



# All-Inside Arthroscopic Partial Articular-Sided Supraspinatus Tendon Avulsion (PASTA) Repair Without Bunching of the Bursal Side of the Tendon

Thun Itthipanichpong, M.D., Napatpong Thamrongsuksiri, M.D., Danaithep Limskul, M.D., and Thanathep Tanpowpong, M.D.

**Abstract:** PASTA (partial articular-sided supraspinatus tendon avulsion) lesions are supraspinatus tendon tears involved the articular surface. PASTA lesions are commonly repaired using trans-tendon repair or tendon takedown and repair. Systematic reviews have shown that both techniques can improve shoulder function similarly. The advantages of trans-tendon repair are the preservation of the intact tendon and superior biomechanical strength. However, there is a risk that the tendon will become overtensioned and that the technique will create tendon bunching on the bursal side, resulting in imbalanced tendon tension. This Technical Note describes an all-inside arthroscopic trans-tendon repair technique of PASTA lesion without bunching the tendon's bursal side.

## Introduction

Partial-thickness rotator cuff tears are a common cause of shoulder pain and loss of function.<sup>1</sup> Partial-thickness tears are more prevalent than full-thickness tears.<sup>2</sup> PASTA (partial articular-sided supraspinatus tendon avulsion) lesions are supraspinatus tendon tears involving the articular surface. Physical therapy, steroid, platelet-rich plasma (PRP), and autologous adipose tissue-derived mesenchymal stem cells injection have all been shown to improve clinical outcomes and satisfaction in patients with PASTA lesions.<sup>3-6</sup> Surgery is usually indicated when conservative treatments have failed. The surgical treatment of partial-thickness rotator cuff tears is still controversial. PASTA lesions are commonly repaired using trans-tendon repair and tendon takedown and repair. In

the short and medium term, arthroscopic repair using either the trans-tendon repair or tendon takedown and repair technique is associated with good results.<sup>7</sup> The advantages of tendon takedown and repair are better footprint preparation and debridement of degenerative tendons.<sup>8</sup> However, this technique involves the excision of a good bursal-sided tendon, which could result



**Fig 1.** Coronal T2-weighted magnetic resonance image with fat saturation of right shoulder showing a PASTA (partial articular-sided supraspinatus tendon avulsion) lesion (arrow).

Department of Orthopaedics, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, The Thai Red Cross Society, Bangkok, Thailand (T.I., N.T., D.L., T.T.).

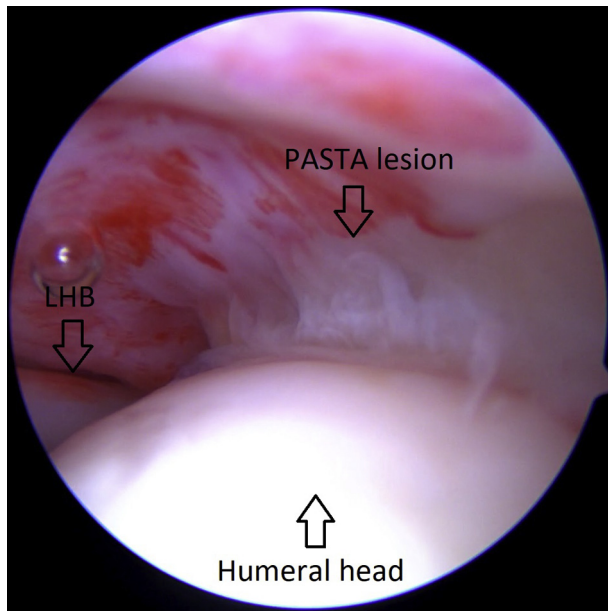
Received January 11, 2022; accepted January 27, 2022.

Address correspondence to Napatpong Thamrongsuksiri, M.D., Department of Orthopaedics, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, The Thai Red Cross Society, Bangkok, Thailand. E-mail: [napatpong.tha@gmail.com](mailto:napatpong.tha@gmail.com).

© 2022 THE AUTHORS. Published by Elsevier Inc. on behalf of the Arthroscopy Association of North America. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

2212-6287/2284

<https://doi.org/10.1016/j.eats.2022.02.013>



**Fig 2.** Right shoulder, beach chair position, view of glenohumeral joint from posterior portal. PASTA (partial articular-sided supraspinatus tendon avulsion) lesion can be easily seen while the shoulder is in slight abduction and external rotation. (LHB, long head of biceps tendon).

in a higher retear rate.<sup>9</sup> The preservation of the intact tendon and superior biomechanical strength are two advantages of trans-tendon repairs.<sup>10,11</sup> However, there is a risk that the tendon will become overtensioned<sup>10,11</sup> and that the technique will create tendon bunching on the bursal side, resulting in imbalanced tendon tension.<sup>12</sup> Nevertheless, systematic reviews have shown that both techniques can improve shoulder function in

the same way.<sup>13-15</sup> We propose an all-inside arthroscopic trans-tendon repair technique of PASTA lesion without bunching of the bursal side of the tendon.

### Preoperative Evaluation

Standard plain shoulder radiograph and magnetic resonance imaging (MRI) are performed to identify PASTA lesions and associated capsulolabral injuries (Fig 1).

### Surgical Technique

See Video 1 for details on the surgical technique.

### Patient Positioning

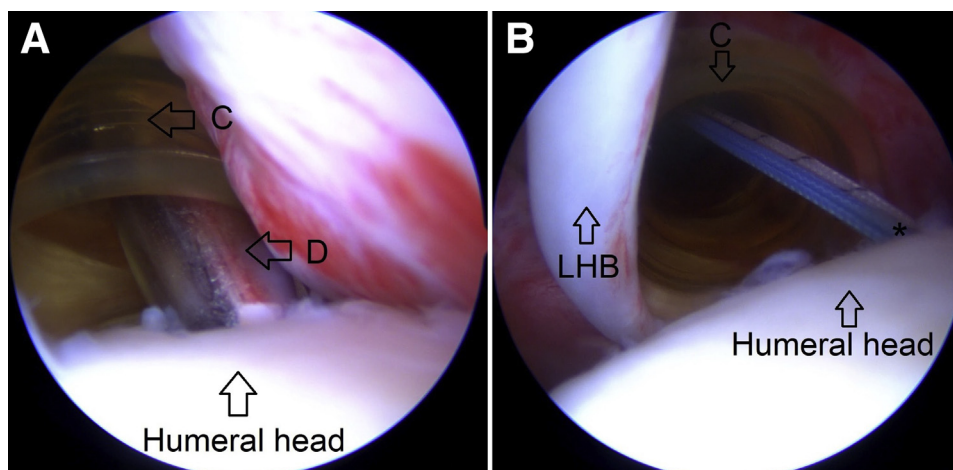
The patient is placed in the beach chair position. Anatomical bone landmarks are identified and marked after the patient has been prepped and draped.

### Arthroscopic Portal Placement

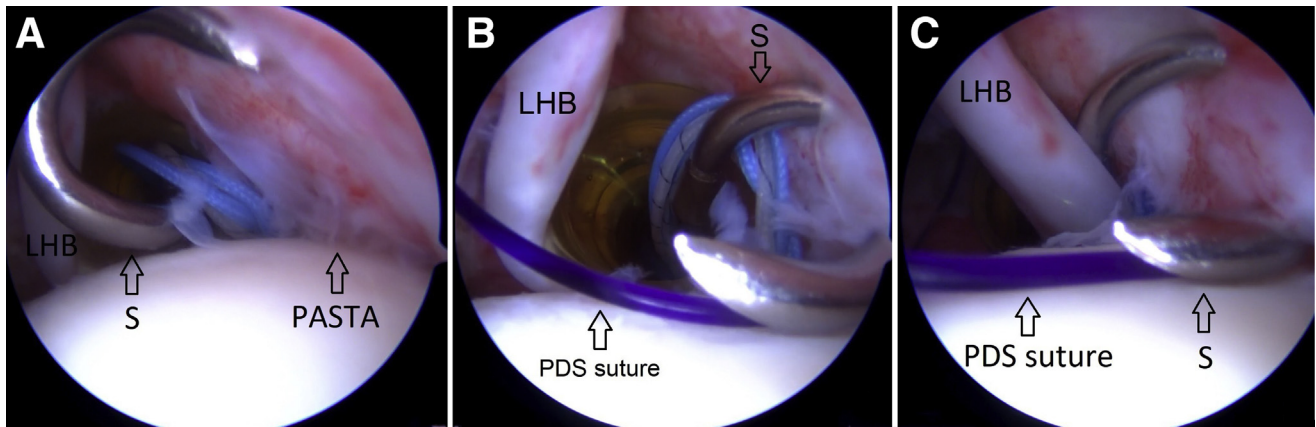
Arthroscopic examination of the glenohumeral joint is done with a 30° arthroscope. First, a standard posterior portal located 2 cm medial and inferior to the acromion's posterolateral corner is created. Then, the anterior portal, just lateral and superior to the coracoid process, through the rotator interval is created. Then the 8-mm cannula (ConMed, Utica, NY) is inserted through the anterior portal. Put the cannula above the long head biceps tendon. The PASTA lesion can be easily seen while the shoulder is in slight abduction and external rotation (Fig 2).

### Anchor Placement

After the PASTA lesion has been identified, checking the location of the anatomical footprint to locate the



**Fig 3.** Right shoulder, beach chair position, view of glenohumeral joint from posterior portal. (A) Insertion of the curved guide sleeve (ConMed, Utica, NY) is applied through the anterior cannula. At the same time, the shoulder is in adduction and internal rotation position. (B) The double-loaded 1.8-mm Y-Knot Flex all-suture anchor with two strands of no. 2 Hi-Fi sutures (ConMed) is inserted into the hole through the guide sleeve. C, anterior cannula; D, curved guide sleeve; LHB, long head of biceps tendon. An asterisk (\*) indicates the double-loaded, 1.8-mm Y-Knot Flex all-suture anchor).



**Fig 4.** Right shoulder, beach chair position, viewing glenohumeral joint from posterior portal, (A) The 90° spectrum suture passer (ConMed) is introduced to the glenohumeral joint via anterior cannula. (B) The 90° spectrum suture passer (ConMed) is used to sew the articular-side supraspinatus tendon and pass a PDS suture (Ethicon) to shuttle the Hi-Fi suture of the anchor through the tendon. (C) The step is repeated in the same fashion and shuttle another Hi-Fi suture of the anchor through the tendon. LHB, long head of biceps tendon; S, the 90° spectrum suture passer.

anchor location is done, and insertion of the curved guide sleeve (ConMed) is applied through the anterior cannula. At the same time, the shoulder is in adduction and internal rotation position. A flexible drill bit was used to create a pilot hole (Fig 3A). The double-loaded 1.8-mm Y-Knot Flex All-Suture Anchor with two strands of no. 2 Hi-Fi sutures (ConMed, Utica, NY) is inserted into the hole through the guide sleeve (Fig 3B).

#### PASTA Repair

The 90° spectrum suture passer (ConMed) is used to sew the articular-side supraspinatus tendon and pass a PDS suture (Ethicon) to shuttle the Hi-Fi suture of the anchor through the tendon via the anterior portal (Fig 4, A and B). The step is repeated in the same fashion and shuttle another Hi-Fi suture of the anchor

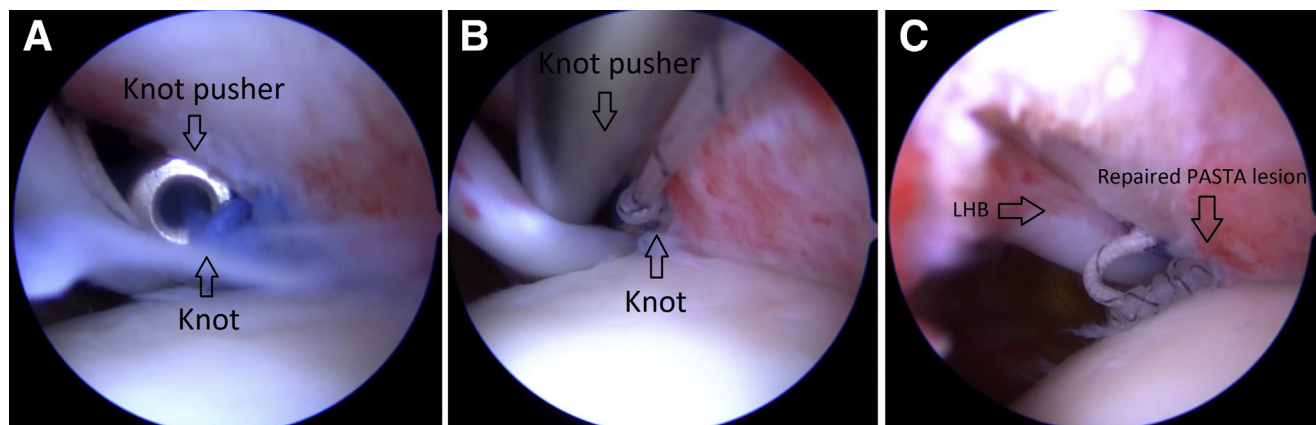
through the tendon (Fig 4C). Then, the Hi-Fi sutures of the suture anchor are tied with sliding knots (Fig 5).

#### Subacromial Space Examination

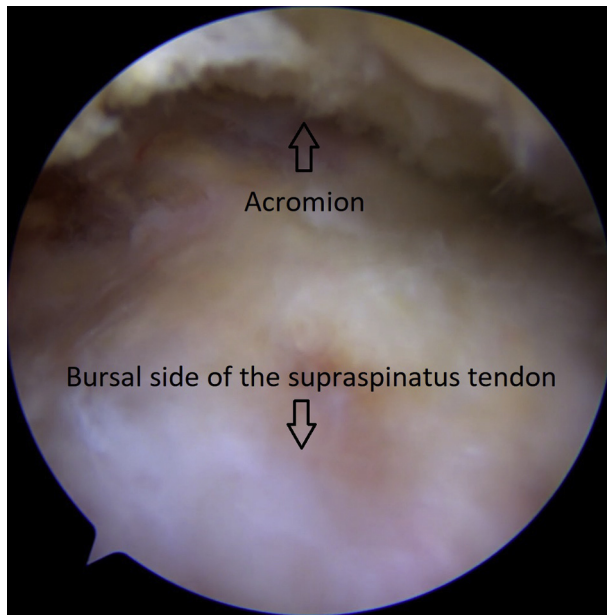
According to preoperative evaluation, after the PASTA lesion is repaired, the arthroscope is switched to the subacromial space to correct subacromial pathology (Fig 6).

#### Postoperative Care

After surgery, the affected shoulder is immobilized with a sling for 3-4 weeks. However, active hand, wrist, and elbow exercises are allowed from the first day, and progressive shoulder mobilization is commenced under observation 15 days postoperatively. Actively assisted physiotherapy is advised 6 weeks postoperatively,



**Fig 5.** Right shoulder, beach chair position, view from the subacromial space from the posterior portal. The Hi-Fi sutures of the suture anchor are tied with sliding knots. (A) The first knot is tied with a sliding knot. (B) The second knot is tied with a sliding knot. (C) The final repaired construct is shown. LHB, long head of biceps tendon.



**Fig 6.** Right shoulder, Beach chair position, viewing subacromial space from posterior portal, After the partial articular-sided supraspinatus tendon avulsion (PASTA) lesion is repaired, the arthroscope is switched to the subacromial space. There is no evidence of rotator cuff tendon overtension or bunching on the bursal side.

focusing on full passive and active shoulder range-of-motion gained and the performance of daily activities without difficulties. No strengthening or resistance exercises are allowed before 3 months.

## Discussion

Supraspinatus tendon avulsions involving the articular surface are known as PASTA. The surgical repair of PASTA lesion is still debatable. Trans-tendon repair and tendon takedown and repair are commonly used to treat PASTA lesions. Several systematic reviews have shown that both techniques can improve shoulder function in the same way.<sup>13-15</sup> The advantages of trans-tendon repair are the preservation of the intact tendon and superior biomechanical strength.<sup>10,11</sup> However, there is a risk that the tendon will become overtensioned and that the technique will create tendon bunching on the bursal side, resulting in imbalanced

**Table 1.** Advantages and Disadvantages

Advantages	<ul style="list-style-type: none"> <li>- No tendon bunching on the bursal side or overtensioned rotator cuff tendon</li> <li>- Preservation of the tendon's bursal side</li> <li>- Superior biomechanical strength compared to tendon takedown and repair</li> <li>- Less area of articular cartilage injury because of using a soft suture anchor</li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>- High technical demand</li> <li>- Difficulty in suture management</li> </ul>

**Table 2.** Pearls and Pitfalls

Pearls	<ul style="list-style-type: none"> <li>- The PASTA lesion can be easily seen while the shoulder is in slight abduction and external rotation.</li> <li>- Using the Spectrum suture passer to sew only the articular-side tendon</li> <li>- Using soft suture anchor with curved guide sleeve and flexible drill bit</li> <li>- Inserting the suture anchor through the anterior cannula to avoid intact rotator cuff injuries</li> <li>- Inserting anchor while adduction and internal rotation of the shoulder</li> </ul>
Pitfalls	<ul style="list-style-type: none"> <li>- Suture anchor pull-out due to inappropriate trajectory of the drilled hole</li> </ul>

tendon tension.<sup>12</sup> Many surgical techniques were reported to treat the PASTA lesion.<sup>16-20</sup> This PASTA repair technique differs from the previous technique in that it offers various advantages, including no tendon bunching on the bursal side or an overtensioned rotator cuff tendon, preservation of the intact tendon, superior biomechanical strength compared to tendon takedown and repair, and less articular cartilage injury due to the soft suture anchor. This procedure is performed on a beach chair with standard shoulder arthroscopy equipment and can also be performed in the lateral decubitus position, depending on the surgeon's preference.

Advantages and disadvantages and pearls and pitfalls of the procedure are further described in [Tables 1 and 2](#).

In conclusion, this presented technique is a reproducible method and a safe surgical technique to repair the PASTA lesion.

## References

1. Matthewson G, Beach CJ, Nelson AA, et al. Partial thickness rotator cuff tears: Current concepts. *Advances in orthopedics* 2015;2015:458786.
2. Gartsman GM, Milne JC. Articular surface partial-thickness rotator cuff tears. *J Shoulder Elbow Surg* 1995;4:409-415.
3. Finnan RP, Crosby LA. Partial-thickness rotator cuff tears. *J Shoulder Elbow Surg* 2010;19:609-616.
4. Matava MJ, Purcell DB, Rudzki JR. Partial-thickness rotator cuff tears. *Am J Sports Med* 2005;33:1405-1417.
5. Thepsoparn M, Thanphraisan P, Tanpowpong T, Itthipanichpong T. Comparison of a platelet-rich plasma injection and a conventional steroid injection for pain relief and functional improvement of partial supraspinatus tears. *Orthop J Sports Med* 2021;9:2325967 1211024937.
6. Jo CH, Chai JW, Jeong EC, Oh S, Yoon KS. Intratendinous injection of mesenchymal stem cells for the treatment of rotator cuff disease: A 2-year follow-up study. *Arthroscopy* 2020;36:971-980.
7. Rossi LA. Editorial Commentary: Arthroscopic repair of partial thickness rotator cuff tears: What do we know so far and where should we put the focus of our future research? *Arthroscopy* 2021;37:1455-1457.

8. Kamath G, Galatz LM, Keener JD, Teefey S, Middleton W, Yamaguchi K. Tendon integrity and functional outcome after arthroscopic repair of high-grade partial-thickness supraspinatus tears. *J Bone Joint Surg Am* 2009;91:1055-1062.
9. Shin SJ. A comparison of 2 repair techniques for partial-thickness articular-sided rotator cuff tears. *Arthroscopy* 2012;28:25-33.
10. Peters KS, Lam PH, Murrell GA. Repair of partial-thickness rotator cuff tears: A biomechanical analysis of footprint contact pressure and strength in an ovine model. *Arthroscopy* 2010;26:877-884.
11. Woods TC, Carroll MJ, Nelson AA, et al. Transtendon rotator-cuff repair of partial-thickness articular surface tears can lead to medial rotator-cuff failure. *Open Access J Sports Med* 2014;5:151-157.
12. Castagna A, Delle Rose G, Conti M, Snyder SJ, Borroni M, Garofalo R. Predictive factors of subtle residual shoulder symptoms after transtendinous arthroscopic cuff repair: A clinical study. *Am J Sports Med* 2009;37:103-108.
13. Ono Y, Woodmass JM, Bois AJ, Boorman RS, Thornton GM, Lo IK. Arthroscopic repair of articular surface partial-thickness rotator cuff tears: Transtendon technique versus repair after completion of the tear-A meta-analysis. *Advances Orthop* 2016;2016:7468054.
14. Sun L, Zhang Q, Ge H, Sun Y, Cheng B. Which is the best repair of articular-sided rotator cuff tears: A meta-analysis. *J Orthop Surg Res* 2015;10:84.
15. Tennent D, Green G. Partial articular supraspinatus tendon avulsion: Should we repair? A systematic review of the evidence. *Shoulder Elbow* 2020;12:253-264.
16. Caldwell LS, Cooper AR, Elfar JC. A novel arthroscopic inside-out repair technique for PASTA lesions. *Arthrosc Tech* 2014;3:e565-e370.
17. Dilisio MF, Miller LR, Higgins LD. Transtendon, double-row, transosseous-equivalent arthroscopic repair of partial-thickness, articular-surface rotator cuff tears. *Arthroscopy Tech* 2014;3:e559-e563.
18. Heffernan JT, Wu VJ, Mulcahey MK, O'Brien MJ, Savoie FH 3rd. Double row-equivalent PASTA repair technique. *Arthrosc Tech* 2019;8:e905-e910.
19. Hirahara AM, Andersen WJ. The PASTA bridge: A technique for the arthroscopic repair of PASTA lesions. *Arthrosc Tech* 2017;6:e1645-e1652.
20. Johnson JS, Caldwell PE 3rd, Pearson SE. Arthroscopic transtendinous modified double-row suture bridge repair of a bony PASTA lesion. *Arthrosc Tech* 2014;3:e449-e453.