

# Techniques in Shoulder and Elbow Surgery

## Surgical Reconstruction of Chronic Latissimus Dorsi Tear Using Achilles Tendon Allograft

--Manuscript Draft--

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<b>Abstract:</b>	Latissimus dorsi rupture is a rare condition. Both surgical and non-surgical treatments of acute rupture have been described in literature. We present a symptomatic chronic rupture in 56 years old male patient and describe a surgical technique to reconstruct latissimus dorsi using Achilles tendon allograft.

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**COVER PAGE 1**

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- The manuscript has been read and approved by above named authors. We believe that the manuscript represents an accurate and honest work.
- We declare that this manuscript, or any part of it, has not been submitted or published elsewhere.

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4 **Surgical Reconstruction of Chronic Latissimus Dorsi Tear Using Achilles Tendon**  
5 **Allograft**  
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9 **Key words:** Latissimus dorsi, chronic tear, tendon rupture, surgical reconstruction,  
10 Achilles tendon allograft.  
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1 Surgical Reconstruction Chronic Latissimus Dorsi Tear

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4 **1 INTRODUCTION**

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6 2 The function of Latissimus dorsi muscle (LD) includes extension, adduction and  
7  
8 3 internal rotation of shoulder. It has a wide origin of thoracic, lumber, sacral vertebrae;  
9  
10 4 iliac crest, distal four ribs and inferior angle of scapula. It inserts into the bicipital groove  
11  
12 5 lateral to teres major insertion. Rupture of LD is extremely rare with a limited number of  
13  
14 6 cases reported in literature. Reported mechanisms of injury involve forceful resisted  
15  
16 7 extension and/or adduction. Both conservative <sup>(1,2,3)</sup> and surgical treatments <sup>(4-10)</sup> are  
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18 8 outlined as management methods. Only one chronic case of LD rupture was reported and  
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20 9 was managed surgically with primary repair <sup>(5)</sup>.  
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26 10 We report a case of chronic rupture of LD that was managed surgically by using  
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28 11 non-irradiated Achilles tendon to reconstruct symptomatic and irreparable LD rupture. To  
29  
30 12 our knowledge, no similar case has been reported in available literature.  
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36 14 **Key words:** Latissimus dorsi, chronic tear, tendon rupture, surgical reconstruction,  
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38 15 Achilles tendon allograft.  
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5 18 **CASE REPORT**  
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8 19 A 56 years old male referred to our office with a chief complaint of right (Rt)  
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10 20 shoulder pain for 6 months duration. This started when felt a pop and tearing in posterior  
11  
12 21 axilla while he was pulled up by towrope during water skiing. This was followed by  
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15 22 immediate pain located at the back of his shoulder and accompanied with blue  
16  
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18 23 discoloration and swelling. He had extensive athletic therapy after acute symptoms had  
19  
20 24 subsided. His main concerns at presentation were cramping pain located at the back of  
21  
22 25 axilla and weakness of Rt shoulder. This pain bothered him during sleep, exaggerated  
23  
24  
25 26 with movement and had gotten worse. He denied any history of steroid use or previous  
26  
27 27 tendon rupture. In addition to the disability for everyday activities, he is an avid golfer  
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29 28 and a cyclist therefore; he thought these symptoms are preventing him from such  
30  
31 29 activities. He is a retired dentist, and Rt hand dominant. He has a history of idiopathic  
32  
33 30 nocturnal frontal lobe epilepsy and takes Tegretol, Lamictal and Clobazam on daily basis.  
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37 31 Pain visual analogue scale was marked at 7 at presentation. Simple Shoulder Test  
38  
39 32 (SST) score was 8/12 and American Shoulder and Elbow Surgeons Score (ASES) was  
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41 33 18/30.  
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44 34 Clinical exam revealed normal cervical spine. There was a definite bulge in  
45  
46 35 substance of latissimus dorsi (LD) of Rt side as compared to contralateral side <sup>figure 1</sup>. This  
47  
48 36 was tender to deep palpation and more painful with resisted downward adduction while  
49  
50 37 shoulder in extension and 90° of abduction. He had full range of motion. Special tests for  
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52 38 impingement, rotator cuff, biceps anchor, biceps tendon and instability were negative.  
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55 39 Distal neurovascular exam was normal.  
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## Surgical Reconstruction Chronic Latissimus Dorsi Tear

41 X-rays of Rt shoulder showed no evidence of bony avulsion. A non-contrast MRI  
42 of right shoulder showed a complete tear of latissimus dorsi <sup>figure 2</sup>. There was moderate  
43 atrophy and fatty degeneration of muscle with significant retraction. Tear was thought to  
44 be at the musculotendinous junction but it was difficult to make statement about humeral  
45 insertion of tendon.

46 A lengthy discussion with our patient was undertaken to discuss treatment  
47 options. The use of Botulinum Toxin A was offered to mainly reduce the muscular  
48 symptoms as first line intervention. Patient refused this treatment option, as weakness  
49 most likely won't be addressed, therefore surgery was requested by the patient. He was  
50 consented for open reconstruction of latissimus dorsi using non irradiated Achilles tendon  
51 allograft. Surgery took place 9 months after index injury.

### 52 **Procedure:**

53 After introduction of general anesthetic, patient was intubated then placed in  
54 lateral decubitus position with Rt side uppermost. Rt upper extremity was prepped and  
55 draped in standard fashion that was extended to include the Rt hemithorax. Forearm was  
56 held in sterile fashion with a commercially available positioner (Trimano, Arthrex,  
57 Naples, Florida.) to keep shoulder in 45° of abduction and 30° of forward flexion at  
58 maximal internal rotation. One gram of first-generation cephalosporin antibiotic was  
59 administered intravenously before skin cut.

60 An inverted J- shape posterior axillary incision was used. This was started around  
61 3 cm distal to the tip of scapula, extended proximally parallel to lateral border of scapula,  
62 curved around apex of axilla then passed distally 3 cm parallel to posterior arm crease. A  
63 Posterior deep flap was elevated to retrieve LD muscle. It was found retracted medial to

## Surgical Reconstruction Chronic Latissimus Dorsi Tear

64 lateral border of scapula (Figure 3). It was mainly muscular with thicken lateral end.  
65 There was not significant tendinous attachment recognized. We noticed intermittent  
66 spontaneous macroscopic fasciculation of LD muscle. Teres major was identified and  
67 retracted proximally. The radial nerve was palpated and retracted laterally with triceps  
68 long head as it exits triangle interval. Blunt dissection along the track of teres major and  
69 toward the medial bicipital ridge was performed. All other axillary content should be  
70 pushed anteriorly while arm is in internal rotation. Careful periosteal elevation was  
71 completed at the medial bicipital ridge to expose a small window for anchors insertion.  
72 Two single loaded 2.3 metallic anchors, which were pre-loaded with number 2 non-  
73 absorbable braided high strength sutures (Fiberwire, Arthrex, Naples, Florida), were  
74 inserted (UltraFix MiniMite anchor system; ConMed Linvatec Largo Florida.). The  
75 Achilles tendon allograft was prepared free of bony attachment then the distal part was  
76 fixed to both anchors using sliding whipstitch technique. At the end, distal graft tendon  
77 was docked to proximal humerus nicely. The free end of graft was passed through the  
78 substance of LD, keeping adequate cuff of muscle laterally (Figure 4). The graft was  
79 tension while the arm was in same setting position; then the free end of graft was sutured  
80 to itself and to LD muscle using no 2 non-absorbable braided sutures (Figure 5). Wound  
81 was irrigated and closure in layers was performed.

82         The patient was immobilized in sling and allowed to do pendulum exercises  
83 immediately. At 2-week postoperative mark, there was a substantial relief of the original  
84 cramping pain, as well as a noticeable decrease in the posterior bulging of the LD muscle  
85 belly. The patient was allowed start on passive and active-assisted range of motion  
86 exercise, taking care not to stress or stretch out the repair. At the 3-month post operative

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87 mark, he was to begin a progressive strengthening program first concentrating on non

88 Latissimus dorsi engaging exercises. Full recovery was anticipated to take at least 9

89 months post surgery.

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5 92 **DISCUSSION**

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10 94 This report describes latissimus dorsi reconstruction using Achilles tendon  
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12 95 allograft to treat symptomatic chronic LD avulsion. To our knowledge, there was no  
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14 96 report of similar surgical technique to address similar condition. Non-surgical  
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16 97 management is a valid option and was tried first in our case; however, persistent pain and  
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18 98 cramping of muscle substance as well as weakness were issues that failed to resolve.

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20 99 Among four reported cases of acute LD tear managed non-surgically<sup>(1,2,3)</sup>, one patient  
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22 100 was unsatisfied at one-year mark with residual posterior axillary fold pain localized to  
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24 101 palpable cord like structure<sup>(3)</sup>. We were not able to find such tender cord-like structure  
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26 102 on clinical exam. Instead, most tenderness was located within muscle substance. Using  
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28 103 muscle relaxant injection such as botulinum toxin A was a logic thought to address  
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30 104 muscular cramps. No evidence was found in similar condition; but its use is well  
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32 105 established for muscular pain in neuromuscular disorders.

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35 106 Strength of shoulder was assessed without objective tool and found not to  
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37 107 correspond to patient's subjective feeling of weakness. Hiemstra et al assessed the  
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39 108 consequence of LD tear objectively by comparing both sides isokinetic strength<sup>(4)</sup>.  
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41 109 Greatest deficit was found in Extension (77%) followed by adduction (21%). This may  
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43 110 emphasize that subjective weakness should be taken into account of decision-making.

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45 111 We found a total of 11 case reports of LD tears that were surgically managed.  
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47 112 There was only one report of chronic LD avulsion and one report of sub acute tear.  
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49 113 Livesey et al reported a chronic LD tear in a 39 years old semi-professional rock climber  
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51 114<sup>(5)</sup>. The main symptoms were weakness and a persistent pain around the posterior axillary

## Surgical Reconstruction Chronic Latissimus Dorsi Tear

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4 115 fold with palpable scarred band. Surgical delayed primary repair using two incisions  
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6 116 technique was performed more than 2 ½ years after the index injury. The patient was  
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8 117 subjectively better than before surgery despite that returning to pre-injury level of  
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10 118 climbing wasn't achieved. Cox et al reported 2 cases with sub acute LD avulsion in  
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12 119 recreational athletes <sup>(6)</sup>. Primary repair was achieved at two months mark from index  
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14 120 Injury. A single posterior axillary incision was utilized. Their patients showed  
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16 121 improvement in functional outcome measures and were able to return to pre-injury status.  
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18 122 A pseudo capsule around the torn tendon was utilized to locate humeral insertion of LD  
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20 123 <sup>(6,7)</sup>. In our case, a cord like structure was found during surgery and it was located deep to  
21  
22 124 the retracted LD musculature. It was traced proximally and found not to attach to  
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24 125 proximal humerus, but it was diving into the axillary region. To us, that was consistent  
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26 126 with the anatomic features of thoracodorsal neurovascular structure. Thus, care should be  
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28 127 taken to ensure that any tendon remnant or pseudocapsule must be tracked into its  
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30 128 insertion site of proximal humerus to avoid inadvertent transection of thoracodorsal  
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32 129 pedicle. A cadaveric study may be an essential step to point out the relation of LD, its  
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34 130 tendon and thoracodorsal pedicle, especially in chronic cases.

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36 131 Different surgical approaches were utilized to address torn LD tendon. These  
37  
38 132 include combined deltopectoral and posterior axillary approaches <sup>(5,6,8)</sup>, combined anterior  
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40 133 and posterior axillary approaches <sup>(9)</sup> and single posterior axillary approach <sup>(4,10)</sup>. Lim and  
41  
42 134 his group were first to describe the use of single posterior axillary incision to treat acute  
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44 135 traumatic LD tear. It was suggested that a lateral decubitus position gives more freedom  
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46 136 to have anterior access if needed. We found this approach an excellent extensile option  
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48 137 that allowed us to elevate a deep posterior flap to retrieve the retracted muscle. Finding  
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## Surgical Reconstruction Chronic Latissimus Dorsi Tear

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4 138 the humeral insertion site can be tricky and difficult in chronic cases. The normal track of  
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6 139 tendon can be undefined at axillary region as in our case. We used the teres major tendon  
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9 140 as a guide into axilla toward humeral insertion of LD. A very careful blunt dissection  
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11 141 should be performed medial to long head of triceps. Radial nerve must be digitally  
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14 142 palpated and protected. Periosteal elevation during bone preparation and anchor insertion  
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16 143 must be into bone without jeopardizing surrounding structures.  
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## Surgical Reconstruction Chronic Latissimus Dorsi Tear

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6 146 **Conclusion**

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9 147 Latissimus dorsi tear can be chronically associated with weakness and pain in  
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11 148 some patients. Because of paucity of clinical data, it is impossible to draw line between  
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14 149 who will and who won't be doing well with conservative treatment. Hence, avoiding  
15  
16 150 more complex late reconstructive procedures cannot be assured bases on initial  
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18  
19 151 presentation. Patients with LD tear of dominant arm with intent to continue on regular  
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21 152 sport activities, with subjective weakness and with tender palpable posterior cord like  
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24 153 structure should be counseled for early primary repair.

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## Surgical Reconstruction Chronic Latissimus Dorsi Tear

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### 192 **Figures Legends:**

- 193 • Figure 1: Difference between both shoulders can be observed with empty  
194 posterior axillary fold of Rt shoulder.
- 195 • Figure 2: coronal T2 PD image shows torn Latissimus dorsi with significant  
196 retraction
- 197 • Figure 3: Latissimus dorsi retrieved into surgical field. Notice absence of  
198 significant tendinous portion.
- 199 • Figure 4: The graft was fixed into proximal humerus and the free end was looped  
200 into latissimus dorsi muscle and ready to be fixed distally.
- 201 • Figure 5: Final picture of reconstruction shows latissimus dorsi brought in tension  
202 to the posterior axillary fold.

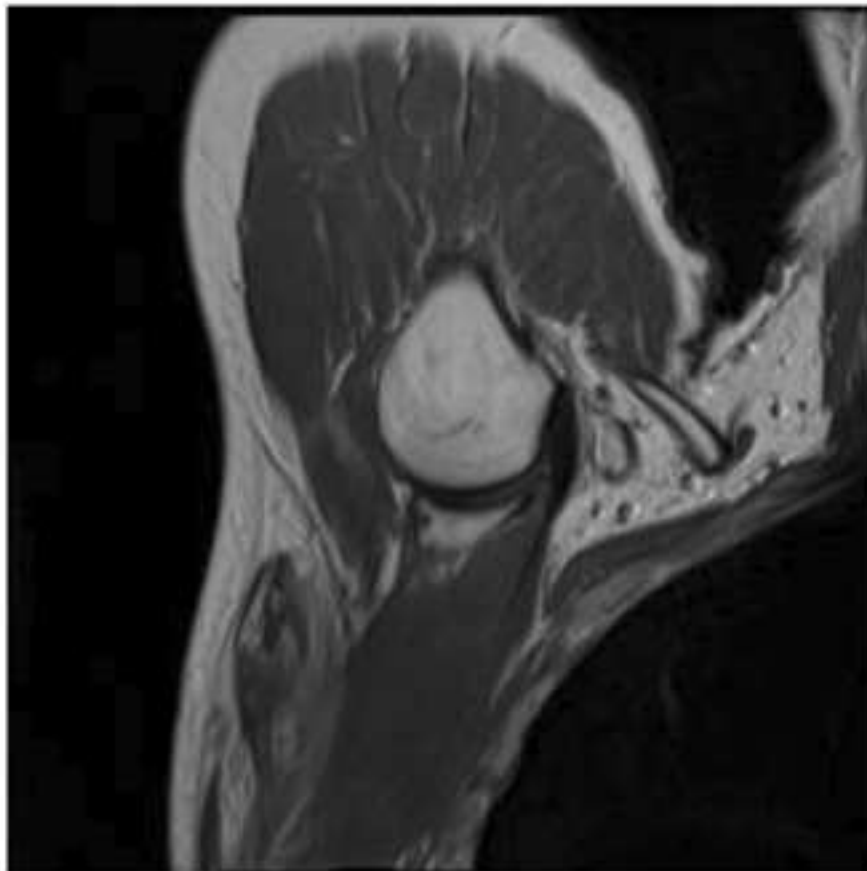
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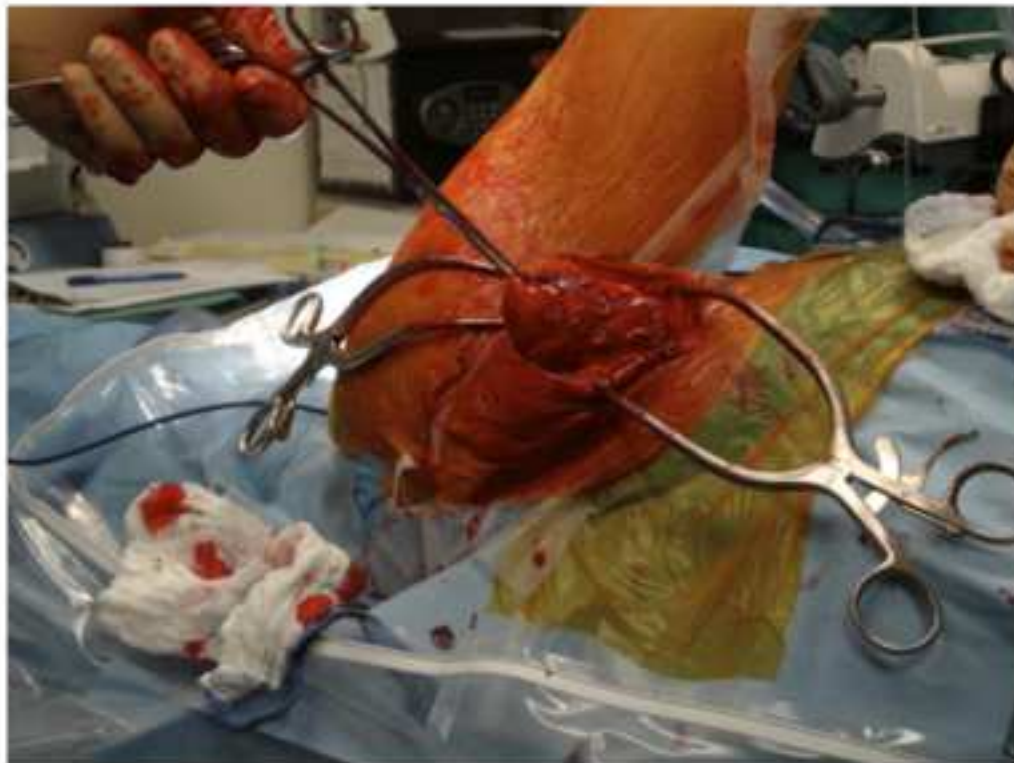
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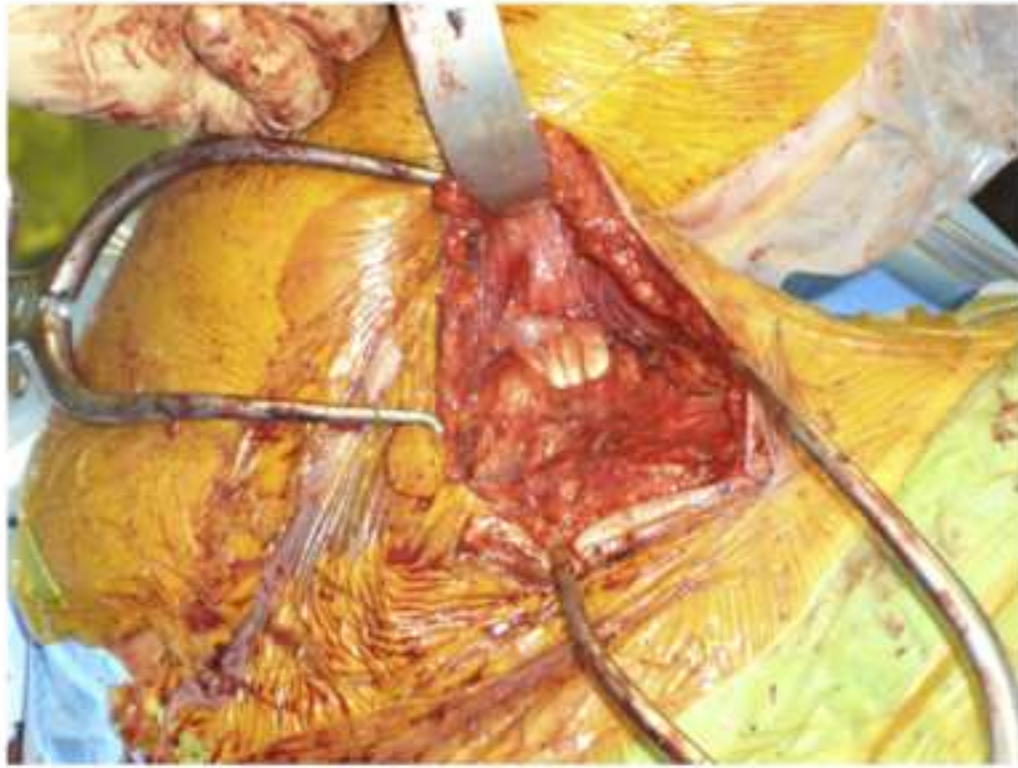


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