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# The Arthroscopic Latarjet Procedure for Anterior Shoulder Instability

## 5-Year Minimum Follow-up

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*Investigation performed at Alps Surgery Institute, Clinique Générale, Annecy, France*

**Background:** The arthroscopic Latarjet procedure combines the benefits of arthroscopic surgery with the low rate of recurrent instability associated with the Latarjet procedure. Only short-term outcomes after arthroscopic Latarjet procedure have been reported.

**Purpose:** To evaluate the rate of recurrent instability and patient outcomes a minimum of 5 years after stabilization performed with the arthroscopic Latarjet procedure.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** Patients who underwent the arthroscopic Latarjet procedure before June 2008 completed a questionnaire to determine whether they had experienced a dislocation, subluxation, or further surgery. The patients also completed the Western Ontario Shoulder Instability Index (WOSI).

**Results:** A total of 62 of 87 patients (64/89 shoulders) were contacted for follow-up. Mean follow-up time was 76.4 months (range, 61.2-100.7 months). No patients had reported a dislocation since their surgery. One patient reported having subluxations since the surgery. Thus, 1 patient (1.59%) had recurrent instability after the procedure. The mean  $\pm$  standard deviation aggregate WOSI score was  $90.6\% \pm 9.4\%$ . Mean WOSI domain scores were as follows: Physical Symptoms,  $90.1\% \pm 8.7\%$ ; Sports/Recreation/Work,  $90.3\% \pm 12.9\%$ ; Lifestyle,  $93.7\% \pm 9.8\%$ ; and Emotions,  $88.7\% \pm 17.3\%$ .

**Conclusion:** The rate of recurrent instability after arthroscopic Latarjet procedure is low in this series of patients with a minimum 5-year follow-up. Patient outcomes as measured by the WOSI are good.

**Keywords:** shoulder instability; shoulder dislocation; arthroscopic Latarjet procedure; Latarjet; Bankart

Shoulder instability commonly affects the young and active population.<sup>16</sup> Initial treatment of anterior instability is usually nonoperative; however, certain risk factors have been shown to predispose patients to recurrence.<sup>12,33</sup> Young age, presence of a bony defect (Hill-Sachs lesion or

bony Bankart), history of dislocation, and an active lifestyle have all been shown to be associated with recurrent dislocation and therefore are relative indications for bony augmentation.<sup>14,19</sup> The number of anterior shoulder dislocations that are predisposed to recurrence is unknown; some clinicians recommend surgical treatment after the initial episode and others recommend surgery after multiple recurrences. The propensity for recurrence is influenced by the type of capsulolabral lesion observed.<sup>29</sup>

Current surgical techniques for treatment of anterior glenohumeral instability can be classified as (1) soft tissue capsulolabral repairs or (2) bony augmentation procedures.<sup>17</sup> The Bankart procedure (open or arthroscopic) involves repair of the capsulolabral structures and the inferior glenohumeral ligament to the anterior bony glenoid rim and is most frequently used to treat anterior glenohumeral instability.<sup>3</sup> The Latarjet and the Bristow procedures involve a transfer of the osteotomized coracoid process, with its attached conjoint tendon (short head of biceps brachii and coracobrachialis), through a horizontal split in the subscapularis tendon, to the anterior glenoid.<sup>28</sup>

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The technique in its open form, although often used as a salvage procedure in cases of failed soft tissue repair, also can be used as a primary stabilization procedure.<sup>32</sup> The Latarjet procedure has more recently been described in conjunction with arthroscopic technique, with promising early results.<sup>7,26</sup>

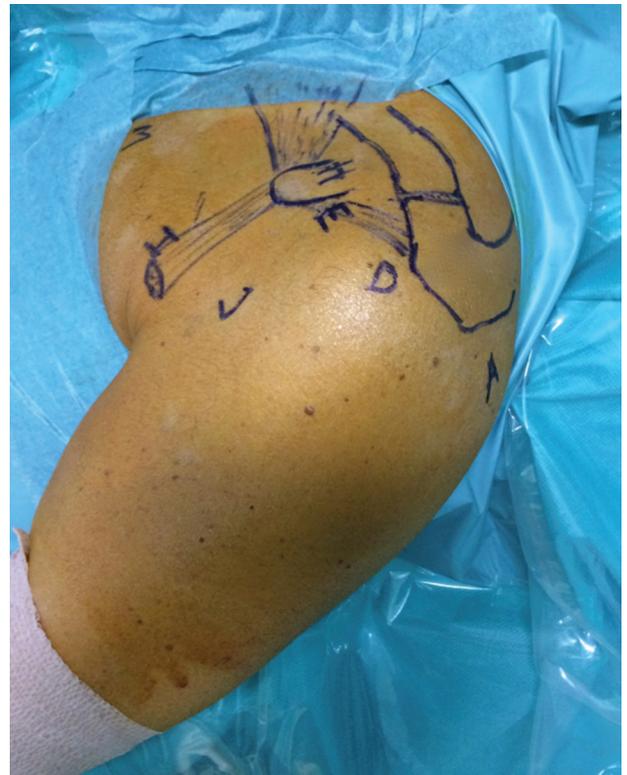
The rate of recurrent instability for patients in our series was previously reported and showed 0 of 62 recurrent dislocations at 18 months' follow-up and 0 of 35 recurrent dislocations at 26 months.<sup>26</sup> The purpose of this study was to evaluate the rate of recurrent instability and patient outcomes at a minimum of 5 years after arthroscopic Latarjet procedure for treatment of anterior glenohumeral instability. Our hypothesis was that the rate of recurrent instability in patients treated with the arthroscopic Latarjet procedure would be within the range reported for the open Latarjet procedure (0%-8%) and would be lower than that reported for patients having undergone Bankart soft tissue stabilization (8%-11%).<sup>6,21</sup>

## MATERIALS AND METHODS

Approval from our institution's administrative research board was obtained to perform this retrospective study. The case list of the senior surgeon (L.L.) from a single facility was reviewed to identify patients who had undergone the arthroscopic Latarjet procedure. Indications for the procedure were patient specific and included high-demand patients with 10% to 25% glenoid bone loss, patients with associated instability lesions (humeral avulsion of the glenohumeral ligament [HAGL], anterior labral periosteal sleeve avulsion [ALPSA], or large Hill-Sachs lesions), and any patient with more than 25% bone loss. In addition, patients who had failed prior stabilization procedures were treated with the arthroscopic Latarjet procedure. Patients who had undergone the procedure before June 1, 2008, were included in the study. Patients were contacted via telephone, postal mail, or e-mail. Each patient was asked to complete a questionnaire. The questionnaire asked whether the patient had sustained any dislocations, subluxations, or further surgery to the shoulder since the index procedure. All patients completed the Western Ontario Shoulder Instability Index (WOSI), a disease-specific, validated, quality-of-life measurement tool for patients with shoulder instability.<sup>25</sup> The WOSI contains 21 questions that are divided into 4 domains: Physical Symptoms, Sports/Recreation/Work, Lifestyle, and Emotions. Scores for each domain as well as the aggregate score are expressed on a scale of 0% to 100%, with higher scores being more favorable. Postoperative WOSI scores were compared for patients undergoing the procedure as a primary surgery for instability versus a revision procedure. Postoperative WOSI scores were also compared for first time dislocators versus patients with a history of multiple dislocations.

### Surgical Technique

The procedure was performed arthroscopically with a total of 7 arthroscopic portals (Figure 1). A diagnostic



**Figure 1.** Seven arthroscopic portals marked for arthroscopic Latarjet procedure.

arthroscopy was initially performed to confirm the expected pathologic abnormalities and to identify any associated lesions not detected on preoperative imaging. The anterior labrum, capsule, middle glenohumeral ligament, and anterior portion of the inferior glenohumeral ligament between the 2-o'clock and 5-o'clock positions were resected using radiofrequency ablation. The coracoacromial ligament and pectoralis minor were both detached from their respective attachments to the coracoid. The coracoid was cleared of soft tissues circumferentially to its base (as defined by the coracoclavicular ligaments), while protecting the attachment of the conjoint tendon at the coracoid tip.

Through a portal superior to the coracoid, 2 holes were drilled and tapped over guide wires. A "top-hat" washer was inserted into each hole, again over a guide wire. After a circumferential stress riser was created at the base of the coracoid, the osteotomy was completed by use of a curved osteotome. The surgeon split the subscapularis at the junction of its inferior third and superior two-thirds by using radiofrequency ablation, keeping the face of the ablator directed laterally to avoid injury to the axillary nerve. The split was completed medially via blunt dissection with a trocar and external rotation of the arm.

The anterior glenoid face was then prepared; an arthroscopic burr was used to create an even, flat bed of bleeding bone. The coracoid was retrieved by use of the double-barrel cannula and long cannulated holding screws that engage the previously placed top hats (Depuy-Synthes-Mitek). The inferior surface of the coracoid was

decorticated with a bur, creating an even, flat surface to match the anterior glenoid. The coracoid was then manipulated via the double-barrel cannula, through the subscapularis split, and onto the glenoid face between the 2-o'clock and 5-o'clock positions (previously marked). Optimal positioning of the coracoid is 1 to 2 mm medial to the glenoid rim (avoiding a proud graft). Long guide wires were inserted through the cannulated holding screws. Once graft positioning was verified and found to be acceptable, a 3.2-mm cannulated drill was used to predrill each hole before insertion of both 3.5-mm cannulated screws, beginning with the inferior screw. The long guide wires were removed posteriorly before removal of the double-barrel cannula anteriorly. Graft position was verified, and any prominence was addressed with a bur. The subscapularis sling effect could be observed immediately.

Postoperatively, the patients were placed in a simple pillow sling for 1 week and were allowed to begin range of motion exercises (both passive and active) as soon as their symptoms allowed. This was followed by progressive strengthening and return to sporting activities by as early as 6 weeks postoperatively. The surgical technique can be seen in the Video Supplement.

## RESULTS

A total of 87 patients (89 shoulders) were identified who met our inclusion criteria. Of these, 62 patients (71.3%; 64 shoulders) were available for follow-up. Mean follow-up was 76.4 months (6.4 years), with a range of 61.2 to 100.7 months. The mean patient age at surgery was 29.4 years and median age was 27.1 years (range, 17.1-57.4 years). Of the 64 patients, 55 (85.9%) were male and 9 (14.1%) were female. The mean number of dislocations before surgery was 5.3 (median, 2), and the mean number of subluxations before surgery was 4.1 (median, 3). The mean and the median overall numbers of instability events (dislocations plus subluxations) were 8.6 and 7, respectively. Seven patients underwent the procedure after only 1 dislocation. Of these 7 patients, the mean number of subluxations was 10 (median, 10). Twelve of 64 (18.8%) patients had undergone prior procedures on the shoulder in question for instability, all of which were arthroscopic Bankart repairs. The remaining 52 of 64 (81.2%) patients underwent the arthroscopic Latarjet procedure as the primary surgical treatment for their unstable shoulder. For the 12 patients who underwent prior arthroscopic Bankart repair, the mean and median times between that procedure and the arthroscopic Latarjet procedure were 4.34 and 3.82 years, respectively (range, 0.51-13.0 years). One patient has undergone total shoulder arthroplasty for glenohumeral arthrosis since the procedure. Of the remaining 63 patients, none have reported a dislocation since their surgery, and 1 reported having subluxations since the procedure. Thus, 1 of 63 (1.59%) shoulders had recurrent instability after the procedure. Postoperative participation in sports was reported in 58 of 62 patients (Table 1).

The mean  $\pm$  standard deviation aggregate WOSI was 90.6%  $\pm$  9.4%. Mean WOSI domain scores were as follows: Physical Symptoms 90.1%  $\pm$  8.7%; Sports/Recreation/Work

TABLE 1  
Postoperative Participation in Sports by Patients

Sport	No. of Patients Reporting Participation
Skiing/snowboarding	34
Running/track	18
Bicycling/motocross	18
Water sports	14
Racket sports	11
Hiking/mountain climbing	9
Weight lifting/body building	7
Soccer	5
Rugby	4
Martial arts	4
Handball	2
Parachuting	2
Horseback riding	2
Basketball	1
No sport reported	4

90.3%  $\pm$  12.9%; Lifestyle 93.7%  $\pm$  9.8%; and Emotions 88.7%  $\pm$  17.3%. Mean responses for individual questions of the WOSI are found in Table 2. No statistically significant difference was seen in comparisons of WOSI domain scores and aggregate scores from first-time dislocators versus multiple dislocators or primary surgeries versus revision surgeries (Table 3).

## Complications

Of 64 patients, 3 were noted to have postoperative hematoma, which resolved without surgery. In total, 10 of 64 (15.6%) patients returned to the operating room after the arthroscopic Latarjet procedure: 1 patient returned for a displaced coracoid graft, which was successfully repositioned; 8 patients returned to have prominent screws removed; and 1 patient required underwent total shoulder arthroplasty after the procedure for glenohumeral arthrosis. One of the patients who underwent screw removal was noted to have some wasting of the deltoid, and an arthroscopic release of the axillary nerve was performed.

## DISCUSSION

The glenohumeral joint relies on static and dynamic structures that aid in stabilizing the joint. Disruption to these restraints manifests as a spectrum of clinical pathologic lesions ranging from subtle subluxation to recurrent shoulder dislocation.<sup>17</sup> The most frequent complication of shoulder dislocation is recurrence, a complication that occurs much more frequently in younger patients.<sup>23</sup> Surgical treatment has been associated with a significantly lower rate of recurrence of glenohumeral instability.<sup>11,20</sup> The mainstays in operative treatment of anterior recurrent instability of the shoulder have been the arthroscopic or open Bankart repair and the open Latarjet procedure. Many series report low recurrence rates after open or arthroscopic Bankart repair; however, the length of

TABLE 2  
Western Ontario Shoulder Instability Index Scores<sup>a</sup>

	Question Score, %	Section Score, %
Section A: Physical Symptoms		90.1 ± 8.7
1 How much pain do you experience in your shoulder with overhead activities?	92.5 ± 13.3	
2 How much aching or throbbing do you experience in your shoulder?	96.2 ± 9.1	
3 How much weakness or lack of strength do you experience in your shoulder?	88.0 ± 16.4	
4 How much fatigue of lack of stamina do you experience in your shoulder?	90.6 ± 14.3	
5 How much clicking, cracking, or snapping do you experience in your shoulder?	84.9 ± 21.5	
6 How much stiffness do you experience in your shoulder?	86.0 ± 16.5	
7 How much discomfort do you experience in your neck muscles as a result of your shoulder?	92.4 ± 14.1	
8 How much feeling of instability or looseness do you experience in your shoulder?	96.3 ± 9.9	
9 How much do you compensate for your shoulder with other muscles?	89.5 ± 16.6	
10 How much loss of range of motion do you have in your shoulder?	84.0 ± 15.9	
Section B: Sports/Recreation/Work		90.3 ± 12.9
11 How much has your shoulder limited the amount you can participate in sports or recreational activities?	89.1 ± 16.6	
12 How much has your shoulder affected your ability to perform the specific skills required for your sport or work?	95.0 ± 10.3	
13 How much do you feel the need to protect your arm during activities?	92.0 ± 15.9	
14 How much difficulty do you experience lifting heavy objects below shoulder level?	85.0 ± 22.7	
Section C: Lifestyle		93.7 ± 9.8
15 How much fear do you have of falling on your shoulder?	86.1 ± 25.1	
16 How much difficulty do you experience maintaining your desired level of fitness?	95.2 ± 13.8	
17 How much difficulty do you have "roughhousing or horsing around" with family or friends?	97.8 ± 7.2	
18 How much difficulty do you have sleeping because of your shoulder?	95.6 ± 9.1	
Section D: Emotions		88.7 ± 17.3
19 How conscious are you of your shoulder?	84.0 ± 25.9	
20 How concerned are you about your shoulder becoming worse?	91.3 ± 18.2	
21 How much frustration do you feel because of your shoulder?	90.6 ± 17.5	

<sup>a</sup>Values are expressed as mean ± SD.

TABLE 3  
Comparison of Western Ontario Shoulder Instability (WOSI) Scores in Arthroscopic Latarjet Procedure: Revision vs Primary Instability Surgery and 1 Dislocation vs Multiple Dislocations

	WOSI Score, %		
	Primary Surgery	Revision Surgery	P Value (Student <i>t</i> Test) <sup>a</sup>
(A) Revision vs Primary Instability Surgery			
Aggregate score	90.5	91	.88
Physical Symptoms	89.8	91.04	.67
Sports/Recreation/Work	89.9	92.1	.60
Lifestyle	93.5	94.7	.70
Emotions	89.7	84.3	.33
(B) Patients With History of 1 Dislocation vs Multiple Dislocations	1 Dislocation	Multiple Dislocations	P Value (Student <i>t</i> Test) <sup>a</sup>
Aggregate score	90.9	90.6	.94
Physical Symptoms	91.4	89.9	.66
Sports/Recreation/Work	92	90.1	.72
Lifestyle	90.2	94.1	.32
Emotions	88.3	88.7	.96

<sup>a</sup>Significant at *P* < .05.

follow-up is quite limited in most of these studies.<sup>10,18,22,30</sup> Bhatia et al<sup>6</sup> performed a systematic review of outcomes after the Latarjet procedure. Eight studies reported recurrence rates of 0% to 8% with follow-up between 6 months and 14 years. Harris et al<sup>21</sup> performed a systematic review

of outcomes after open and arthroscopic Bankart repair that included 26 studies and 1781 patients and a minimum follow-up of 5 years (mean follow-up 11 years). Rates of recurrent instability after arthroscopic and open Bankart repair were 11% and 8%, respectively. Bessiere et al<sup>5</sup>

compared arthroscopic Bankart repair versus open Latarjet procedure and found the rate of recurrent instability at 5 years of follow-up to be 24% after arthroscopic Bankart repair and 12% after Latarjet procedure. Bankart repair has been associated with higher recurrence rates in collision versus noncollision athletes in the literature.<sup>31</sup> Risk of postoperative recurrence has been noted to increase with the presence of a bony defect (glenoid or humeral), hyperlaxity of the shoulder, young age, and increased number of dislocations before surgery.<sup>9,35</sup> Certain soft tissue lesions as well as glenoid and humeral bone loss also have been implicated in the failure of soft tissue repairs.<sup>24,37</sup> Patients with these characteristics or lesions may benefit from procedures that go beyond repair of soft tissue structures. The Instability Severity Index Score (ISIS) takes into consideration these risk factors and can be useful in determining the appropriate procedure for individual patients.<sup>34</sup>

The indication for surgery in this series was anterior shoulder instability manifested by at least 1 shoulder dislocation. Choice of surgical procedure was between arthroscopic Bankart repair or arthroscopic Latarjet procedure. The senior surgeon did not perform open Bankart repairs or open Latarjet procedures during the study period. Many patients reported multiple dislocation and subluxation events. The factors considered by the senior surgeon in determining whether to perform the arthroscopic Latarjet procedure versus the arthroscopic Bankart procedure are similar to those tallied for the ISIS. Most of the surgeries in this series predate the publication of the ISIS in 2007. More recently, the ISIS is used by the senior author to help with preoperative decision making. We typically reserve the arthroscopic Bankart procedure for patients with less than 10% glenoid bone loss and no associated instability lesions such as HAGL, ALPSA, or large Hill-Sachs lesions. Low-demand patients with 10% to 25% bone loss and a bony Bankart fragment that can be reconstructed are treated with arthroscopic bony Bankart repair. High-demand patients with 10% to 25% glenoid bone loss, patients with associated instability lesions (HAGL, ALPSA, or large Hill-Sachs lesions), or any patient with more than 25% bone loss is typically treated with the arthroscopic Latarjet procedure. During initial evaluation, our standard shoulder series includes a true anteroposterior view of the glenohumeral joint and the Bernageau profile view, which allows evaluation of the anterior glenoid for cortical disruption and bone loss.<sup>4</sup> More recently, 3-dimensional computed tomography of the shoulder has been added to our standard preoperative workup for more reliable measurement of glenoid bone loss.

The Latarjet procedure restores stability to the shoulder through a combination of bony and soft tissue mechanisms. Augmentation of the anterior bony glenoid results in an increased glenoid surface area, thus preventing a Hill-Sachs lesion from engaging the anterior glenoid rim. More important, transfer of the coracobrachialis tendon with the coracoid through a split in the subscapularis creates a dynamic reinforcement to the deficient anteroinferior capsulolabral complex. This slinglike construct becomes taut with the shoulder in the abducted, externally rotated position typically associated with shoulder instability.<sup>36</sup>

The open Latarjet procedure has shown excellent results.<sup>1,6</sup> The arthroscopic Latarjet procedure combines the excellent results of its open counterpart with the advantages of arthroscopic surgery. The main advantages of the arthroscopic Latarjet procedure are (1) improved visualization for accurate positioning of the coracoid graft in the inferior-superior and medial-lateral directions; (2) the ability to better visualize and then treat associated intra-articular lesions (such as posterior labral tears, superior anterior-posterior labral tears, cartilage defects); (3) the diminished potential for formation of postoperative scar tissue and stiffness associated with a larger open incision and dissection; (4) the ability to present the patient with the option of 2 arthroscopic techniques, precluding the need to convert to open surgery if bone loss is too significant to proceed with arthroscopic Bankart repair; (5) the improved cosmesis associated with arthroscopic portals compared with an open surgery incision; and (6) the improved ability to visualize nearby neurovascular structures and ensure their protection throughout the procedure.<sup>2,8,27</sup>

Early results of arthroscopic coracoid transfer have been promising, with one series reporting 0 of 41 recurrent dislocations at 16 months of follow-up (Bristow technique).<sup>6</sup> Our series was previously reported and showed 0 of 62 recurrent dislocations at 18 months and later 0 of 35 recurrent dislocations at 26 months.<sup>26</sup> Mid- to long-term results are necessary to adequately evaluate efficacy of the procedure and compare it with other surgical techniques commonly used to treat anterior glenohumeral instability. Our study presents the longest follow-up to date in the largest series of patients undergoing the arthroscopic Latarjet procedure.

Limitations of this study include those inherent to a retrospective study, including possible selection bias of the surgeon and inability to reach all patients for follow-up after the surgery. Demographics of patients we were able to contact for follow-up are representative of those of the entire series. The overall group was 86.5% male and 13.5% female, with a mean/median age of 30.3/27.2 years. Our center is a referral center for shoulder surgery, with most patients coming from outside our region, rendering follow-up more challenging. Results from this series were reported at a mean of 18 and 26 months, at which time some patients were available for clinical follow-up and radiographs. Given the difficulty of obtaining even short-term clinical and radiographic follow-up, we deemed our mail/phone questionnaire the most effective way to reach the highest number of patients in this series. Although the WOSI includes specific questions regarding shoulder motion and stiffness, it is impossible for us to quantify postoperative limitations in motion without a clinical examination. Similarly, we are unable to objectively comment on the presence of apprehension or the strength of the shoulder musculature (with the subscapularis of particular interest). The possibility of glenohumeral arthritis or coracoid graft osteolysis cannot be assessed without radiographs. We do not have preoperative data, such as the WOSI, for comparison with the postoperative scores we collected.

Potential complications of the surgery are similar to those of open Latarjet procedure and include graft non-union, malposition of the graft, graft osteolysis, neurological injury, infection, hematoma, hardware complications, and recurrent instability.<sup>13</sup> We have listed all complications that could be identified. Unfortunately, without radiographic follow-up we are unable to comment on graft union/osteolysis or glenohumeral arthritis. We suspect that significant glenohumeral arthritis would be reflected in the WOSI pain and motion scores. Time required to complete the procedure was not recorded for this study but has improved with the experience of the senior author. The procedure typically requires approximately 60 to 75 minutes to complete at our center. The procedure should be introduced to the surgeon's practice gradually, beginning with practice on surgical models and cadavers to improve understanding of the instrumentation and anatomic considerations.<sup>15</sup>

## CONCLUSION

The rate of recurrent instability after arthroscopic Latarjet procedure for the treatment of anterior shoulder instability is low. Results in our series show a rate of recurrence that is lower than recurrence rates reported for arthroscopic and open Bankart repairs and that is within the range reported for the open Latarjet procedure. Specific outcome scores regarding shoulder instability after the procedure are also encouraging. The arthroscopic Latarjet procedure remains technically challenging but should be strongly considered as a reliable treatment option for anterior shoulder instability.

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A Video Supplement for this article is available in the online version or at <http://ajs.sagepub.com/supplemental>.

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