

SUPER REVO[®]

Rotator Cuff Repair Surgical Technique



THE IDEAL
FIXATION DEVICE FOR
ROTATOR CUFF REPAIR

Patent Pending

 **Linvatec**

SUPER REVO®



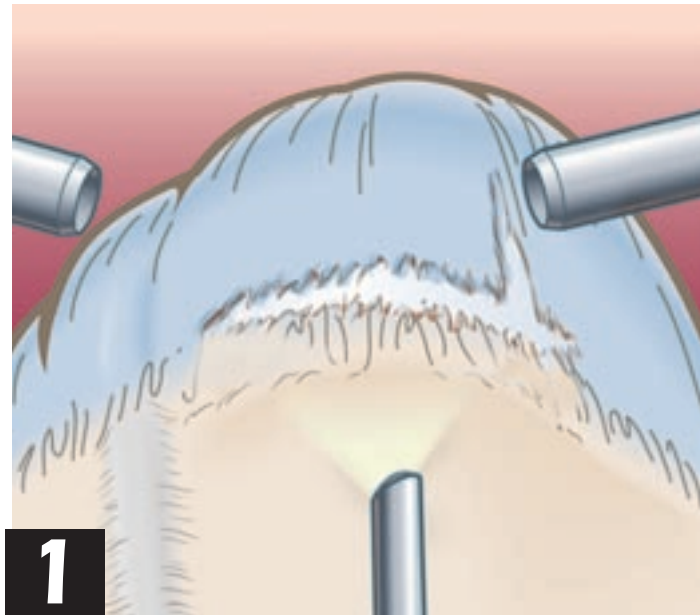
The following techniques are described by Stephen J. Snyder, M.D., Van Nuys, CA.

ROTATOR CUFF REPAIR SURGICAL TECHNIQUE

Steps in repair technique

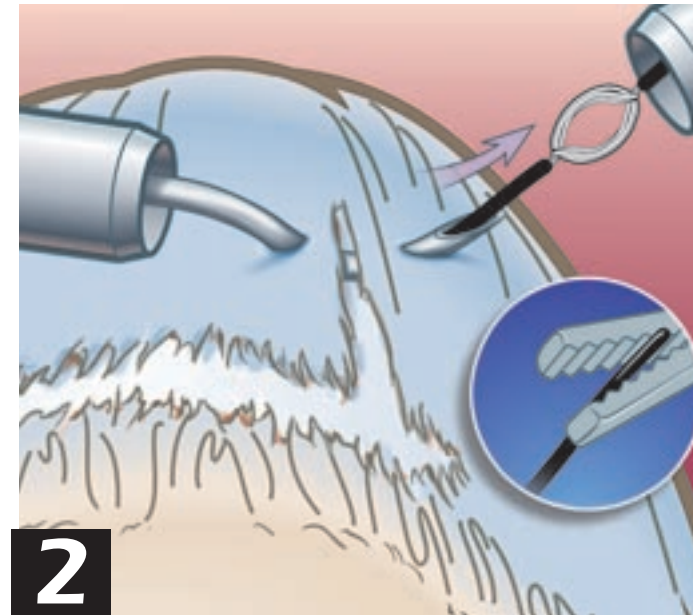
The Linvatec 5mm Super Revo Suture Anchor offers a simple and reproducible technique for arthroscopic or a mini-open rotator cuff repair. The cutting tip requires no pre-drilling and the anchor is pre-threaded with two #2 strands of braided polyester suture. The potential pitfalls of suture management are avoided with the Independent Suture Sliding (I.S.S.™) Eyelet design. The sutures slide with relative ease, which allows for sliding knots to be tied without the worry of locking the other strand and minimizes suture abrasion. In addition, the Super Revo Suture Anchor is designed for improved pullout strength.

The surgeon must have an excellent understanding of the technique and must practice suture passing and knot tying before attempting the operation. The following outline highlights the important steps in a typical rotator cuff repair. Linvatec Corporation will be happy to provide more comprehensive videotape instructions. You may also use an "Alex The Shoulder Professor" shoulder model to practice these techniques prior to surgery. Information can be obtained by calling your local Linvatec representative or Customer Service at (800) 237-0169.



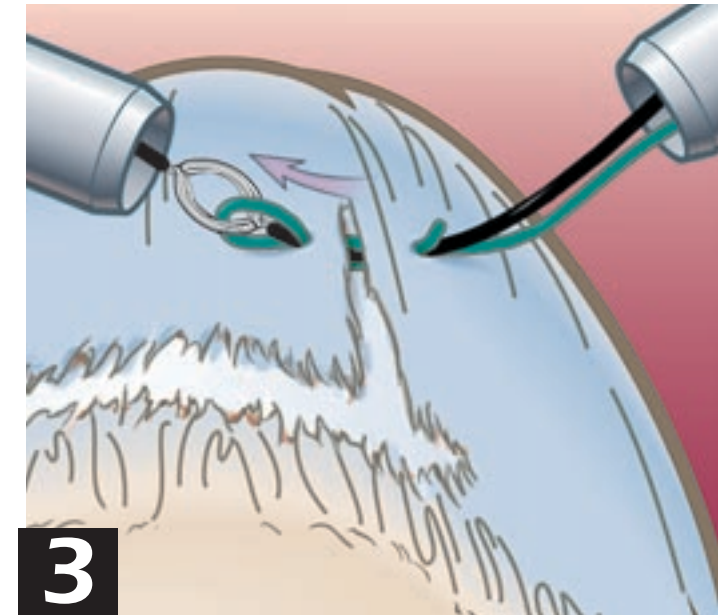
1

The rotator cuff tear is carefully evaluated with an arthroscope on both the articular and bursal sides, and the frayed edges of the cuff are debrided. The best view of the rotator cuff is usually "the 50 yard line" view with the arthroscope in a lateral subacromial portal which is located at the center point of the rotator cuff tear.



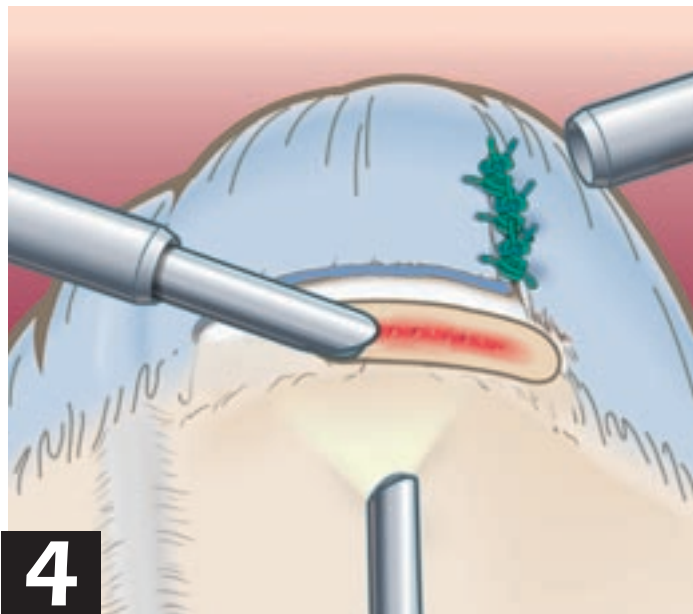
2

A Spectrum® Crescent Suture Hook with a Shuttle Relay™ or a Blitz® suture passer is used to perform a side-to-side repair of longitudinal tears in the rotator cuff tendon.



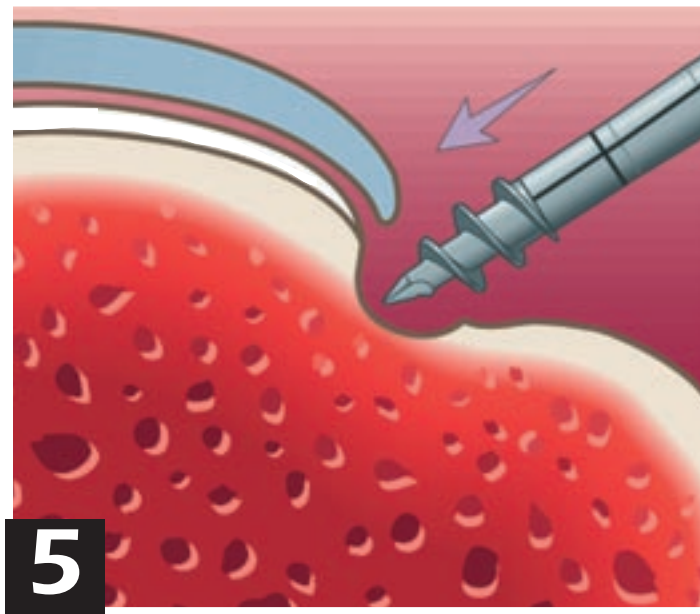
3

After passing the curved suture hook across the tear, a strong, long-lasting suture is carried across the tear and the suture limbs tied together.



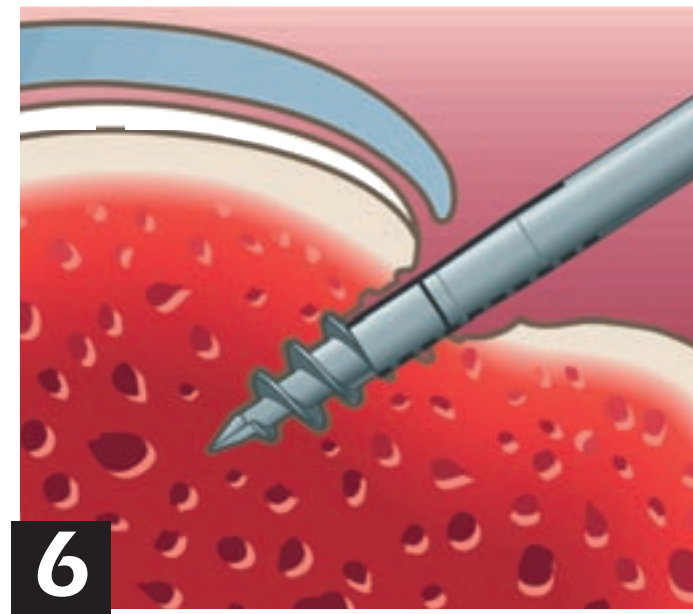
4

The bone is lightly decorticated at the anatomical neck of the humerus, adjacent to the articular cartilage, using a high speed bur and/or shaver. The rotator cuff is mobilized to minimize tension on the repair.



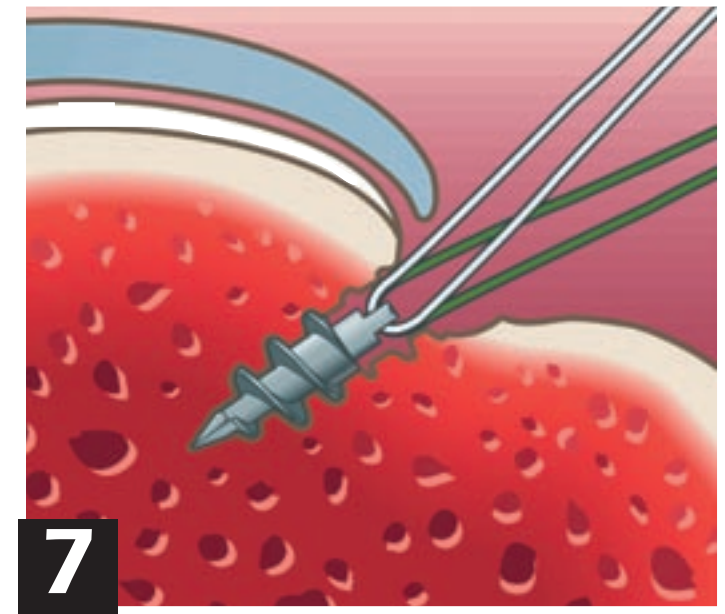
5

A small puncture wound is created adjacent to the lateral border of the acromion. The 5mm Super Revo anchor, preloaded with two strands of #2 braided polyester suture, is inserted directly through the percutaneous puncture wound (no cannula is needed to insert the anchor). The posterior anchor is usually inserted first. The anchor is directed to enter the bone in a medial direction below the subchondral bone at approximately a 45° angle.



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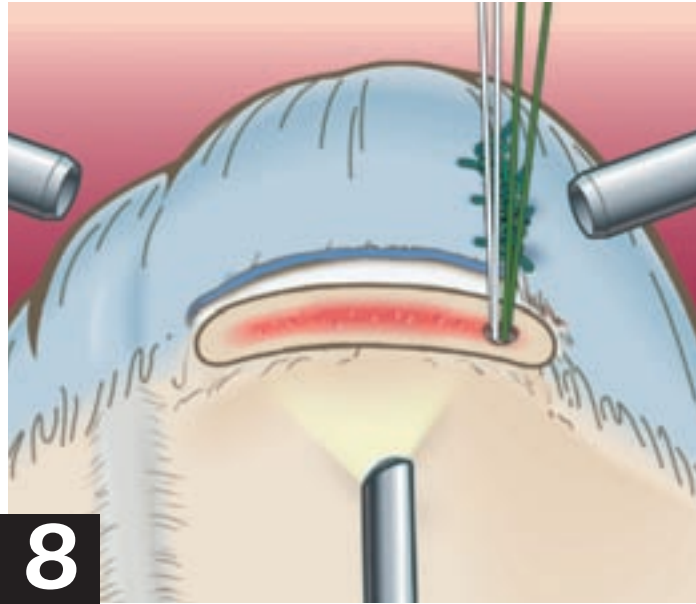
The Super Revo anchor is inserted into the bone until the seating ring on the driver is just below the surface. The vertical orientation mark (solid or dashed line which indicates the direction the anchor eyelet is facing) is aligned toward the cuff edge. This ensures that the suture passes in a direct line from the eyelet to the cuff without forming a twist.



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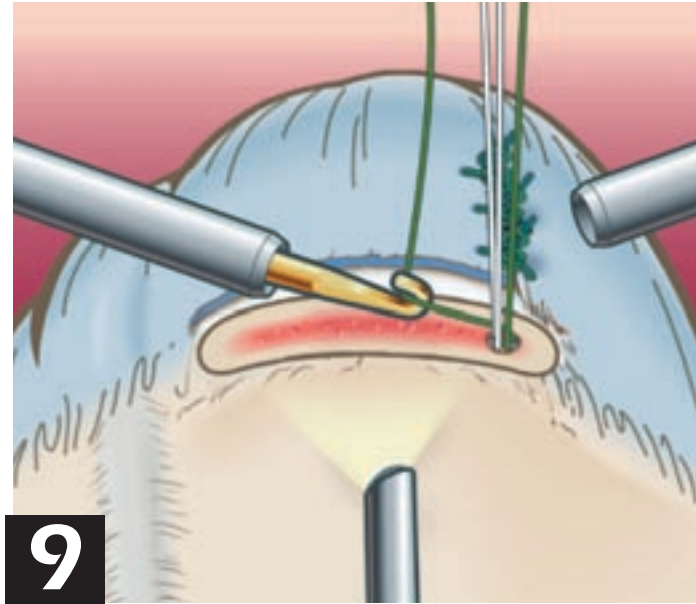
The anchor security is tested by pulling on the suture strands.

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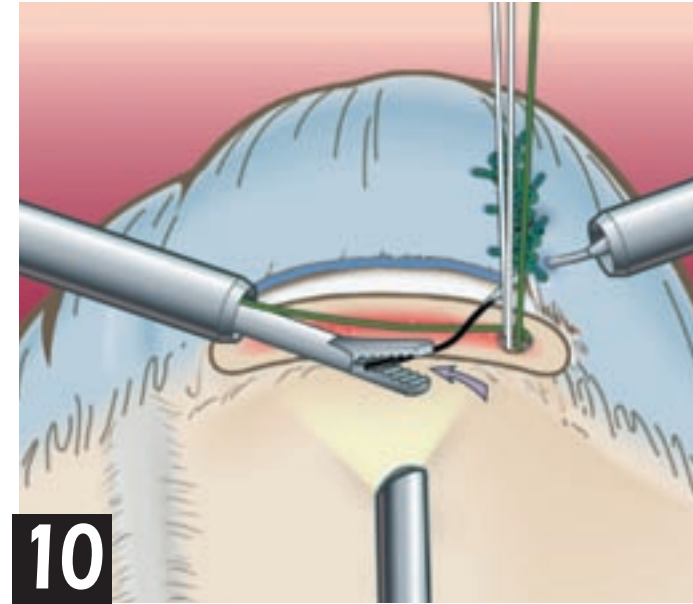
The arthroscope can be positioned in the anterior or posterior portal but most often the overall visualization is best from the lateral acromial portal.



9

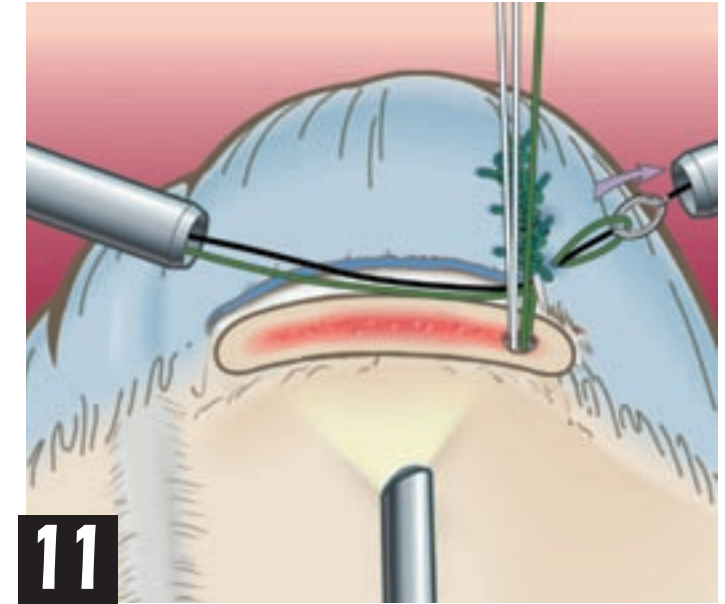
A crochet hook or suture retrieval forceps is inserted through the anterior portal (Linvatec 6mm operating cannula) and retrieves the strand of the green suture that exits the anchor closest to the cuff*. The retriever must pass behind (medial to) the suture limbs.

*Prior to insertion the anchor and suture can be disengaged from the driver. A marking pen can be used to color one side of the suture limbs. This simple maneuver helps to differentiate between the two suture limbs during suture retrieval.



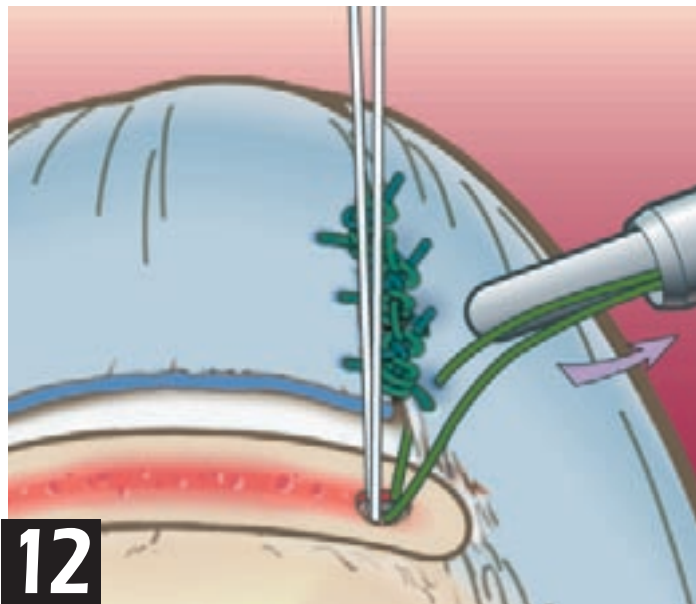
10

A **Spectrum Crescent Suture Hook** is inserted into the posterior cannula and through the bursal side of the posterior edge of the torn rotator cuff 5mm posterior to the anchor. The **Shuttle Relay** suture passer is sent through the hook and retrieved with a grasping forceps out the anterior cannula. Care must be taken to insure that the grasping forceps follows the same path as the green suture when retrieving the **Shuttle Relay** to avoid causing twists in the strands.



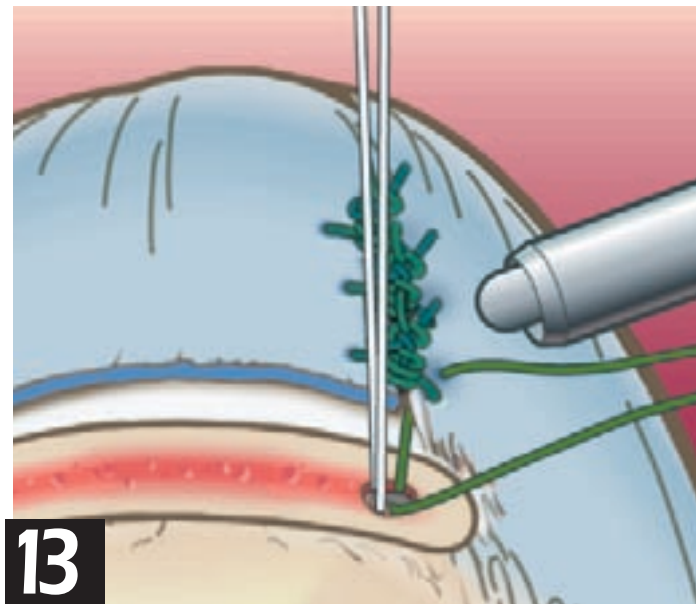
11

The green suture strand is loaded into the eyelet of the **Shuttle Relay** suture passer outside the anterior cannula. The suture is then carried through the cuff from the articular side to the bursal side by withdrawing the opposite end of the suture passer out the posterior cannula.



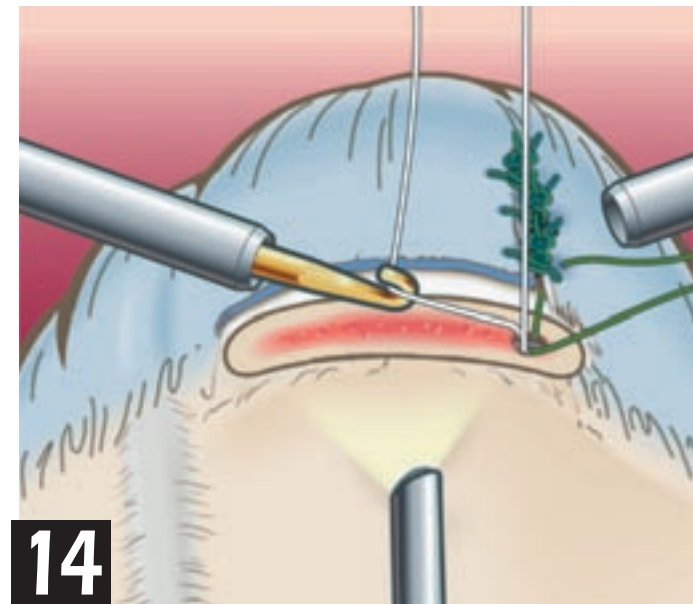
12

A crochet hook is used to retrieve the other limb of green suture into the posterior cannula. A switching stick is then inserted through the posterior cannula and the cannula is removed from the joint.



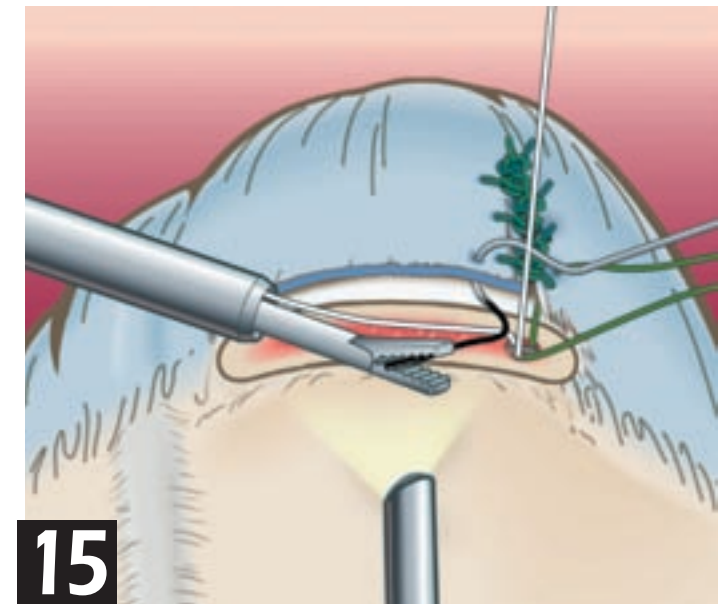
13

The cannula is reinserted over the switching stick leaving the sutures outside the cannula where they will be less likely to be tangled during stitching with the white sutures.



14

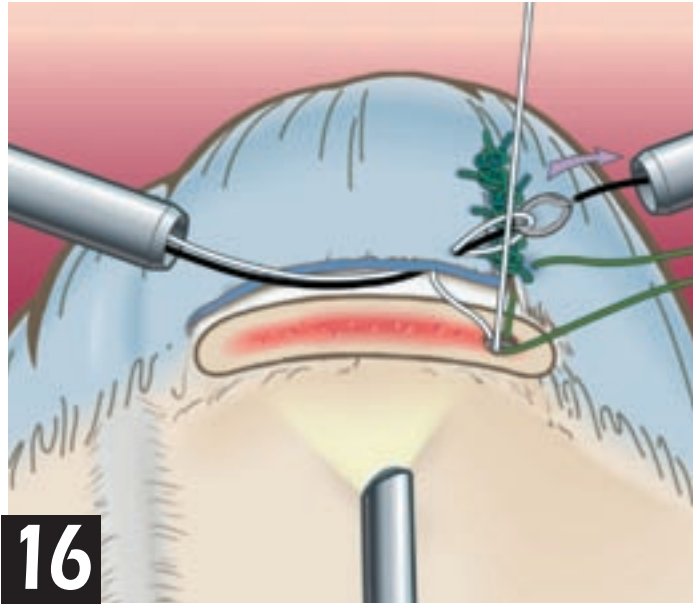
A crochet hook or suture retrieval forceps is used to retrieve the limb of white suture that exits the anchor eyelet closest to the rotator cuff. The suture is pulled through the anterior cannula.



15

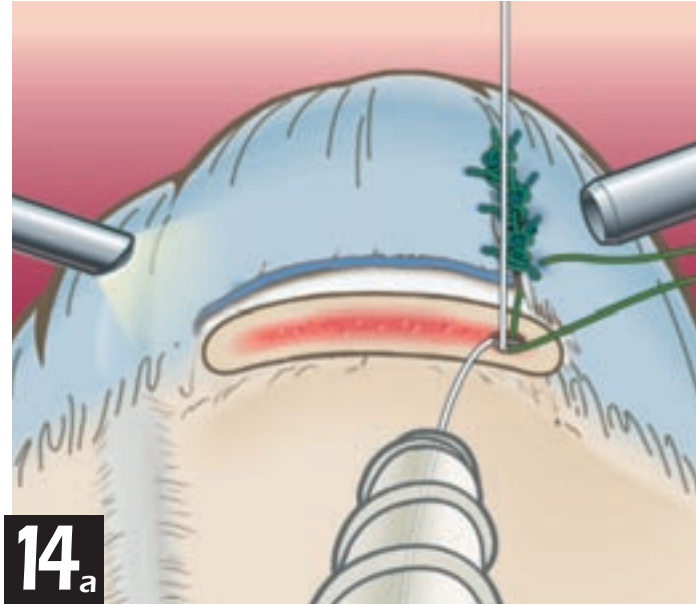
The **Spectrum Suture Hook** is passed through the torn rotator cuff from top to bottom approximately 5mm anterior to the anchor site. If a crescent suture hook is used again, it may be inserted through the posterior cannula. If a more angled suture hook is used, the posterior cannula can be removed and the hook passed directly through the portal without a cannula. The **Shuttle Relay** suture passer is passed through the hook and retrieved with a grasping forceps through the anterior cannula.

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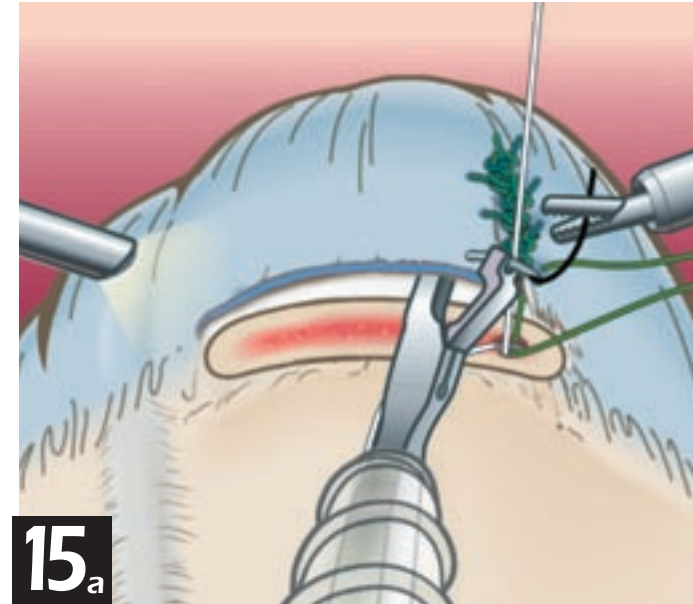
16

The white suture strand is loaded into the eyelet of the **Shuttle Relay** suture passer outside the anterior cannula. The suture is carried through the cuff from the articular side to the bursal side by withdrawing the opposite end of the suture passer out the posterior portal.



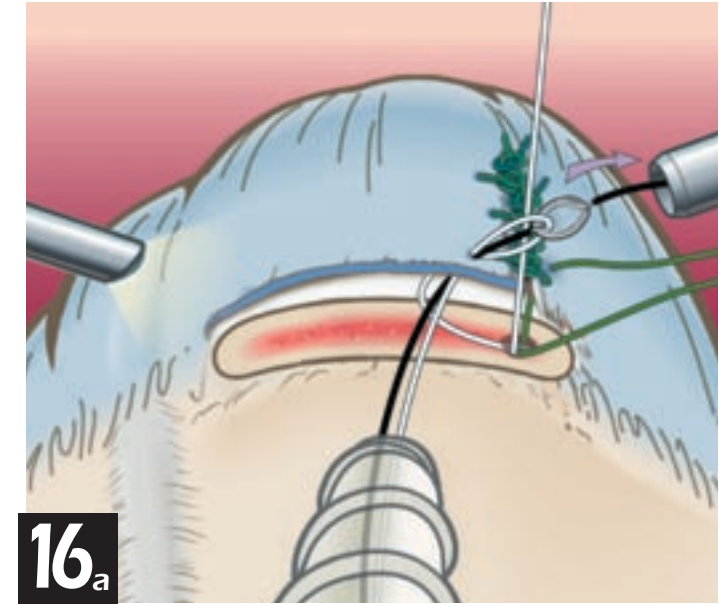
14_a

ALTERNATIVE METHOD (MODIFIED CASPARI SUTURE PUNCH): A crochet hook is used to retrieve the limb of white suture that is closest to the cuff. The suture is pulled out through the lateral cannula.



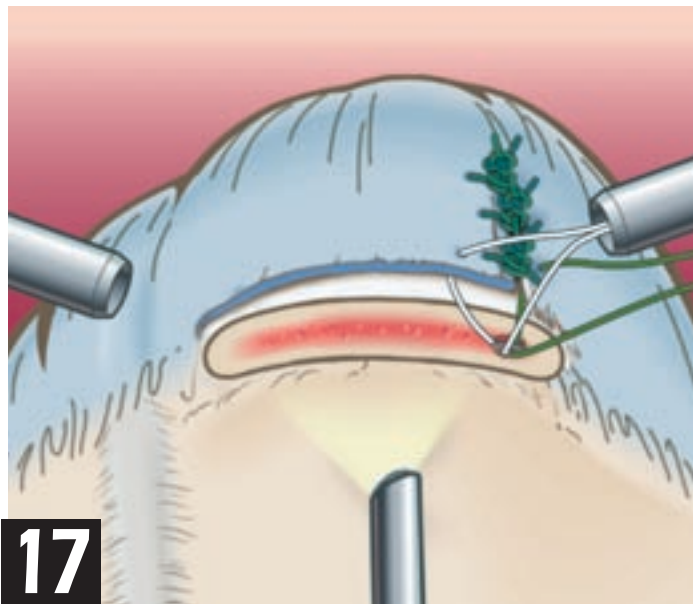
15_a

MODIFIED CASPARI SUTURE PUNCH CONTINUED: With the scope viewing from the anterior portal, a modified Caspari Suture Punch can be inserted through a **6mm ClearFlex Cannula** in the lateral portal to pass a **Shuttle Relay** suture passer from the bottom to top through the cuff. The suture passer is carried out the posterior cannula with a grasping forceps.



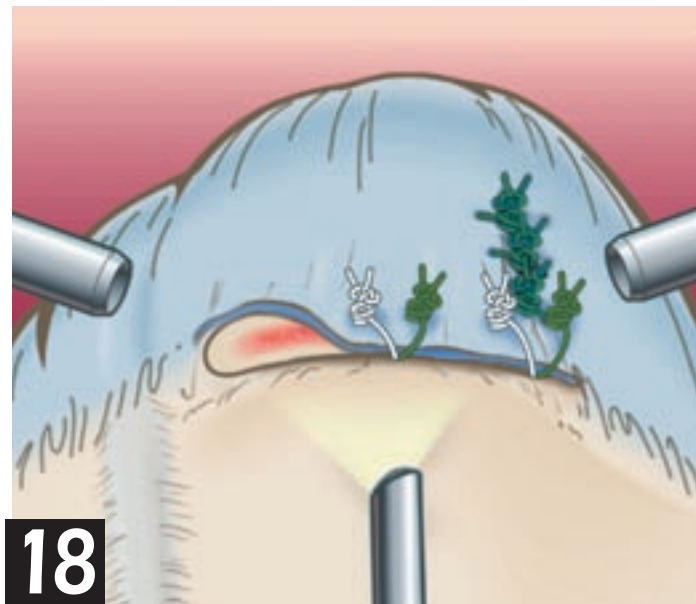
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MODIFIED CASPARI SUTURE PUNCH CONTINUED: The eyelet of the **Shuttle Relay** suture passer is loaded with the suture outside the lateral cannula and carried through the cuff from bottom to top by pulling on the opposite end.



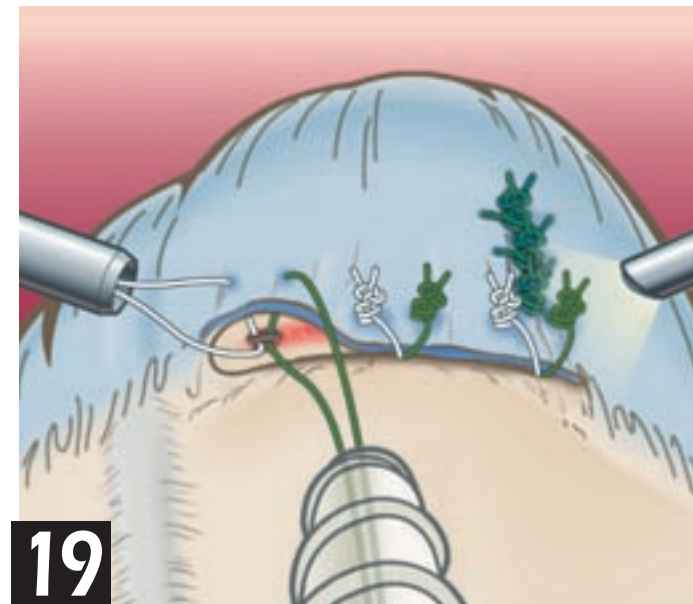
17

The posterior cannula is reinserted and the remaining white suture limb is retrieved using a crochet hook or suture retrieval forceps.



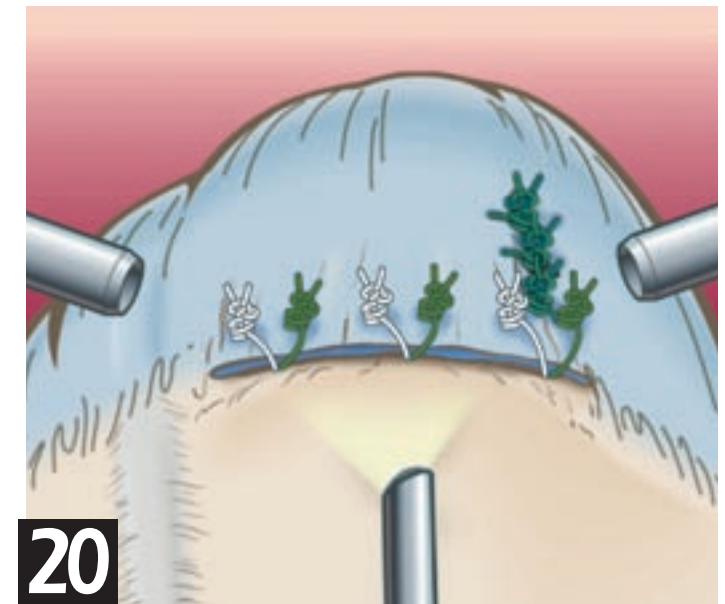
18

The ring handled knot pusher is threaded on to the green suture exiting the top of the cuff. It is passed into the joint to ensure there are no twists or obstructing soft tissue. The green and white suture limbs associated with the posterior anchor are first tied using a knot of choice. The second anchor is placed in a similar fashion, suture limbs passed, and tied down.



19

The arthroscope may be moved to the posterior cannula for visualization. The third (anterior) anchor is placed in the same fashion and suture limbs passed through the cuff, usually suturing from the anterior portal.



20

The illustration of the final repair shows three **Super Revo** anchors in place. Each anchor has two fixation points through the rotator cuff oriented 45° from the anchor. Notice the final side-to-side repair. At the completion of the repair, the torn end of the rotator cuff is tightly opposed to the bone to promote strong rotator cuff tendon healing.

REVO[®] KNOT

The arthroscopic Revo knot is an extremely important knot for all surgeons performing advanced shoulder reconstruction procedures. This knot can be used in any and all situations, whether or not the suture material slides freely through the tissue and anchor eyelet. If a complex stitch such as a figure-of-eight or double-pass mattress stitch is used, this knot is preferable to any sliding knot. In addition, when capsular plication is performed, it is important not to use a sliding knot because of the possible trauma to the labrum as the suture is pulled through.



1. Both suture tails are the same length and the loop-handled knot pusher is threaded onto the suture which has been passed through the soft tissue. This original "post" is positioned on the left side, shown as the darker tail for illustration purposes. The knot pusher is passed down the original post suture to ensure that there are no twists or soft tissue obstructions.



2. An **underhand** half-hitch is placed around the original post and advanced into position on the edge of the soft tissue.



3. Tension is held on the post suture while a second **underhand** half-hitch is worked down the post suture to reinforce the first hitch.



4. An **overhand** half-hitch is next placed on the same initial post and worked down into position on the other two throws.



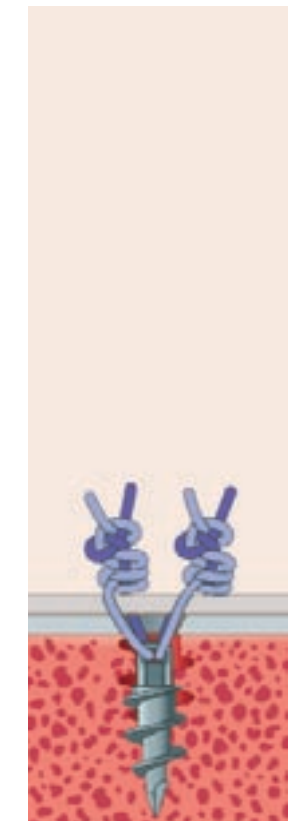
5. The knot pusher and clamp are changed to the opposite suture and after checking for twists and soft tissue, an **underhanded** throw is advanced down onto the knot stack.



6. The knot pusher is advanced to "past point" to lock the half-hitch securely.



7. A fifth **overhand** half-hitch is placed over the second post and worked down into position on the knot stack.



8. Sometimes a sixth half-hitch can be used as the surgeon prefers, and the suture tails are cut with microscissors.

SMC KNOT

The SMC knot* is a unique sliding knot that utilizes a self-locking loop to achieve good initial knot security. The SMC knot is low profile and there is minimal or no slack once the knot is secured. The SMC Knot cannot be used if the sutures do not easily slide through the soft tissues. If there is any doubt about the freedom of suture passage, then the Revo knot should be used.



1. Thread the knot pusher on the post strand (held in the left hand) and place a clamp on the post. Pass the knot pusher into the joint to ensure that there are no twists or obstructing soft tissue. Arrange the suture so that the original post suture is short, with only 10cm of the suture outside of the cannula.



2. Pinch the two strands together between the thumb and index finger, crossing the loop strand over the post.



3. Pass the loop suture under and then over both strands.



4. Pass the loop strand under the post strand between the two sutures and over the top of the post strand in a direction away from the pinching fingers. There will be a triangular interval formed between the two previous loops over the post strand (red arrow).



5. Feed the free end of the loop strand from bottom to top through this interval under the post strand. As the suture is pulled through, a "locking loop" is created (blue arrow).



6. Release the thumb and index finger and place the left index finger into the "locking loop" from bottom to top to keep it open. Remove all slack (dress the knot) from the sutures with the index finger in place to avoid tightening the "locking loop" prematurely.



7. Pull on the post strand and use the knot pusher to guide the knot down to the tissue. **Do not pull on the loop strand until the knot is seated.** Maintain tension on the post strand and back off the knot pusher to assess the knot.



8. Once satisfied that the knot is well seated, tighten the "locking loop" by pulling on the loop strand while maintaining pressure on the knot with the knot pusher.



9. The "locking loop" will slide over the knot pusher and secure the knot. For further security, an **underhand** half-hitch is worked down the post suture.



10. An **overhand** half-hitch is next placed on the post and worked down into position onto the knot stack.



11. Suture tails are cut with microscissors.

*Developed by Seung-Ho Kim, M.D., Samsung Medical Center, Seoul, Korea

ORDERING INFORMATION

THE SUPER REVO® SHOULDER FIXATION SYSTEM

Implants

Super Revo Suture Anchor, 5.0mm, pre-loaded on a disposable driver C6140
(pre-threaded with two #2 braided polyester sutures - green and white)

Suture Passing Instruments

Slotted Jaw, Suture Punch, 4.0mm needle 18.1008
Spectrum Instrument Set:
Suture Hook Handle 27.00011
Suture Hook, Straight 97.10015
Suture Hook, 45° Left Curve 97.14115
Suture Hook, 45° Right Curve 97.14215
Suture Hook, 90° Left Curve 97.19115
Suture Hook, 90° Right Curve 97.19215
Crescent Suture Hook, Small Curve, 3.0 x 15.0mm C8740
Crescent Suture Hook, Medium Curve, 4.0 x 20.0mm C8741
Crescent Suture Hook, Large Curve, 6.0 x 25.0mm C8742
Shuttle-Relay™ Suture Passer (10 per box) C6004
Blitz® Suture Retriever, Straight (6 per box) C6111
Blitz® Suture Retriever, 45° Left (6 per box) C6211
Blitz® Suture Retriever, 45° Right (6 per box) C6311
Hawkeye® Suture Needle (6 per box) C6001

Accessories

Loop Handle Knot Pusher C6112
Crochet Hook C6105
Microscissors, 2.75mm Diameter, Straight 2.10011
Grasping Forceps, 3.4mm Diameter, Straight with Ratchet 11.1001
Suture Retrieval Forceps, 3.4mm Diameter 16.1018
Liberator Knife 25.50014

Entry Systems (Disposable)

6.5mm x 73.0mm Clear Flexible Cannula with Disposable Conical Obturator .. C7312
6.0mm x 50.0mm Cannula with Disposable Conical Obturator
Threaded Body C7322
Smooth Body C7324
6.0mm x 75.0mm Cannula with Disposable Conical Obturator
Threaded Body C7332
Smooth Body C7334
6.0mm x 90.0mm Cannula with Disposable Conical Obturator
Threaded Body C7342
Smooth Body C7344
8.4mm x 50.0mm Cannula with Disposable Conical Obturator
Threaded Body C7352
Smooth Body C7354
8.4mm x 75.0mm Cannula with Disposable Conical Obturator
Threaded Body C7362
Smooth Body C7364
8.4mm x 90.0mm Cannula with Disposable Conical Obturator
Threaded Body C7372
Smooth Body C7374
70.0mm Universal Cannula Set with Fenestrations 9704
70.0mm Universal Cannula Set without Fenestrations 9718

