



Original article

In situ repair of partial articular surface lesions of the supraspinatus tendon[☆]



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ABSTRACT

Objective: To demonstrate the *in situ* repair technique of high-degree partial-thickness articular surface lesions of the supraspinatus tendon (SS). The procedure consists of the arthroscopic surgical repair of these lesions, without the need to complete the lesion, as occurs in traditional classical technique. A small incision is made in the longitudinal direction of the intact bursal fibers and where bone fixation anchors are introduced, which makes the procedure easier. These anchors are transferred to the tendon and thus enable the repair of the lesion.

Methods: 48 shoulders were operated in the period 2010–2015. The minimum follow-up was 12 months and maximum 60 months. Ages ranged from 38 years to 75 years (mean 54 years). They were indicated for the repair of high-degree symptomatic lesions and at least 30% intact superior bursal fibers of good quality.

Results: Patients were evaluated according to the UCLA criteria, the results were: 69% excellent, 17% good, 7% fair, and 7% poor. Fair results occurred in three patients with associated symptoms of polyarthralgia who remained with residual pain. Three patients developed postoperative joint stiffness (7%).

Conclusion: The procedure under study is safe and easy to reproduce. It shows high rates of positive results (86%). The opening made in the bursal side of the SS tendon allowed the arthroscope to remain in the subacromial space, making it easier to perform surgery.

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Técnica de reparo *in situ* das lesões parciais da superfície articular do tendão do supraespal

R E S U M O

Palavras-chave:

Articulação do ombro/lesões
Articulação do ombro/cirurgia
Artroscopia

Objetivo: Demonstrar a técnica de reparo *in situ* das lesões de espessura parcial da superfície articular de alto grau do tendão do supraespal (SE). O procedimento consiste no reparo cirúrgico dessas lesões por *via* artroscópica, sem a necessidade de completar a lesão, como ocorre na técnica clássica tradicional. É feita uma pequena incisão longitudinal no sentido das fibras intactas bursais, por onde são introduzidas as âncoras de fixação óssea, o que torna mais fácil o procedimento. Essas âncoras são transferidas para o tendão e assim se faz o reparo da lesão.

Métodos: Foram operados 48 ombros de 2010 a 2015. O seguimento mínimo foi de 12 meses e o máximo de 60. A idade variou de 38 anos a 75 (média de 54). Foram indicadas para o reparo as lesões sintomáticas de alto grau que apresentassem pelo menos 30% da fibras superiores bursais intactas e de boa qualidade.

Resultados: Os pacientes foram avaliados segundo os critérios da Universidade da Califórnia em Los Angeles (UCLA), obtiveram-se resultados excelentes em 69%, bons em 17%, razoáveis em 7% e ruins em 7%. Os resultados razoáveis ocorreram em três pacientes que apresentavam sintomas associados de poliartralgia e permaneceram com dor residual. Três pacientes desenvolveram rigidez articular no pós-operatório (7%).

Conclusão: O procedimento em estudo é seguro e de fácil reprodutibilidade e apresenta altos índices de resultados positivos (86%). A abertura feita no lado bursal do tendão do SE permitiu a manutenção do artroscópio no espaço subacromial e tornou mais fácil a cirurgia.

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Introduction

Partial type A supraspinatus (SS) tendon lesions are incomplete tears located on the lower surface of the tendon with intact fibers on the superior side. They are also known as partial articular supraspinatus tendon avulsion (PASTA) lesions.¹ These lesions may produce symptoms and surgery is indicated after failure of conservative treatment.

There are two different techniques for closing PASTA lesions, both of which can be performed videarthroscopically. The classical technique² is the “complete and repair,” that is, to close the defect it is necessary to detach the SS tendon from the greater tubercle of the humerus. This transforms the partial lesion into a complete lesion, so that the traditional repair with anchors can be made. The other technique is the trans-tendon repair,¹ which consists of reconstructing the lesion without detaching the bursal fibers. Fixation anchors are introduced from above through these fibers and closure is made by the suture anchors. For this technique, it is necessary to constantly move the arthroscope from the glenohumeral joint to the subacromial space and *vice versa*.

The author describes a method similar to traditional trans-tendon repair, but simpler and more reproducible. This study aimed to demonstrate this surgical method, developed by the author to facilitate the procedure. Following the same principle of longitudinal opening the SS tendon to introduce intramedullary nails into the humerus, after closure, healing is facilitated. Based on this aspect, a small longitudinal opening is made in the intact fibers in which the anchors are inserted to be fixated into the bone and then transferred into the

tendon so that the suture can finally be made. In this technique, the arthroscope can be kept in the subacromial space during the entire surgical procedure.

Material and methods

This study was approved by the Institutional Review Board under CAAE No. 56917516.1.0000.5138.

48 shoulders were operated from 2010 to 2015. Minimum postoperative follow-up time was 12 months and maximum was 60 months. Of the 42 evaluated shoulders, 34 (81%) were from female patients and eight (19%) from male patients; 32 were on the right side and 10 on the left side. Patient's age ranged from 38 to 75 years (mean 54 years). Partial articular SS lesion (type A) was diagnosed by radiography and magnetic resonance imaging (MRI) in all cases. Surgery by this technique was indicated in symptomatic patients refractory to treatment by physical therapy, corticosteroid infiltration, and analgesic use for at least three months. Lesions were partial type A of high grade, and they had at least 30% intact, good quality superior fibers observed on MRI and confirmed by arthroscopy. The cases of association with other procedures – such as distal clavicle resection, biceps tenodesis, and glenohumeral joint instability – were excluded from the study.

Surgical technique

Arthroscopy is performed with the patient in lateral decubitus and longitudinal traction, under general anesthesia and brachial plexus blockade. Posterior, lateral, posterolateral, and

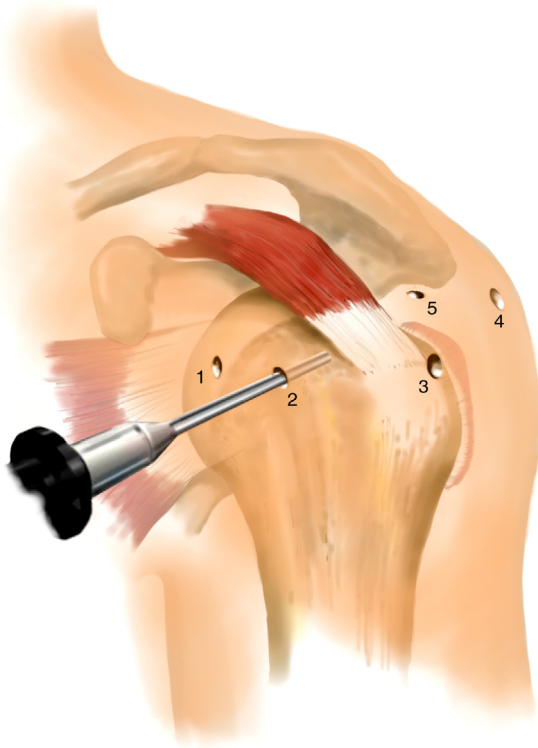


Fig. 1 – Portals: (1) posterior; (2) posterosuperior; (3) lateral; (4) anterior; (5) anterosuperior.

anterior portals are made (Fig. 1), as well as an anterosuperior miniportal. Initially, a joint inspection is performed to diagnose and correct other existing associated lesions. Then, the classical fibrillation of the lower portion of the SS tendon is visualized. At this time, the assistant surgeon forces the shoulder into approximately 80° of abduction, and inferiorly subluxates the humeral head to improve the view of the articular surface of the SS tendon. Through the anterior portal, a soft tissue shaver is used to debride all fibrillation and prepare a bone bed. The lesion is marked with a suture marker, which is introduced from above through a Jelco No. 14 (Fig. 2) catheter to be positioned on the bursal side. This wire should be located in the most medial portion of the lesion and in the normal tendon transition. During bursoscopy, the suture marker is located and the posterolateral portal is made, to which the arthroscope is transferred. After the bursectomy, a shoulder cannula is placed in the lateral portal and a probe is used to assess the quality of the remaining intact fibers; if the quality is poor, i.e., the fibers are friable and translucent, then the preferred approach is to complete the injury and perform the repair. If the quality is good, then the *in situ* repair technique is used. At this point, a longitudinal incision of approximately 10 mm long is made in the direction of the tendon fibers, from the suture marker toward the greater tuberosity, without damaging the tendon insertion (Fig. 2). This opening meets the bone bed, which has already been prepared during the joint inspection. This incision is opened with a retractor to improve depth vision (Fig. 3). Then, an accessory anterosuperior miniportal is made, from the outside in,



Fig. 2 – (1) Suture marker delimiting the location of the partial articular lesion of the SS not visible in the bursoscopy. (2) Longitudinal incision in the direction of the SS tendon fibers, until reaching the bone bed inferiorly for the introduction of the anchors.

controlled with a Jelco No. 14 catheter, seeking the best position for the entry of the anchors, which should make an angle of approximately 15° with the humeral shaft. Two 5-mm anchors, preferably absorbable, are introduced, one at a time, through this portal (Fig. 3). Through the opening, they

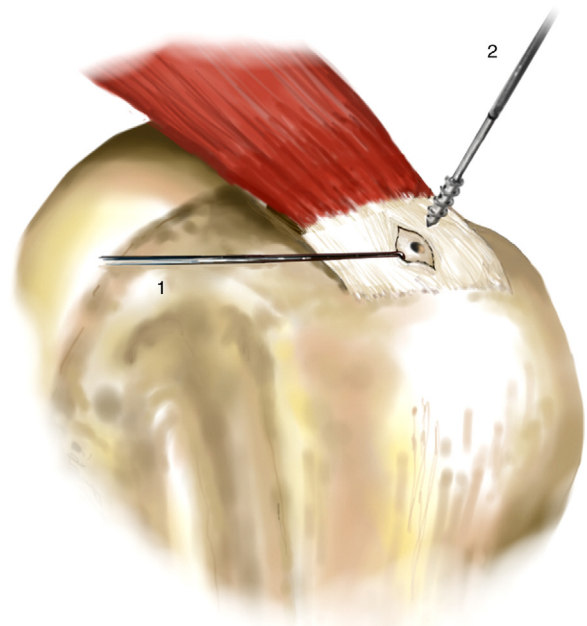


Fig. 3 – (1) Retractor placed posteriorly on the posterior edge of the tendon opening, to improve the depth of vision. (2) Introduction of the anchor toward the anterior orifice in the bone bed.

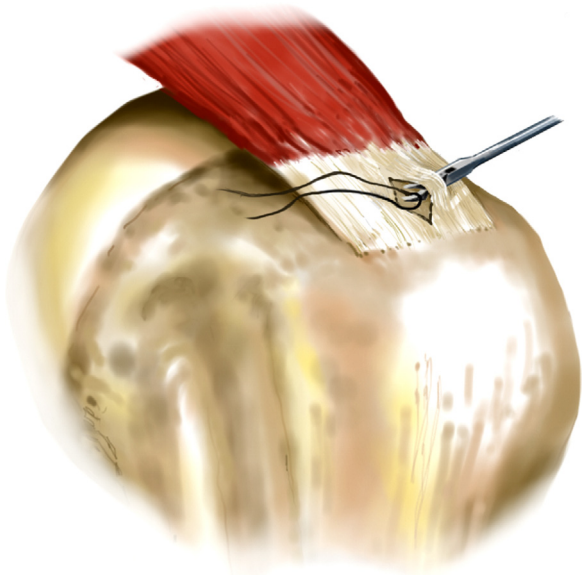


Fig. 4 – Each tip of the anchor wire is transported to the tendon via wire passer at different points.

are fixated to the bone bed, one at the anterior end and the other at the posterior end. The No. 2 anchor wires must be non-absorbable and resistant. These wires are transferred to the tendon via wire passers at approximately 6 mm from the edge of the opening on each side (Fig. 4). Closure is made with a suture bridge; the loose ends of the posterior wires are joined with the tips of the anterior wires, so that the tendon is compressed inferiorly over the bone bed and the longitudinal opening is closed (Figs. 5 and 6). The arthroscope can be moved to the posterolateral and lateral portals when necessary for better vision; it remains in the subacromial space throughout the surgery. In the final revision, the insertion of the supraspinal tendon into the larger tuber remains intact,

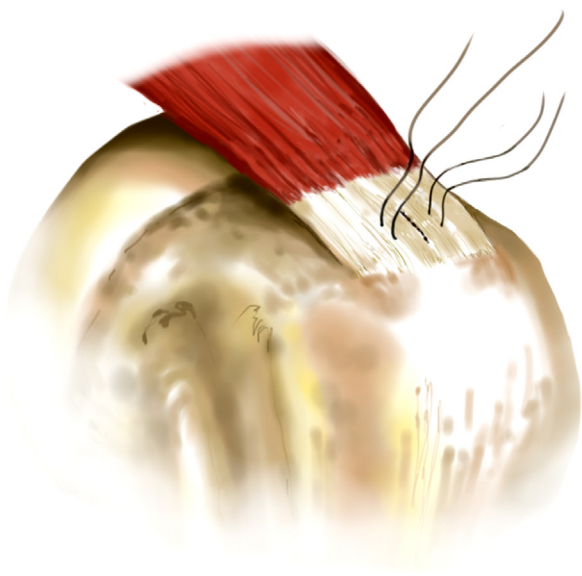


Fig. 5 – The wires of the anterior and posterior anchors, already transported to the SS tendon.



Fig. 6 – The loose ends of the anterior anchor wire are connected with the tips of the posterior anchor wire through a bridge suture.

without any detachment. In the postoperative (PO) period, a sling is used for four weeks and the patient is oriented to perform active elbow and hand exercises and passive shoulder exercises. Rehabilitation follows the traditional protocol for PO rehabilitation of rotator cuff repair. The assisted physiotherapy starts six weeks after surgery.

Results

Patients were evaluated according to UCLA criteria; the results obtained were 69% excellent, 17% good, 7% fair, and 7% poor. PO MRI was performed in eight cases and ultrasonography in four. All images showed healing of the lesion (Figs. 7 and 8). The fair results were observed in three patients who had polyarthralgia symptoms and remained with residual pain. Three patients developed PO joint stiffness (7%) and progressed well with conservative treatment through physical therapy and analgesic use.

Discussion

The rotator cuff can be affected by partial or complete tears. Partial tears can be located on the upper bursal surface (type B rupture), the lower articular surface (type A rupture), and within the tendon (intratendon or intrasubstance ruptures). Partial lesions can be classified as: low grade rupture (less than 50% of thickness), moderate grade (50%), or high grade (more than 50%). These lesions can be quantified with shoulder MRI, with or without contrast; the diagnosis can therefore be accurately made, assessing the quality of the intact bursal fibers.

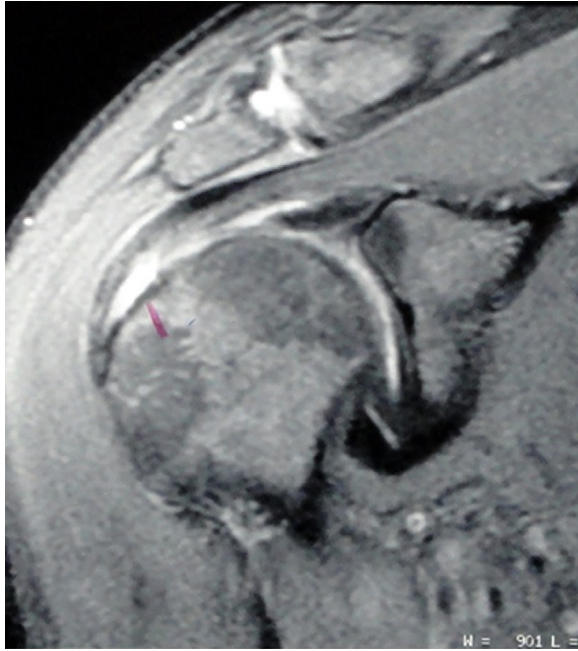


Fig. 7 – Preoperative T2-weighted MRI coronal cut of right shoulder shows partial-thickness SS lesion of high grade.

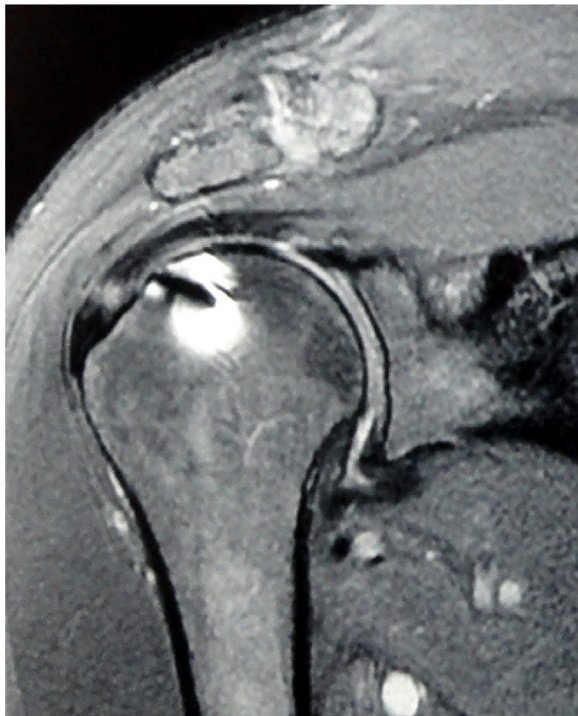


Fig. 8 – Same case as in Fig. 7. MRI one year postoperatively, showing the healed SS.

Partial joint ruptures are more frequent, in the ratio of 3:1 in relation to type B ruptures.² Their etiology and pathogenesis are multifactorial, and both intrinsic and extrinsic factors are involved. Traumatic lesions are more frequently observed in young patients.¹

Studies show that the incidence of these lesions ranges from 13% to 37%.² They are frequent causes of shoulder pain in younger patients. It is accepted that high-grade lesions are indicated for surgical repair after failure of conservative treatment. The author indicated need for surgery in symptomatic cases that did not improve after at least three to six months of conservative treatment, which consisted of analgesic use, corticoid infiltration, and physiotherapy for stretching and muscle strengthening.

Surgeries are always done by the arthroscopic route. For low and moderate degree lesions, only debridement is indicated. Tendon repair is indicated for high grade symptomatic lesions. Two techniques are used for reconstruction. The classic method is to convert the partial injury into a complete injury and then perform the conventional repair with anchors.² Transtendon repair, initially described by Snyder et al.,¹ consists of reconstructing the torn inferior fibers while preserving the intact superior fibers. The anchors are introduced through these bursal fibers. The literature shows that both techniques lead to good results.³

Nonetheless, there are still conflicting opinions regarding them. Supporters of completing the injury claim that the transtendon repair is technically more difficult and that the tissue of intact fibers is always of poor quality.^{4,5} Traditional repair is simpler and clinical results are favorable.² The present author completes these lesions only in high-grade ruptures where less than 30% of the tendon is intact and the poor quality of the tissue initially seen in MRI is confirmed by arthroscopy.

Proponents⁶⁻⁸ of the transtendon repair technique suggest that the intact fibers of the bursal side are substantial and protect the repaired medial part, presenting a high potential for healing after repair, in addition to avoiding the promotion of tendon shortening and leading to a more anatomic healing. Mazzocca et al.,⁹ in a cadaveric study, demonstrated that *in situ* transtendon repair restores the strength of the intact rotator cuff. Clinical studies demonstrate that this repair has better functional results when compared with the traditional “complete and repair” technique.¹⁰

According to the author, to perform the classic transtendon repair described by Snyder et al.,¹ the fixation anchors are introduced through the intact tendon bursal side, which requires the arthroscope to be transferred from the joint to the subacromial space, and *vice versa*. This makes the process more difficult and time-consuming. The author developed this new *in situ* repair technique by following the principles of transtendon repair. A small longitudinal opening is made on the upper fibers of the tendon and through it the anchors are introduced, to be fixated into the bone bed. Throughout the surgery, the arthroscope remains in the subacromial space, which facilitates the technique and shortens the time of surgery.

Some authors² have warned that transtendon repairs are associated with joint stiffness in the PO. In the present series, there were three cases (7%) of PO rigidity; those patients probably already had capsulitis associated with partial joint rupture that was not previously diagnosed. Long-term follow-up indicates that transtendon arthroscopic repair provides pain relief and leads to an improvement in shoulder function.¹¹

Conclusions

This study showed that the *in situ* repair of type A partial SS lesion is safe and reproducible. It presented high rates of positive results (86%), and the complication rates were low. The longitudinal opening on the bursal side of the SS tendon facilitated the introduction of the fixation anchors and allowed the maintenance of the arthroscope in the subacromial space throughout the entire tendon suture.

Conflicts of interest

The author declares no conflicts of interest.

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