Technical Note

Arthroscopic Transosseous Suture Anchor Technique for Rotator Cuff Repairs

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Abstract: The skin is incised 1 to 2 cm distal to the lateral portal. A transosseous tunnel is created through the greater tuberosity by a sharp penetrator, entering 1.5 to 2 cm distal to the top of the greater tuberosity. The penetrator exits medially, between the tip of the greater tuberosity and the articular surface of the humeral head, in the middle of the footprint. The first anchor, a 5-mm Spiralok (DePuy Mitek, Norwood, MA) is placed at the penetrator's exit site on the footprint. Using a specially designed suture leader, the lateral limb of the suture in the anchor, which passes through the previously created transosseous tunnel, is taken from the anchor and pulled out. The other suture end is passed through the supraspinatus tendon. The second suture, placed superficially in the anchor, is passed from the anchor through the supraspinatus tendon, as a mattress suture. If more anchors are required, the procedure should be repeated. The transosseous suture limb and the suture limb that is passed through the supraspinatus tendon are tied through the lateral portal. The knot tying is then performed with a sliding Delimar knot. The mattress suture, passing through the supraspinatus tendon, is tied through the anterior lateral portal. The knot tying procedure is repeated depending on the number of anchors. **Key Words:** Rotator cuff repair—Transosseous suture anchor.

Arthroscopic rotator cuff repairs with suture anchors are the most commonly used techniques. The use of suture anchors has become more popular because of the simplicity and decreased surgical exposure and morbidity.[1,2] The success of a rotator cuff repair depends of the suture material, tendon-grasping technique, and tendon-to-bone fixation.[3,4] The weak point of the tendon-to-bone fixation using a single-row suture anchor technique is the inability to restore the normal medial-to-lateral width of the rotator cuff footprint.[5] The authors have developed an arthroscopic transosseous technique using single-row suture anchors for rotator cuff repairs that can re-establish the normal rotator cuff footprint and may potentially improve healing and mechanical strength of repaired tendons.

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Cite this article as: Cicak N, Klobucar H, Bicanic G, Trsek D. Arthroscopic transosseous suture anchor technique for rotator cuff repairs. Arthroscopy 2006;22:565.e1-565.e6 [doi:10.1016/j.arthro.2006.07.029].

0749-8063/06/2205-0543$32.00/0

doi:10.1016/j.arthro.2005.07.029

SURGICAL TECHNIQUE

The patient is placed in the beach-chair position. Diagnostic glenohumeral arthroscopy is performed using a standard posterior portal. The full-thickness tear is completely visualized from the articular side. The camera is placed into the subacromial space and a complete bursectomy is performed. An acromioplasty is performed as needed. The precise location of the lateral portal is made with a spinal needle. The lateral portal should be in the middle of the tear. The lateral portal is made 1 cm posterior to the anterior acromial border and approximately 2 to 3 cm distal to the

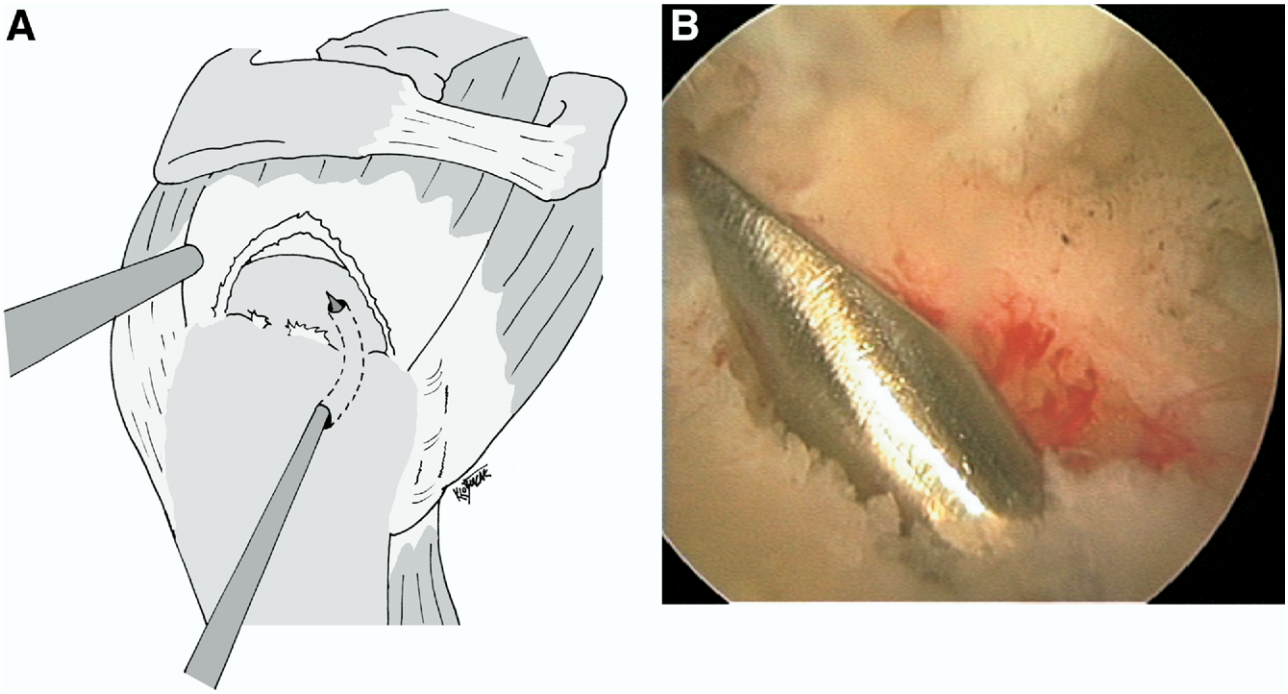

Figure 1. (A) A transosseous tunnel is created through the greater tuberosity by the sharp Alter-Fit penetrator. (B) The penetrator exits medially in the middle of the footprint.

acromion border. The lateral portal should allow the cannula to enter midway between the humeral head and the acromion. The lateral anterior portal is located 2 to 3 cm distal to the anterior acromion or 2 to 3 cm anterior from the lateral portal. The area between the greater tuberosity and articular surface is abraded to bleeding bone with an abrader through the lateral portal without using cannula.

The skin is incised 1 to 2 cm distal to the lateral portal. A transosseous tunnel is created through the greater tuberosity by a sharp penetrator (a specially designed device; Alter-Fit, Zagreb, Croatia), entering 1.5 to 2 cm distal to the top of the greater tuberosity. The penetrator exits medially, between the tip of the greater tuberosity and the articular surface of the humeral head, in the middle of the footprint (Fig 1). The camera is placed in the lateral portal or in the posterior portal, depending on the possibility of visualizing the footprint and the lateral portion of the greater tuberosity at the site of penetrator entry. The first anchor, a 5.0-mm Spiralok with oval-shaped dual suture eyelet (DePuy Mitek, Norwood, MA) is placed at the penetrator's exit site on the footprint (Fig 2A). Using a specially designed suture leader (Alter-Fit) the lateral limb of the suture in the anchor (white suture), which passes through the previously created transosseous tunnel, is taken from the anchor and pulled out (Fig 2B and C). The other suture end is passed through the supraspinatus tendon by flexible suture passer Expressew (DePuy Mitek), through the lateral or anterior lateral portal, depending on the placement of the camera. The second suture, placed superficially in the anchor (green suture), is passed from the anchor through the supraspinatus tendon with the Expressew instrument, as a mattress suture (Fig 3). If more anchors are required, the procedure should be repeated. The transosseous suture limb and the suture limb that is passed through the supraspinatus tendon are tied through the lateral portal. The knot tying is then performed with a sliding Delimar knot,[6] with the arm in abduction of approximately 30° to 40°. The mattress suture, passing through the supraspinatus tendon, is tied through the anterior lateral portal (Fig 4). The knot tying procedure is repeated depending on the number of anchors.

Patients

Fifteen patients were operated on with the use of this technique. The average follow-up was 16 months (range, 12 to 24 months). The size of the tears was type I or II according to Bernageau. There were sev-

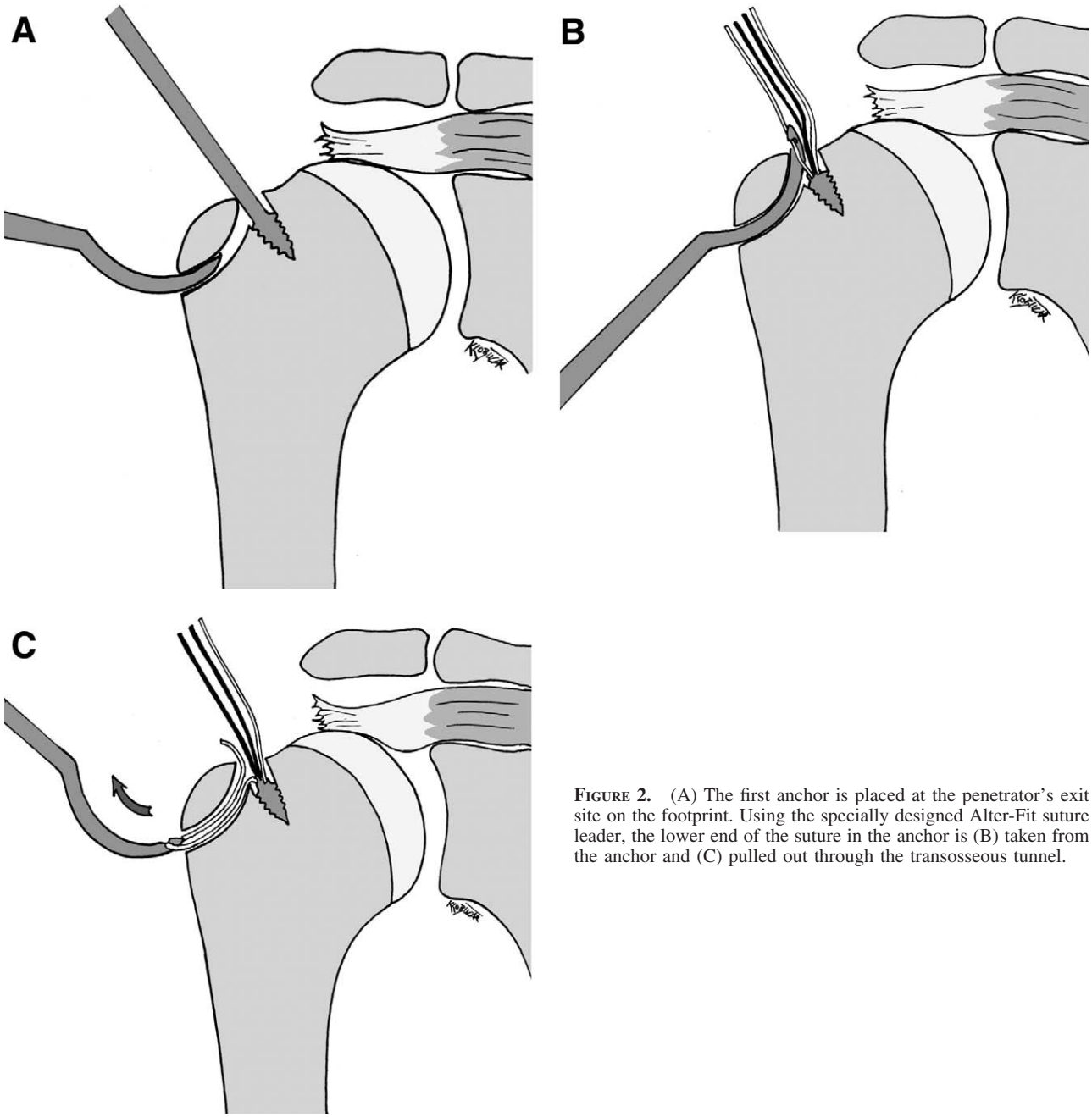

FIGURE 2. (A) The first anchor is placed at the penetrator's exit site on the footprint. Using the specially designed Alter-Fit suture leader, the lower end of the suture in the anchor is (B) taken from the anchor and (C) pulled out through the transosseous tunnel.

eral suture breakages in the beginning using metal anchor. There were no postoperative complications. All patients were satisfied with this procedure.

DISCUSSION

The footprint cannot be adequately restored with a single-row suture anchor technique.[7] The original footprint of the rotator cuff using single-row suture anchor technique is restored to only 67% of its surface area. On the contrary, approximately 85% of the surface of the footprint can be restored by a transosseous simple suture technique. A double-row repair technique provides adequate covering of the footprint, increases the area of contact for healing, and improves the mechanical strength of the repaired rotator cuff.[5]

FIGURE 3. Position of the sutures before knot tying procedure.

The transosseous suture anchor technique can be compared with double-row repair technique. With the addition of 1 transosseous suture to 2 anchors, the strength of the repair could be doubled.[8] The footprint is fully reconstructed by using the transosseous suture anchor technique.

The suture anchor can migrate and become loose because of the osteoporosis of the proximal part of the humerus.[9] This problem could be improved with the anchor, which is stabilized using transosseous suture through the greater tuberosity while the supraspinatus tendon is directly fixed to the bleeding bone by the same transosseous suture and by the mattress suture. The weak point of the transosseous anchor technique is imprecise position of the penetrator exit site on the footprint. An animal study will be required to compare the double-row repair technique with transosseous suture anchor technique in terms of mechanical strength and reconstruction of the footprint after completion of the healing process. This technique can be used for open, mini-open, and arthroscopic rotator cuff repairs.

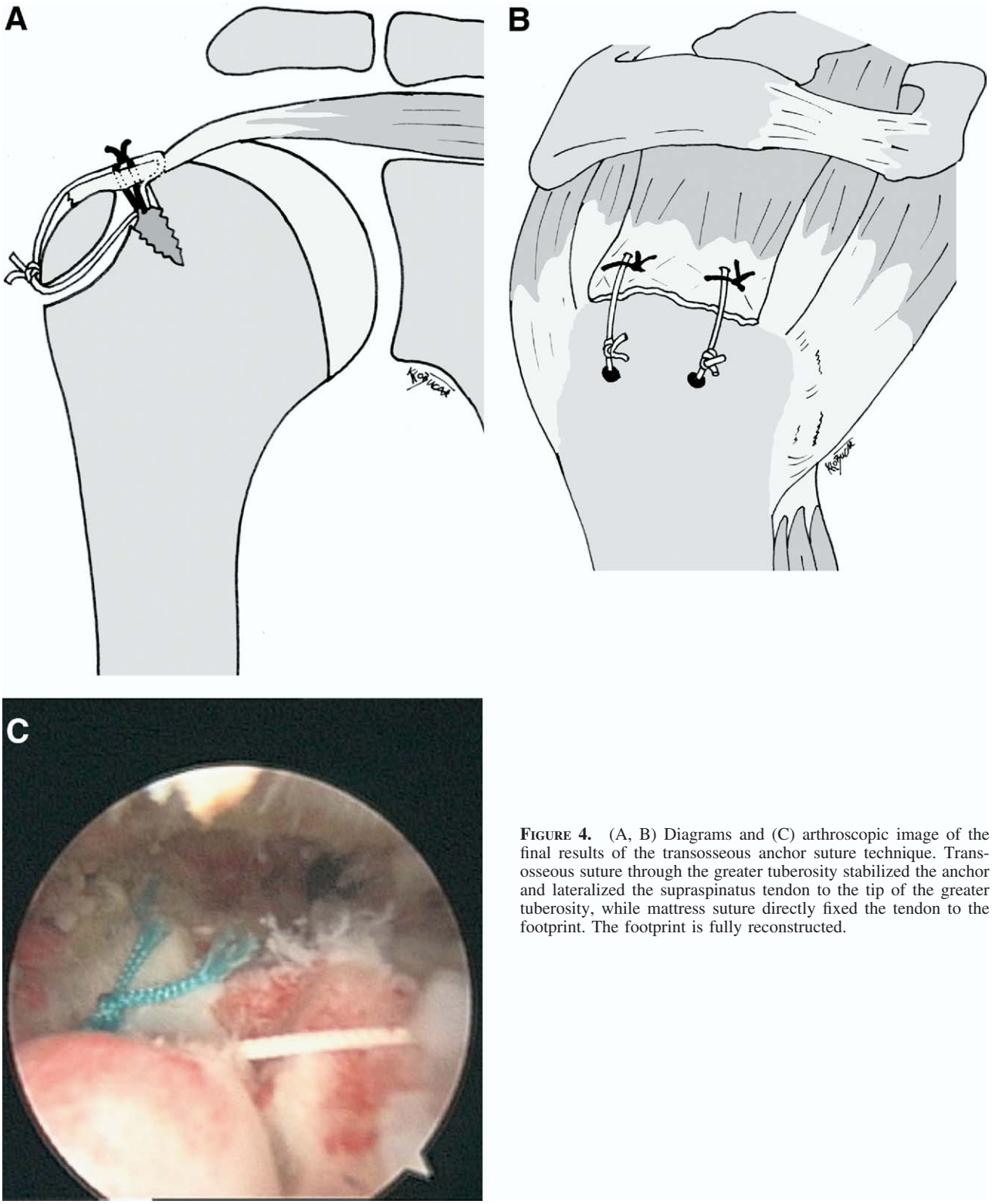

Figure 4. (A, B) Diagrams and (C) arthroscopic image of the final results of the transosseous anchor suture technique. Transosseous suture through the greater tuberosity stabilized the anchor and lateralized the supraspinatus tendon to the tip of the greater tuberosity, while mattress suture directly fixed the tendon to the footprint. The footprint is fully reconstructed.

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