigating the effect of graft tensioning protocols on intraarticular tibiofemoral contact pressures, a low risk of increased intra-articular contact pressures was observed.¹² The key factors for keeping intra-articular pressures normal included: (1) keeping the knee in a neutral rotation, and (2) using only a moderate graft tension (2kg) when fixating the anterolateral graft. These findings highlight important technical factors to be considered in the anterolateral procedures. Renewed clinical follow-up evaluations will hopefully reproduce the normalized knee kinematics found in these time-zero cadaveric studies.

The modified Lemaire tenodesis is a procedure that is indicated as a supplement to anterior cruciate ligament (ACL) reconstruction in selected cases. Although the best use of the procedure is still under development, current indications have been suggested to be primary ACL cases with a large rotational instability (clinically assessed by the pivot shift manoeuvre), patients with a high risk of failure after surgery and selected revision cases. There are also indications that a combined intra-articular ACL reconstruction and an extra-articular procedure can have a protective effect on the ACL graft during early postoperative rehabilitation.¹³

The current technique is a modification of the eponymous procedure described by Marcel Lemaire in 1967.¹⁴ It has been used conventionally since then, but modifications have led to the current, less invasive, approach. With the use of a transposed graft from the iliotibial band, there is only need for a single incision with no additional tendon harvesting required.

The current technique tunnels the graft deep to the lateral collateral ligament, which restores reliable knee kinematics and normalizes the rotational instability of the knee. It is easy to perform with the bony landmarks for graft insertion being identifiable through the open approach used. By using only one fixation device at the femoral insertion, there is a reduced risk of graft slippage as well as reduced costs related to the procedure. The BIOSURE REGENESORB Interference Screw provides reliable fixation for the femoral insertion site with a unique open architecture design that allows for bone in-growth.^{15–17}

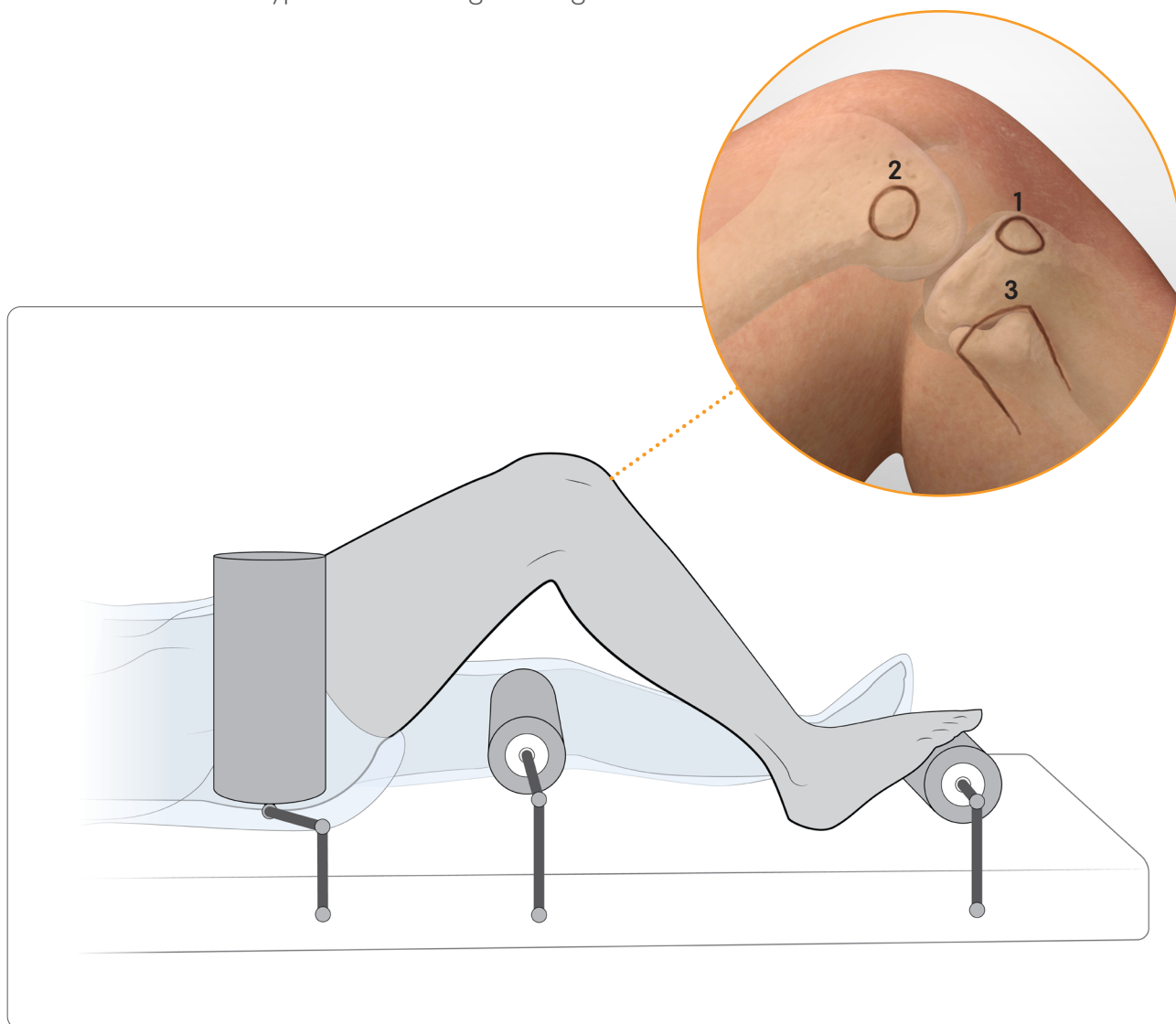
Patient preparation

The procedure is performed with knee flexion starting at 90°. The patient should be positioned as for an ACL reconstruction, lying supine on an operating room table. A lateral hip pad is used to stabilize the pelvis and support the thigh. A distal foot rest is adjusted so that the knee is maintained in 90° of flexion.

The lateral landmarks should be palpated and marked on the skin with a surgical marker pen.

1. Gerdy's tubercle
2. Lateral epicondyle
3. Fibular head

NOTE: For an ACL reconstruction where the femoral tunnel is reamed via an accessory anteromedial arthroscopic portal, some surgeons will prefer to also have an additional proximal footrest to maintain the knee in hyperflexion during reaming.



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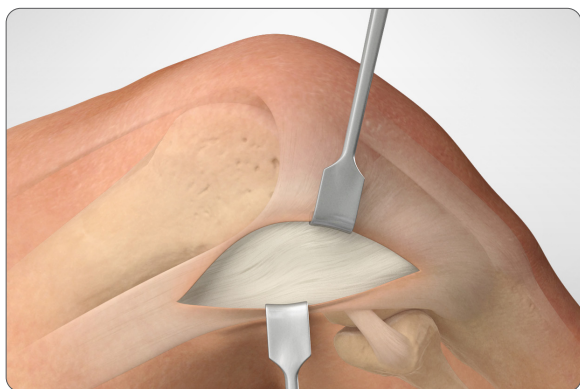


Figure 1

Procedure

The surgical technique is composed of 6 surgical steps.

1. Expose the iliotibial band

- Make an oblique skin incision from Gerdy's tubercle to the lateral epicondyle.
- Using a scalpel, carefully dissect the soft tissue down to expose the iliotibial band (**Figure 1**).

TIP: If the knee is positioned in a figure-of-four position, the lateral collateral ligament (LCL) can also be found in its extent from the fibular head to the lateral epicondyle.

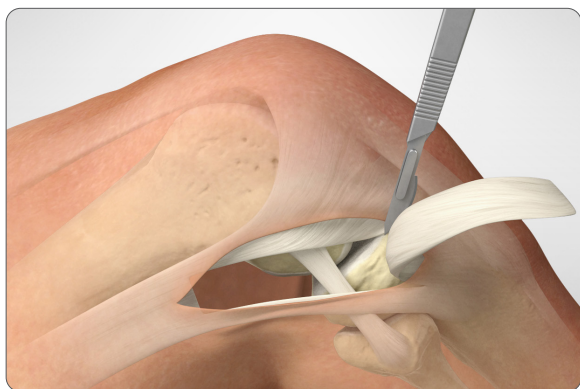


Figure 2

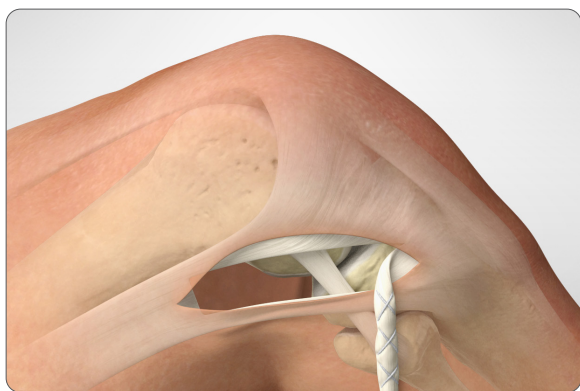


Figure 3

2. Iliotibial band graft harvesting

- Demarcate and harvest an 8cm long and 1.5cm wide strip from the middle part of the iliotibial band (**Figure 2**).
- Leave the distal end attached to Gerdy's tubercle and detach the proximal end with a scalpel.

NOTE: Use careful dissection when releasing the proximal end of the graft, as the lateral genicular artery is sometimes found in this area. A lesion to the lateral genicular artery may cause bleeding and postoperative hematoma.

- The free end of the graft is whipstitched with high strength #2 ULTRABRAID® Suture (**Figure 3**).

NOTE: Take care, not to injure the lateral collateral ligament when harvesting the iliotibial band graft.

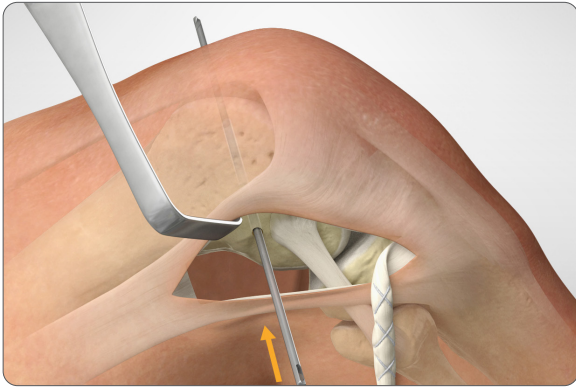


Figure 4

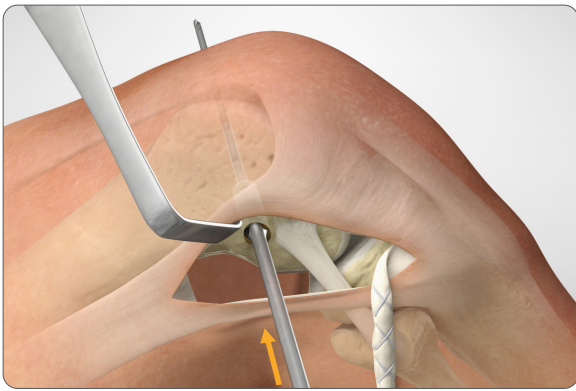


Figure 5

3. Preparation of the femoral attachment

- a. Identify the lateral collateral ligament.
- b. Locate the femoral insertion of the graft at just proximal and posterior to the lateral epicondyle.¹⁸

NOTE: It is important to identify the correct femoral graft insertion site to maintain ideal graft tensioning properties.

- c. Carefully remove the soft tissue overlying the femoral insertion site using cautery.
- d. Position a 2.4mm eyelet Kirschner-wire (K-wire) at the insertion site.
- e. Drill the 2.4mm K-wire through the lateral cortex out of the medial femoral cortex in a slightly anterior and proximal direction to avoid conflict with the ACL femoral tunnel (**Figure 4**).
- f. Over-ream the guide pin with an 8mm cannulated headed reamer to a depth of 20mm (**Figure 5**).

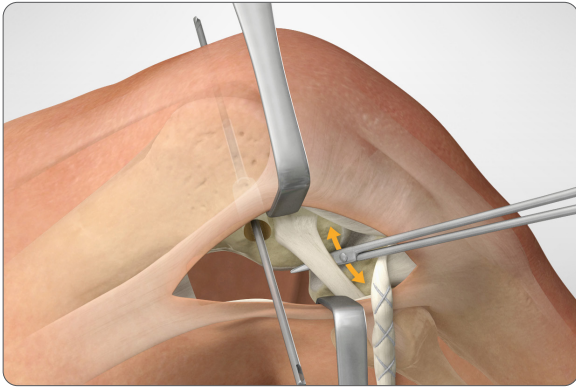


Figure 6

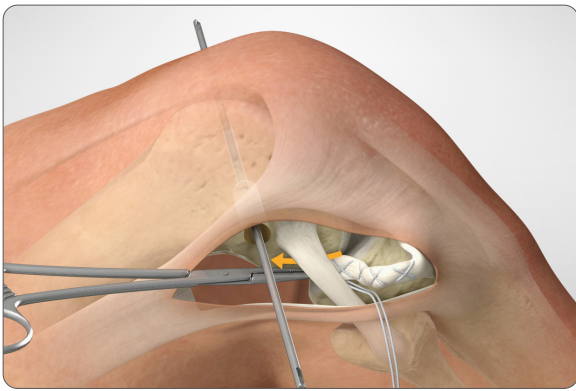


Figure 7

4. Graft passage

- a. Using scissors, carefully separate the layer between the lateral collateral ligament and the lateral capsule, from distal to proximal, whilst preserving the joint capsule (**Figure 6**).
- b. Use a curved clip to route the passing suture of the iliotibial band graft, followed by the iliotibial band graft, from distal to proximal, deep to the lateral collateral ligament (**Figure 7**).

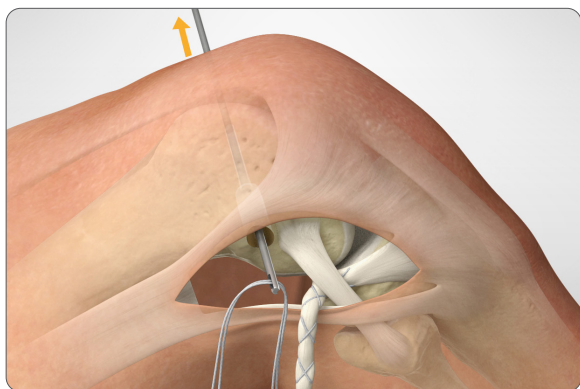


Figure 8

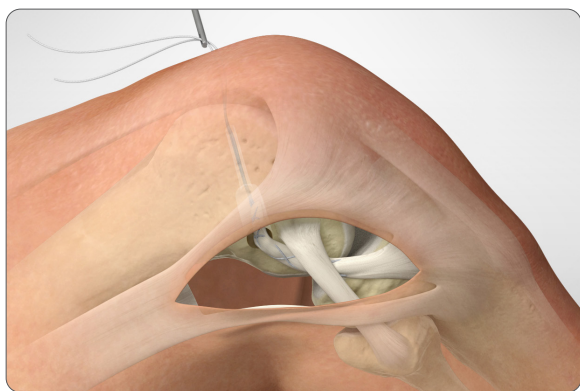


Figure 9

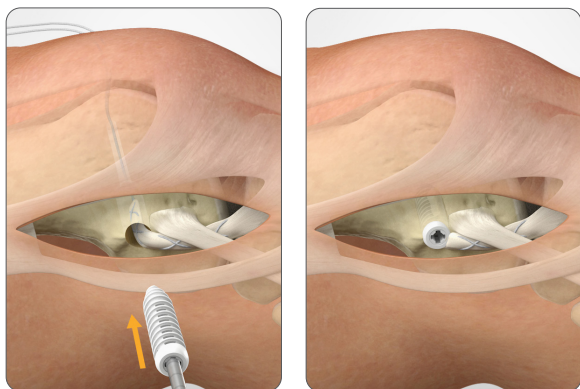


Figure 10

5. Positioning the graft

- Thread the passing suture through the eyelet of the 2.4mm K-wire.
- Pull the 2.4mm K-wire out of the contralateral cortex, pulling the iliotibial band graft into the femoral tunnel (**Figure 8, 9**).
- Place a nitinol wire in the femoral tunnel to facilitate later interference screw fixation.
- Manually set the correct graft tension by pulling the graft (only 20N [2kg] if needed).^{10, 12}
- Position the knee at 30° of flexion with neutral rotation in the leg¹⁹ and fix the graft into the femoral tunnel with an 8mm x 20mm or 9mm x 20mm BIOSURE REGENESORB Interference Screw according to bone hardness (**Figure 10**).

NOTE: No more than 20N [2kg] pull should be used at the time of fixation.^{10, 12}

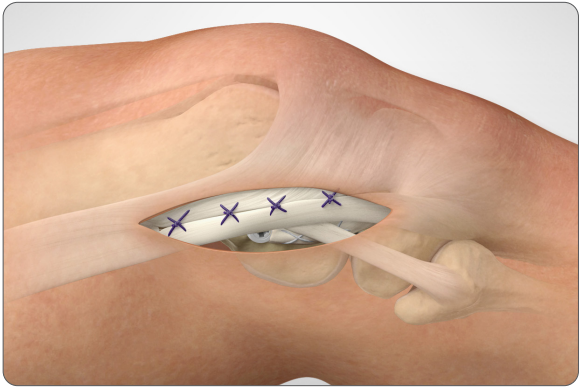


Figure 11

6. Suturing

- Close the iliotibial band using absorbable VICRYL™ sutures at the proximal end to avoid potential muscular herniation (**Figure 11**).
- Close subcutaneous tissue using absorbable VICRYL™.
- Use intracutaneous MONOCRYL™ sutures for skin closure. Tibial tunnel drilling.

Ordering information

ACUFEX® DIRECTOR ELITE® ACL Drill Guide System	
Reference #	Description
013661	Endoscopic Drill, 8mm
BIOSURE® REGENESORB® Interference Screw	
Reference #	Description
72204398	BIOSURE REGENESORB Interference Screw, 8mm x 20mm
72204403	BIOSURE REGENESORB Interference Screw, 9mm x 20mm
Instruments	
Reference #	Description
7211138	Guide Wire, 1.2mm x 12" sterile, 5 per box
72201201	Guide Wire, 1.2mm x 18" sterile, 5 per box

72201887	BIOSURE Driver
72201888	BIOSURE Ratchet Driver (requires Ratcheting Handle with Hudson Adapter, 7207707)
7207707	Ratcheting Handle with Hudson Adapter
72202817	2.4mm x 15" Drill-Tip Passing Pin, sterile, single use, 6 per package
Sutures	
Reference #	Description
7210914	ULTRABRAID® Suture, #2 and Needle Assembly, cobraid, sterile, 38", white, single package, 10 per box
7210915	ULTRABRAID Suture, #2 and Needle Assembly, cobraid, sterile, 38", cobraid-blue, single package, 10 per box

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Additional instruction

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References

1. Dodds AL, et al. *J Bone Joint Surg Br*. 2011;93(11):1440-8. 2. Marcacci M, et al. *Knee Surg Traumatol Arthrosc*. 2003;11(1):2-8. 3. Noyes FR, Barber SD. *J Bone Joint Surg Am*. 1991;73(6):882-92. 4. Vadala AP, et al. *Int Orthop*. 2013;37(2):187-92. 5. Zaffagnini S, et al. *Am J Sports Med*. 2006;14(11):1060-9. 6. Kittl C, et al. *Am J Sports Med*. 2016;44(2):345-54. 7. Goldman AB, et al. *Am J Roentgenol*. 1988;151(6):1163-7. 8. Mansour R, et al. *Skeletal Rad*. 2014;43(10):1369-75. 9. Terry GC, et al. *Am J Sports Med*. 1993;21(1):55-60. 10. Inderhaug E, et al. *Am J Sports Med*. 2016. DOI:10.1177/0363546516681555. 11. Ferretti A. *Joints*. 2014;2(1):41-7. 12. Inderhaug E, Stephen JM, El-Daou H, Williams A, Amis AA. The Effects of Anterolateral Tenodesis on Tibiofemoral Contact Pressures and Kinematics. *Am J Sports Med*. 2017;45(13):3081-3088. 13. Engebretsen L, et al. *Am J Sports Med*. 1990;18(2):169-76. 14. Lemaire M. *J Chirurg*. 1967;93:311-20. 15. Smith+Nephew 2015. BIOSURE REGENESORB ovine ACL implantation study. NCS250. 16. Smith+Nephew 2014. Verif, BIOSURE HA Screw Fixation Strength and Insertion. 15002832 Revision A. 17. Smith+Nephew 2017. Verification & Validation, BIOSURE REGENESORB Interference Screws. 15004843 Revision F. 18. Kittl C, et al. *Am J Sports Med*. 2015;43(2):354-62. 19. Inderhaug E, Stephen JM, Williams A, Amis AA. Anterolateral Tenodesis or Anterolateral Ligament Complex Reconstruction: Effect of Flexion Angle at Graft Fixation When Combined With ACL Reconstruction. *Am J Sports Med*. 2017;45(13):3089-3097.