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Arthroscopic treatment of type 2 superior labrum anterior posterior lesions

Tip 2 superior labrum anterior posterior lezyonlarının artroskopik tedavisi

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Amaç: Bu çalışmada, izole tip 2 superior labrum anterior posterior (SLAP) lezyonu tanısıyla artroskopik tamir uygulanan hastalar geriye dönük olarak değerlendirildi.

Çalışma planı: Konservatif tedaviye yanıt vermeyen, omuz ağrısı yakınması bulunan sekiz hastada (5 erkek, 3 kadın; ort. yaş 48.5; dağılım 27-60) izole tip 2 SLAP lezyonu tanısıyla dikişli çapalar kullanılarak artroskopik tamir yapıldı. Ameliyat öncesi semptomların ortalama süresi 18.6 ay (dağılım 2-48 ay) idi. Hastaların öntanılarında, yakınmalar, fizik muayene ve görüntüleme yöntemleri bulguları değerlendirildi. Kesin tanı tanısal artroskopi ile kondu. Altı hastada iki adet, iki hastada bir adet dikiş çapası kullanılarak tespit yapıldı. Hastalar ameliyat öncesi ve sonrasında fizik muayene, radyografi ve UCLA (University of California at Los Angeles) omuz skoruna göre değerlendirildi. Ameliyat sonrasında ortalama takip süresi 30.8 ay (dağılım 14-48 ay) idi.

Sonuçlar: Ameliyat öncesinde 13.3 (dağılım 10-18) olan ortalama UCLA skoru, ameliyat sonrasında 30.8'e (dağılım 24-33) yükseldi ($p<0.05$). Yedi hastada (%87.5) iyi, bir hastada (%12.5) orta sonuç elde edildi. Ameliyat öncesinde aktif öne elevasyon ortalama 136.3° (dağılım 90°-170°), adduksiyon dış rotasyon ortalama 42.5° (dağılım 40°-60°) ölçüldü; adduksiyon iç rotasyon ise üç hastada T_7, beş hastada L_1 düzeyindeydi. Son takiplerde aktif öne fleksiyon ortalama 164.3° (dağılım 150°-170°), adduksiyon dış rotasyon ortalama 40° (dağılım 30°-60°) ölçülürken, adduksiyon iç rotasyon dört hastada T_7, dört hastada T_{12} düzeyinde bulundu.

Çıkarımlar: Tip 2 SLAP lezyonu bulunan ve dikişli çapalar kullanılarak artroskopik tamir yapılan olguların çoğunda başarılı sonuç alınması mümkündür. Başarı için artroskopik tekniğin, biseps yapışma yerinin stabilitesini yeniden oluşturacak şekilde uygulanması şarttır.

Anahtar sözcükler: Artroskopi; eklem instabilitesi/cerrahi; omuz eklemi/yaralanma/cerrahi; tendon yaralanması.

Objectives: We retrospectively evaluated patients who underwent arthroscopic repair for isolated type 2 superior labrum anterior posterior (SLAP) lesions.

Methods: Isolated type 2 SLAP lesions were treated with arthroscopic repair with suture anchors in eight patients (5 males, 3 females; mean age 48.5 years; range 27 to 60 years) with shoulder pain unresponsive to conservative treatment. The mean duration of symptoms was 18.6 months (range 2 to 48 months). Initial diagnoses were based on patients' complaints and findings of physical examination and radiologic imaging and were confirmed at diagnostic arthroscopy. Two suture anchors were used in six patients. Patients were evaluated with physical examination, radiographs, and the UCLA (University of California at Los Angeles) score. The mean follow-up was 30.8 months (range 14 to 48 months).

Results : The mean preoperative and postoperative UCLA scores were 13.3 (range 10 to 18) and 30.8 (range 24 to 33), respectively ($p<0.05$). The results were good in seven patients (87.5%), and fair in one patient (12.5%). The mean preoperative active forward elevation was 136.3° (range 90° to 170°), adduction-external rotation was 42.5° (range 40° to 60°), and adduction-internal rotation was at T_7 in three patients, and at L_1 in five patients. At final follow-ups, the mean active forward flexion increased to 164.3° (range 150° to 170°), adduction-external rotation was 40° (range 30° to 60°), and adduction-internal rotation was at T_7 in four patients, and at T_{12} in four patients.

Conclusion: The results of arthroscopic fixation of type 2 SLAP lesions with suture anchors are successful in the majority of patients, provided that an appropriate arthroscopic technique is performed to re-establish the stability of the biceps anchor.

Key words: Arthroscopy; joint instability/surgery; shoulder joint/injuries/surgery; tendon injuries.

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Complex injuries of the superior glenoid labrum and biceps were initially defined by Andrews et al. [1] in 1985. This form of injury was named and classified by Snyder et al. [2] (Figure 1) in 1990 as superior labrum anterior posterior (SLAP) tears. According to this categorization, while degeneration accompanied by significant fraying is present at the superior labrum in type I tears; the biceps anchor and the labrum are firmly attached to the glenoid. On type II tears, superior labrum and the biceps anchor are detached from the glenoid edge and are instable. Type II SLAP lesions were categorized by Morgan et al.[3] under three sub-groups as anterior, posterior and combined anterior-posterior according to their anatomic locations. While superior labrum is torn from the glenoid edge in bucket handle form in type III tears, biceps anchor continues to be stable. Type IV lesions are characterized with bucket handle tear of the superior labrum extending up to the biceps tendon. The combination of the above are defined as complex tears.

Maffet et al.[4] incorporated three variations to the four basic types of SLAP lesions. These are anteroinferior type labral lesion extending as SLAP lesion (Type 5); detachment of the biceps tendon accompanied by instable flap tear of the labrum (Type 6) and superior labrum biceps tendon detachment extending below the mid-glenohumeral ligament (Type 7).

While the etiology of superior labral lesions remain to be uncertain; glenohumeral joint instability is involved in the formation of these lesions.[5]

The treatment of these lesions is set up according to their types. While debridement is performed in type I and type III lesions which are considered stable; repair is required for lesions Type II and IV which are considered as instable.[6]

In this study, patients who were diagnosed and operated for isolated Type II SLAP lesions and underwent arthroscopic repair using suture anchors were evaluated retrospectively.

Patients and method

Patient selection

8 patients (5 males, 3 females; mean age 48.5; range 27-60) were included in the study who turned up for their final examinations after being treated with arthroscopic repair using suture anchors between March 2000- April 2004 subsequent to being diagnosed arthroscopically with isolated Type II SLAP lesions.

Diagnosing the superior labral tear

The patients were diagnosed with superior labral tear through the evaluation of complaints, physical examination findings and imaging methods. Speed test, active compression (O'Brien) test and Jobe relocation test as well as range of motion and strength checks were performed in the physical examinations.[7]

Speed test was performed by resisting the forward flexion of the forearm with the shoulder in 90o flexion, with the forearm in supination and with the elbow extended and elicitation of pain in the biceps tendon or in its adhesion site was considered positive sign.

In the O'Brien test, the patients were evaluated separately in terms of pain inducement in the frontal part of the shoulder by resisting against upward elevation with the shoulder in 20o adduction and in 90o flexion, with the forearm supinated and pronated. The result was considered positive when pain increases in the prone position.

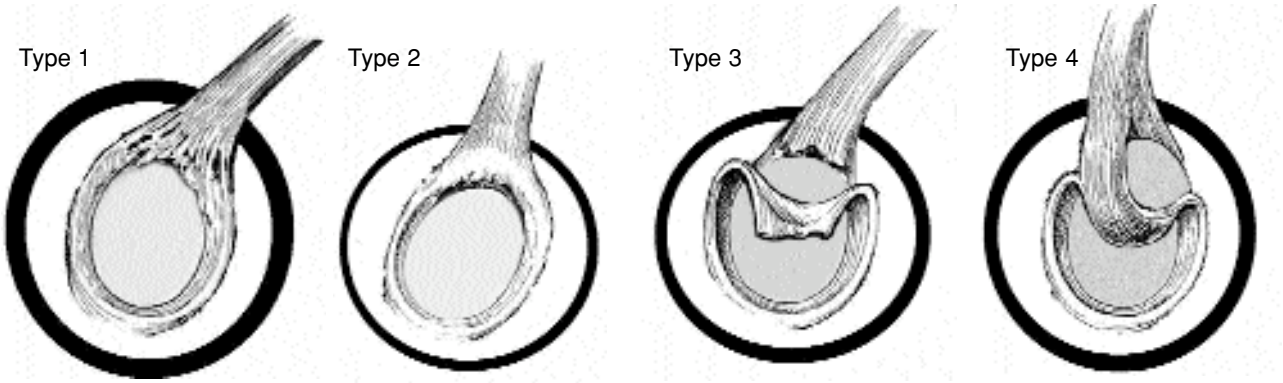

Figure 1. Snyder categorization

Concerning the Jobe relocation test, pain formation while the shoulder is in abduction and in external rotation was considered as a positive response to apprehension test and relieving of this pain by applying posterior pressure to the humerus was considered a positive sign for relocation test.

All the patients were examined through magnetic resonance imaging (MRI) as well as through frontal-distal, axillar and supraspinatus outlet x-rays. Proton density obtained along the axis of the supraspinatus in the coronal oblique plan and increased signal density detected between labrum superior section and the glenoid fossa section in T2-weighted sequences was considered to be confirming superior labral tear (Figure 2). Confirmation of this state through diagnostic arthroscopy was required.

Examination under general anesthesia and patient position

Consequent to being examined in terms of shoulder's range of motion and instability under general anesthesia, all patients were operated in beach chair position.

Surgical Technique

Standard systematic arthroscopic examination was performed through posterior portal created at the 2 cm inferior and 2 cm medial of the postero-lateral edge of the acromion. Glenohumeral joint was assessed in terms of other pathologies prior to the employment of standard treatment protocol.

During the glenohumeral arthroscopy, if the superior labrum was found to be torn from the glenoid edge with fraying and/or hemorrhage present on the lower surface and if this detachment was more than 0.5 cm, extending to the medial from the glenoid edge; then the lesion was considered to be pathologic and was repaired (Figure 3).

Adhesion site of the biceps tendon and the abnormal instability of the labrum by traction as well as the loss of glenoid cartilage extending from the upper corner of the glenoid to the medial aspect were evaluated in uncertain cases. [8]

Furthermore, peel-back test described by Burkhart and Morgan[9] for SLAP lesions was employed. In view of that, backward peeling of the labrum from the postero-superior glenoid by internally and externally rotating the arm in abduction ad external rotation position.

In order to assess the instability, drive-through sign was sought both during the diagnostic arthroscopy and following the repair.[10] Accordingly, accessibility of the arthroscope into the axillary pouch while being advanced along the anterior of the glenohumeral joint between the humeral head and the glenoid was evaluated. With the easy access of the scope the capsule was considered to have laxity and with positive drive-through sign.

Figure 2. Magnetic resonance image of the superior labral tear

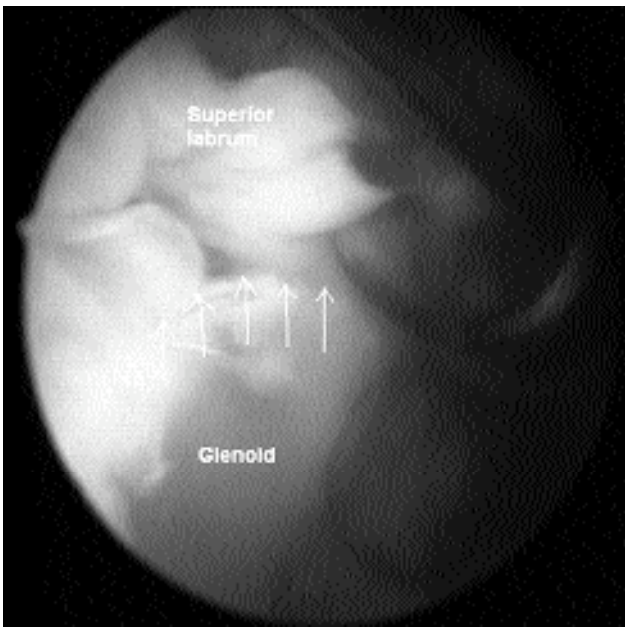

Figure 3. Arthroscopic image of the superior labrum anterior posterior lesion

For the repair, antero-superior and antero-inferior portals were created with spinal needle using an "outside-in" technique. The antero-superior portal was created just to the anterior of the acromioclavicular joint, on the biceps tendon enabling access to both sides of the tendon. A large, threaded cannula (8.4 mm, Cannuloc; Linvatec, Largo, Florida, USA) was placed in the antero-superior portal and a small, non-threaded cannula (Universal Cannula; Linvatec) was placed in the antero-inferior portal. Antero-superior section of the glenoid rim was carefully debrided to bleeding bone with motor shavers. Mini-Revo suture anchors (Linvatec) loaded with number-2 non-absorbable sutures (Ethibond; Ethicon, Somerville, New Jersey, USA) were introduced from the antero-superior portal at 45o to the joint surface, at the site prepared to match the superior labrum attachment of the biceps tendon at the superior glenoid rim. One end of the suture was pulled back out of the antero-inferior portal. The labrum was pierced at the base of the biceps tendon using a 45° suture loop (Suture Lasso, Arthrex, Naples, Florida, ABD) loaded with suture passer (Shuttle-Relay, Linvatec) introduced from the anterosuperior portal. The suture passer was taken out by means of a tissue holder introduced from the antero-inferior portal and Ethibond suture number-2 was taken out of the antero-superior portal by being attached to the eye of the suture carrier.

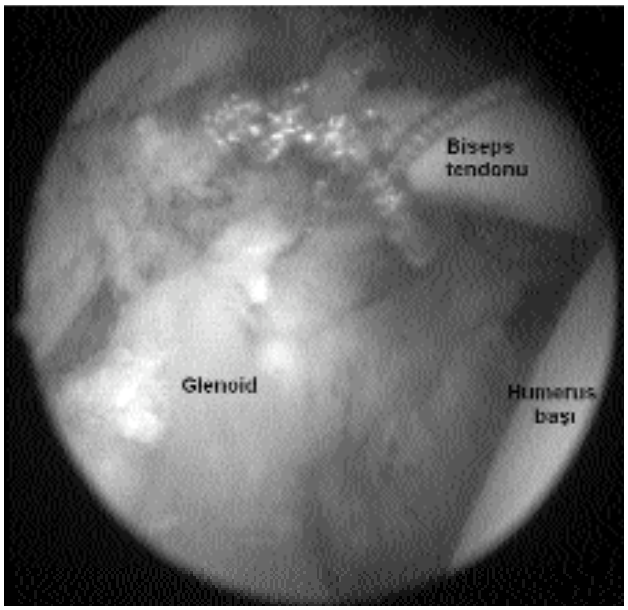

Figure 4. View of the superior labrum anterior posterior lesion after the repair

The ends were tied using an arthroscopic knot pusher and Samsung Medical Center (SMC) arthroscopic knot technique.[11] The quality and durability of the repair was evaluated by using a probe during the arthroscopy.

A second suture anchor was placed at the posterior for cases wherein repair had not sufficient and where the peel-back test or drive-through sign had been positive. Postero-superior lateral acromial portal was used in these cases to allow for the suture anchor to be placed at the postero-superior glenoid with an appropriate angle. This portal was created with an 'outside-in' spinal needle under direct visualization, approximately 1 cm. lateral and 1 cm. anterior to the posterior corner of the acromion (Figure 4).

Postoperative care and evaluation

The shoulder was kept in an arm sling over the next four weeks. Pendulum exercises and exercises for increasing the elbow range of motion were done during this period. External rotation over 0o was eliminated during the first three weeks. Shoulder range of motion was enhanced by active/assisted and passive techniques. Exercises against resistance were started once the full range of motion was attained. Unlimited activity was allowed only after the sixth month.

Evaluation of the patients

Range of motion was measured by goniometer with the patients in sitting position while the muscle strengths were evaluated manually. Frontal-distal, supraspinatus outlet and axillar x-rays were taken both preoperatively and following the surgery.

The patients were evaluated pre- and postoperatively by physical examination, radiography and the UCLA (University of California at Los Angeles) shoulder assessment scale.[12] This scale (max. 35 points) assigns maximum 10 points for pain, 10 for function and 5 points each for active forward elevation, strength of forward flexion and overall patient satisfaction. 34-35 points indicate an excellent outcome, 28-33 points are indicative of a good outcome, 21-27 points indicate a moderate outcome whereas 0-20 points are indicative of a poor outcome in this scale. Mean follow-up time for the patients was 30.8 months (range 14-48 months).

Statistical analysis

Wilcoxon two-sample paired test was used for statistical analysis.

Conclusions

The lesion was on the dominant side of 7 patients and on the non-dominant side of the other 1 patient. The primary complaint of all the patients was pain felt around the shoulder aggravated by overhead activities. Six patients had a history of trauma. The trauma was caused by traction in four patients and by axial strain. Two patients do not have a trauma history. Three patients were describing crepitus during shoulder movements. The mean duration of the preoperative symptoms was 18.6 months (range 2-48 months).

O'Brien test and Speed test were found to be positive in six patients while the results for apprehension and relocation tests were positive in three patients.

Preoperative x-rays were evaluated as normal. Superior labrum lesion was detected in five patients in the shoulder MRI images. Peel-back test was positive in five patients during the diagnostic arthroscopy. Drive-through sign was evaluated as positive in thee of the patients.

The fixing was performed by using two suture anchors in six patients and by using one suture anchor in two patients.

Drive-through ad peel-back tests were repeated following the repair. Peel-back test which had been positive in five patients was found to be negative in all the patients. Thus it was confirmed that a stable repair was done and stability was ensured in the biceps attachment area. Drive-through sign which had been positive in three patients was found to be negative in all the patients following the repair. Therefore, no further attempt was made to eliminate capsule laxity considering that glenohumeral joint instability has been due to superior labral pathology and that it was eliminated subsequent to the repair.

The mean preoperative UCLA shoulder score of 13.3 (range 10-18 increased to 30.8 (range 24-33) following the surgery ($p<0.05$). Good results in seven patients (87.5%) and moderate results in one patient (12.5%) were achieved.

Mean preoperative active forward elevation was 136.3° (range 90°-170°), and mean adduction external rotation was 42.5° (range 40°-60°); whereas the adduction internal rotation was T7 in three patients and L1 in five patients. During the final examinations on the other hand, the mean active forward flexion was 164.3° (range 150°-170°) and mean adduction external rotation was 40° (range 30°-60°); while the adduction internal rotation was found to be T7 in four patients and in the other four

In the postoperative x-rays of the seven patients with good results, the position of the screw was observed to be accurate in six patients while the positioning was seen to be subperiosteal in one patient. The thread of one of the screws was observed to be breaching the superior cortex in the patient with the moderate result.

Discussion

The treatment of Type II SLAP lesions wherein the biceps attachment site and the superior labrum are torn apart from the glenoid is correlated with the instability of the lesion and the age of the patient. In cases where the labral detachment is pronounced and is easily peeled off from the superior glenoid -if possible- repair or tenodesis should be considered. Repair is a suitable treatment for young and athletic patients in general. Nevertheless, there is no definite age limit concerning the patients on which repair or tenodesis should be employed. Pagnani et al.[13] reported that 22 cases on which they performed repair were between the ages of 18-40; while Field and Savoie[14] reported an age range of 18-52 (mean 39) for patients with instable superior labrum lesion which they have treated with arthroscopic repair. Snyder et al.[2] on the other hand reported an age range of 20-60 (mean 37.5) without any discrimination on lesion type for the 27 patients on which they have employed arthroscopic surgery. In the cited study, biceps tenodesis was employed on three patients with extremely instable biceps tendon. It might be appropriate to evaluate the condition of the biceps tendon, patients' activity level and prospects as well as the age of the patient when deciding on which patients repair should be employed. The mean age in our cases was 48.5 (range 27-60) and we had three patients over the age of 45. Lesion repair instead of arthrodesis was employed on these patients as they have been actively working in their normal life, as their complaints started following a

trauma with no previous problems in the shoulder prior to the trauma and as a repairable SLAP lesion was detected in the diagnostic arthroscopy.

A significant part of the studies related to superior labral lesions is focused upon the detection of these lesions and the repair techniques.

While traction type of injuries in the majority of the patients were reported in the study conducted by Maffet et al.[4] , the possibility of the formation of SLAP lesions due to glenohumeral joint compression occurring by direct falls or by falling on the extended arm was cited as well.[6] The trauma histories in four of our cases were due to traction, while the trauma was due to axial load in two. The remaining two patients did not have a trauma history whatsoever.

No specific treatment used alone or together with other treatments has been reported for superior labrum anterior posterior lesions. There are however, tests reported to be advantageous in terms of diagnosis. O'Brien ad Speed tests' results were found to be positive in six cases included in our study. In the standard MRI examinations conducted before the arthroscopy, findings indicative of SLAP lesions were found only in 25% of the patients. Thus, taking arthro-MRI's of the patients who are pre-diagnosed with SLAP might be more appropriate. Precise diagnosis in all of our cases was enabled through arthroscopy.

Long term results for patients with Type II SLAP lesions who were treated by debridement were found to be ineffective. While in one study pain reduction in 78% of the cases was observed at the end of the first year; the ratio of patients with pain went up to 50% in the second year.[15] Instability detected under anesthesia in the majority of the patients was held responsible for the poor results despite the fact that there was no history of dislocations.

Repair of instable tears came up with the poor results achieved by debridement as well as with the better understanding of the functional significance of superior labral complex. The arthroscopic methods were developed owing to the difficulties in repairs conducted by open surgery methods.

A wide range of stabilization materials were used for the repair of the SLAP lesion in patients with instability on the biceps attachment site. Initially, Yoneda et al.[16] employed repair using metal staples in 10 patients with instability on the biceps attachment site; with healing in all the cases being confirmed during the arthroscopy conducted to remove the metal staple and with very good results in 80% of the patients subsequent to a follow-up period of 24 months. Field and Savoie [14] achieved successful results for 1 year follow-up period in all of the 20 patients repaired with a transosseous suture technique. Pagnani et al.[13] reported an achievement ratio of 86% subsequent to a 2-year follow-up in 22 patients treated with absorbable tacks. Repair of Type II SLAP lesions by screw type suture anchors was proposed by Nam and Snyder, [6] due to poor results obtained through basic debridement, the requirement of removing the metal tacks, the complexity of the employment of the transsoseous technique and the possibility of the absorbable tacks being broken. Kim et ark.[17] treated 34 patients having isolated Type II SLAP lesions by using suture anchors and achieved successful results in 94% at the end of a mean follow-up period of 33 months.

In the single anchor- double suture technique described by Nam and Snyder [6] visualization was attained through the postero-soperior portal while the antero-superior portal was used as the paortal of entry, the sutures being placed from thereof. Antero-inferior portal on the other hand was used as the supplementary portal. The authors reported that the same portal could be used if the second suture anchor is required. Kim et al.[17] reported that forcing the suture anchor to be placed through the antero-superior portal as acutely as possible would restrict the creation of a second portal used for placing the suture anchor.

Supero-medial Neviaser[18] portal could be used for the repair as well as the anterior and posterior portals. Supero-medial portal is created by visualization through the arthroscope and with the employment of a spinal needle through the soft spot located about 1-2 cm medial to the clavicle posterior and the medial edge of the acromion. The entry to the glenohumeral joint is generally just behind the attachment site of the biceps tendon. On the other hand, Burkhart and Morgan[19] reported that placing the suture anchor at the posterio-superior glenoid in an appropriate angle through the standard antero-superior portal is impossible and thus the postero-superi-

or lateral acromial portal (Wilmington portal) should be used additionally. In a cadaveric study where simulated type II SLAP lesions were repaired and later anatomical and radiological examination of the implant position were conducted; Trusler et al.[20] reported that the lateral acromial portal is reliable for the suture anchor placed at the postero-superior glenoid. In two of our cases, we used single sutured anchors placed through the antero-superior portal. In the six cases wherein the second suture was agreed to be placed; the postero-lateral cromial portal was used to enable the placement of the suture anchor on the postero-superior rim with an angle of 45°.

Precise diagnosis of Type II SLAP lesions in our cases was attained through arthroscopy. In order to ensure the stability of the attachment site of the biceps, placing a second suture anchor to the posterior was required in the majority of our cases. Posterolateral acromial portal is advantageous in positioning the second suture anchor in a correct angle.

In conclusion, successful results are likely to be obtained in the majority of the cases with Type II SLAP lesions through the arthroscopic repair using suture anchors. The employment of the arthroscopic technique for restoring the stability of the biceps attachment site plays a great role in achieving successful results.

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