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## Transfer of the latissimus dorsi and teres major for irreparable rotator-cuff tears

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### Abstract

We treated 32 shoulders in the period of 1993 to 2002 by the transfer of latissimus dorsi and teres mayor technic. We evaluate 29 shoulders in 26 patients with irreparable rotator-cuff, before and after surgery using the University of California at Los Angeles (UCLA) protocol.

There were 15 men and 11 women. The mean age was 62.8 years and the average follow-up was 58 months (14 to 114 months). The exclusion criteria were: follow-up less than 12 months (Two cases) and death (One case).

The results were excellent in 10 shoulders, good in 11, fair in six and poor in only two shoulders.

The active forward flexion increased 60 degrees at average. The group in which the biceps was not compromised showed better results than the group in which the biceps was absent when we evaluate about function, active forward flexion and strength.

The authors concluded that the transfer of latissimus dorsi, with the bone insertion is a efficient technique in restoring the function of irreparable lesions of rotator-cuff.

**Keywords:** Latissimus dorsi, teres major, irreparable, rotator-cuff tears

### Introduction

The massive irreparable rotator cuff tears has been subject of extensive debates among shoulder experts [1, 2, 3, 4, 5, 6, 7]. Cofield [7] justifies that special interest because of economic and social effects of this lesion that implicates in several hours lost in labor among patients [1, 2, 3, 5, 7].

Several techniques has been described as treatment of those tears, although none has lead to consistent results. The supraspinatus lateral attachment [1, 3, 4, 7] local rotator cuff transposition and fascia lata autologous or heterologous graft [1, 2, 3, 4].

The massive irreparable rotator cuff tears, meaning a lesion greater than 5 cm, exposes a great part of humeral head articular cartilage, leading to glenohumeral joint dysfunction, by mechanic and nutritional effects [1, 2, 3]. This imbalance will lead to rotator cuff arthropathy [1, 8].

The supraspinatus lateral attachment is restricted anatomically by suprascapular nerve motor branches [8], which allows only 3 cm of lateral progression, representing a technique pitfall to massive tears surgical treatment [7, 8, 9].

The tendon quality, represented by fatty degeneration defined by Goutaleir classification, is an important decision-making factor in surgical technique choice [8, 9, 10].

Fascia lata graft presented unsatisfactory results because of high level of soft tissue adherence and re-rupture [11].

Autologous vascularized great dorsal tendon graft leads to excellent functional outcomes in irreparable tears, allowing great improve, when used as a salvage after surgical primary failure. [10, 12, 13].

### Material and Methods

Between 1993 and 2002, we performed 32 great dorsal transpositions in patients with massive irreparable rotator cuff tears. Exclusion criteria was less than 12 months of follow up and

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Death. We evaluated 29 shoulders in 26 patients. (Table 1). Patients were 15 male and 11 female, with age ranging from 43 to 81 y.o (Mean 62.8).

The dominant side was affected in 22 shoulders. We performed surgery in both shoulders in three patients. Four patients was previously submitted to rotator cuff repair.

The mean follow up was 58 months (14 to 114 months), and patients were evaluated prospectively before and after surgery by the UCLA Score scale (Table 2).

Patients' lesion were classified during surgery according Gerber *et al*, as small, large, massive and massive with

normal biceps tendon. The lesions considered as small were those in which stable repair were possible in complete adduction (GI); Lesions considered large were those in which repair were possible in 60° abduction (GII); massive when no repair was suitable in 60° abduction (GIII) and massive with intact biceps were considered GIII+. Patients electible to *latissimus dorsi* transfer where those GIII or GIII+.

Patients were statistically evaluated by Mann-Whitney criteria, paired before and after surgery using pain, function, active forward flexion, strength, biceps status and satisfaction as criteria.

**Table 1:** Patient data

| Name | Age | Genr | Lat | Score (GIII+ =1 GIII =2) | UCLA before | UCLA After | Previous surgeries (Yes=1 No=2) |
|------|-----|------|-----|--------------------------|-------------|------------|---------------------------------|
| GR   | 64  | M    | R   | 1                        | 10          | 28         | 2                               |
| LTL  | 61  | F    | R   | 1                        | 6           | 34         | 2                               |
| HMR  | 65  | F    | R   | 1                        | 7           | 31         | 2                               |
| CJA  | 79  | F    | L   | 1                        | 13          | 34         | 2                               |
| ES   | 71  | F    | R   | 1                        | 6           | 28         | 2                               |
| JAC  | 65  | F    | R   | 1                        | 9           | 34         | 1                               |
| CFD  | 67  | F    | R   | 1                        | 9           | 35         | 2                               |
| IL   | 59  | M    | L   | 1                        | 6           | 28         | 2                               |
| WSR  | 58  | M    | L   | 1                        | 9           | 31         | 2                               |
| JFS  | 44  | M    | L   | 1                        | 6           | 30         | 2                               |
| HP   | 67  | M    | L   | 1                        | 8           | 30         | 2                               |
| JDM  | 70  | M    | L   | 1                        | 11          | 35         | 2                               |
| EAS  | 59  | M    | L   | 1                        | 9           | 34         | 2                               |
| AC   | 65  | M    | R   | 1                        | 12          | 34         | 2                               |
| JCP  | 58  | M    | R   | 1                        | 12          | 34         | 2                               |
| LS   | 77  | M    | R   | 1                        | 3           | 21         | 1                               |
| DRF  | 75  | M    | R   | 1                        | 9           | 31         | 2                               |
| OAF  | 51  | M    | R   | 1                        | 8           | 30         | 2                               |
| WSR  | 54  | M    | R   | 1                        | 6           | 35         | 2                               |
| SAC  | 72  | F    | R   | 2                        | 3           | 18         | 1                               |
| GLS  | 60  | F    | L   | 2                        | 9           | 27         | 2                               |
| CJA  | 81  | F    | R   | 2                        | 5           | 10         | 2                               |
| AMG  | 55  | F    | R   | 2                        | 4           | 23         | 2                               |
| MJL  | 70  | F    | R   | 2                        | 9           | 25         | 2                               |
| CJR  | 60  | F    | R   | 2                        | 5           | 28         | 2                               |
| ERF  | 65  | M    | L   | 2                        | 9           | 28         | 1                               |
| APS  | 53  | M    | R   | 2                        | 10          | 22         | 2                               |
| JCP  | 56  | M    | L   | 2                        | 6           | 26         | 2                               |
| MAC  | 43  | M    | R   | 2                        | 14          | 35         | 2                               |

**Source:** Gafrée Guinle University Hospital

Legend: GIII+ = Massive Cuff Tear with normal Biceps; GIII- = Massive Cuff Tear with biceps lesion; M = Male; F = Female; R = Right; L = Left

**Table 2:** Analysis of results according to the Gerber classification

| Intraoperative lesion | n  | %     |
|-----------------------|----|-------|
| Classification        |    |       |
| GIII +                | 19 | 65,5  |
| GIII -                | 10 | 34,5  |
| Total                 | 29 | 100,0 |

**Source:** Gafrée Guinle University Hospital

Legend: GIII+ = Massive rotator cuff tear without biceps lesion; GIII- = Massive rotator cuff tear with biceps lesion; n= number of cases

### Surgical technique

We used the beach-chair position, allowing free access to dorsal and ventral shoulder and free mobilization. Three incisions were proceeded. The first one was a anterosuperior arciform incision above acromioclavicular joint. The anterior and lateral portion of deltoid muscle was detached from

Clavicle and acromion. To avoid axillary nerve injury, surgeon should avoid transpass 5 cm distal acromion during deltoid dissection.

We proceed with distal clavicle osteotomy (1 to 1.5 cm) and acromioplasty. Through a second access in axillary region, we evaluated rotator cuff lesion and proceeded *latissimus dorsi* and *teres major* desinsertion with bone graft. Surgeon should pay special attention to circumflex and radial nerves. Three non-absorbable Ethibond® stitches were passed through tendon.

Third access was performed in posterior shoulder, where the muscle where reoriented, passing through teres minor and deltoid muscles, medially to circumflex nerve, posterior to triceps long head tendon (Fig 4).

The tendon graft is fixed in the great tuberosity, in the superolateral portion of humeral head. After that, deltoid muscle is reinserted with transosseous sutures.

**Table 3:** Distribution according to post and pre-surgical results related to the biceps state

| Evaluated Aspects  | N  | Statistical Results Med | Standard Dev | Mín  | Máx  |
|--|----|-------------------------|--------------|------|------|
| Pain   |    |                         |              |      |      |
| GIII+  | 19 | 7,7                     | 1,2          | 6,0  | 9,0  |
| GIII-  | 10 | 6,8                     | 2,8          | 1,0  | 9,0  |
| Mann-Whitney test: p-value = 0, 8479 (No significance).      |    |                         |              |      |      |
| Function   |    |                         |              |      |      |
| GIII+  | 19 | 5,8                     | 2,1          | 1,0  | 9,0  |
| GIII-  | 10 | 2,8                     | 1,8          | 0,0  | 6,0  |
| Mann-Whitney test: p-value = 0, 0014 (Highly significative). |    |                         |              |      |      |
| Active flexion   |    |                         |              |      |      |
| GIII+  | 19 | 2,6                     | 0,6          | 2,0  | 4,0  |
| GIII-  | 10 | 1,4                     | 0,8          | 0,0  | 3,0  |
| Mann-Whitney test: p-value = 0, 0009 (Highly significative). |    |                         |              |      |      |
| Strenght   |    |                         |              |      |      |
| GIII+  | 19 | 2,1                     | 0,8          | 1,0  | 3,0  |
| GIII-  | 10 | 1,2                     | 0,8          | 0,0  | 2,0  |
| Mann-Whitney test: p-value = 0, 0138 (Significative).        |    |                         |              |      |      |
| UCLA   |    |                         |              |      |      |
| GIII+  | 19 | 23,1                    | 2,8          | 18,0 | 29,0 |
| GIII-  | 10 | 16,8                    | 5,2          | 5,0  | 23,0 |
| Mann-Whitney test: p-value = 0, 0005 (Highly significative). |    |                         |              |      |      |

**Source:** Gafreé Guinle University Hospital

Legend: GIII+ = Massive rotator cuff tear without biceps lesion; GIII- = Massive rotator cuff tear with biceps lesion; n= number of cases

## Results

Patients final UCLA Score was excellent in 10, good in 11, regular in 6 patients and poor in 2. (Fig. 4). All the patients presented statistically significant improve in all criteria (e.g. pain, function, active forward flexion, strength, and satisfaction) ( $p < 0.001$ ). There were no statistical difference from genders in Mann-Whitney test ( $p < 0.8$ ).

The biceps status, deltoid function, subscapularis integrity and previous surgeries influenced in post-surgery results. The mean UCLA score improved from 8 before surgery to 30.1 after surgery. The GIII+ group, with preserved biceps tendon obtained better results then those with biceps lesion (GIII-) in all criterias, except pain. (Table 3).

One patient needed reoperation after chronic pain and relevant shoulder dysfunction secondary to rotator cuff arthropathy. A total shoulder arthroplasty with pectoralis major transference where then proceeded.

Two patients with poor results presented biceps tendon preserved in intraoperative assessment. One of them were submitted to previous surgery, the other presented post-surgery infection.

## Discussion

The latissimus dorsi and teres major transposition with bone graft presented excellent or good results in 72% of patients in our study [14, 15, 16].

Those good results presented, are due to better graft fixation, potentializing mechanical strength of tendons transposed, and reducing secondary tear [11, 17].

Rockwood *et al*, in original paper, presented 83% of satisfactory results and 17% unsatisfactory in 57 patients with massive rotator cuff irreparable tears submitted to acromioplasty and debridement, after a 6 to 18 months follow up [3, 14].

Apoil and col. observed that, in massive tears, in 25% of patients the rotator cuff arthropathy with cranial migration of humerus will occur in 3 years after debridement [17]. The migration is due to mechanical and nutritional facts and the stabilizing function should prevent those events [18, 21]. Several

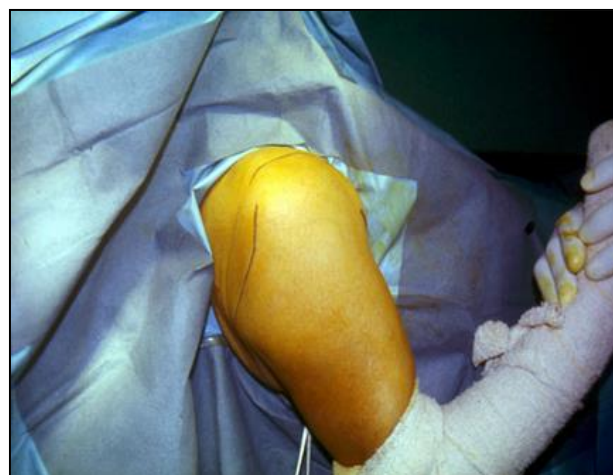
authors are favorable to rotator cuff repair [3, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20].

The reverse shoulder arthroplasty, developed in early 21st century, was designed to treat arthropathy after rotator cuff failure [21]. Although providing good results, the arthroplasty should be reserved to elderly patients, above 65 y.o. In young patients the transposition should be considered as option [19, 21, 22].

Some risk factors has been implicated as limiting factors to satisfactory results: multiple surgeries, deltoid muscle insufficiency, biceps long head lesions or subscapularis tears [12, 13, 17].

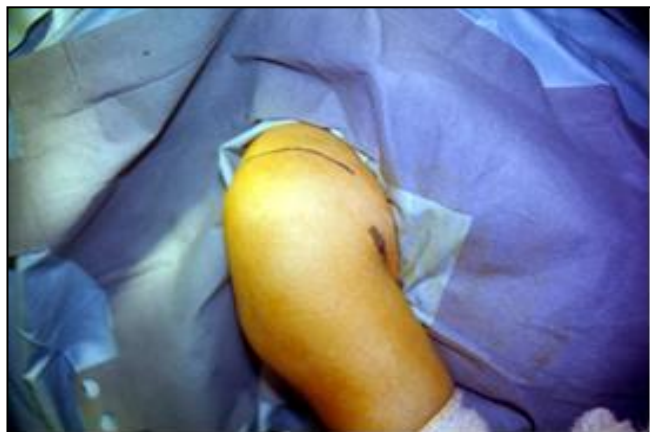
In our study, the biceps integrity lead to better results than the group with tendon rupture. The GIII+ group presented better scores in all criteria but pain.

The integrity of the biceps long head is crucial for better results, as the tendon acts as a depressor um humeral head [13, 16, 17, 18]. With the stabilization of transposed latissimus dorsi and teres major, the sinergic forces allows glenoumeral fulcrum restoration, and permits that deltoid muscle act normally [17, 20, 21].

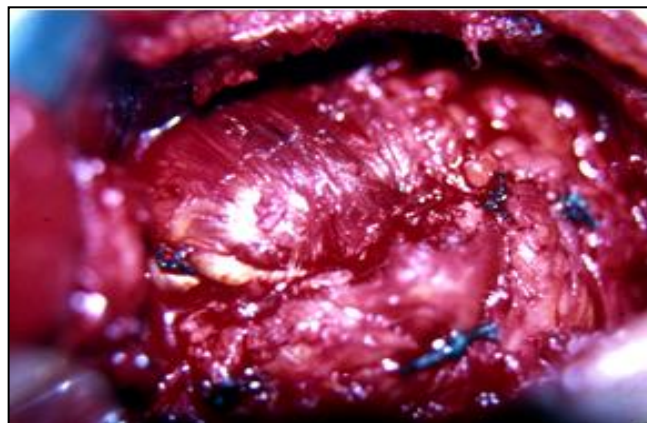


**Fig 1:** Posterior incision outline

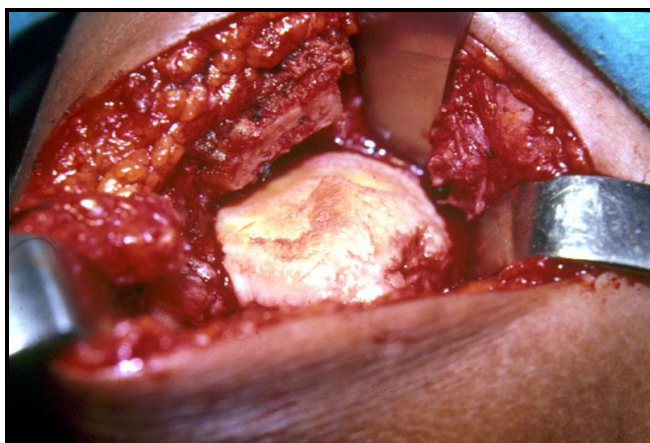




**Fig 2:** Superior and Axillary incision outline



**Fig 6:** After muscular fixation



**Fig 3:** Superior view of Massive Rotator Cuff Tear



**Fig 7:** Forward Flexion deficit before surgery



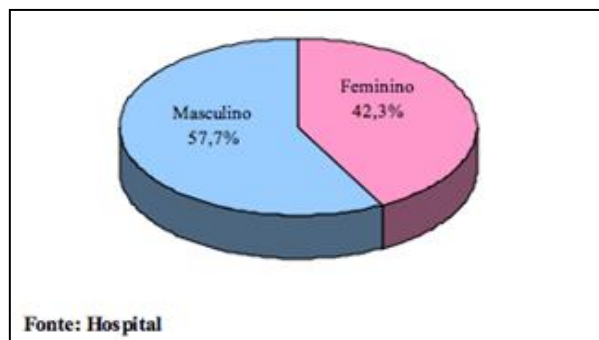
**Fig 4:** Latissimus Dorsi and Teres Major with bone insertion



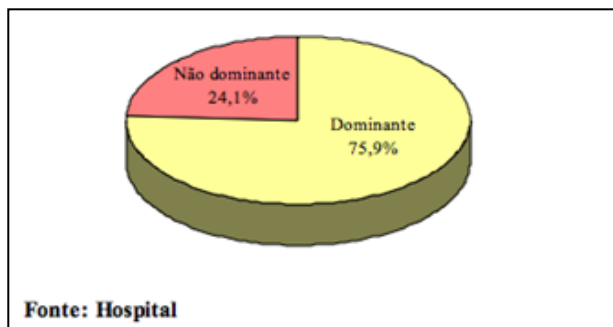
**Fig 8:** Forward Flexion six months after surgery



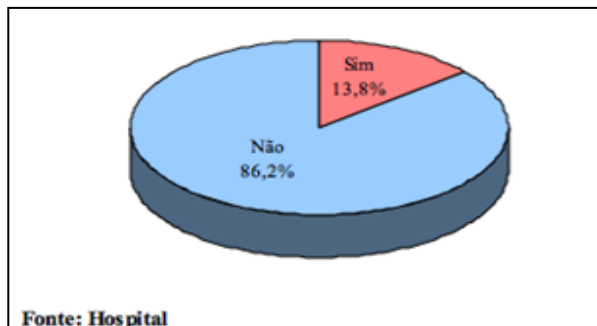
**Fig 5:** Latissimus dorsi and teres major advancement with bone graft



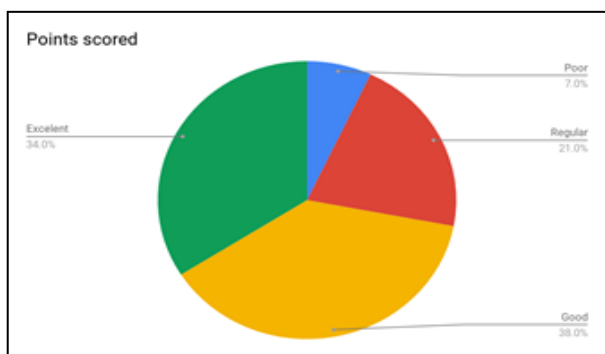
**Graph 1:** Analysis of results according to gender



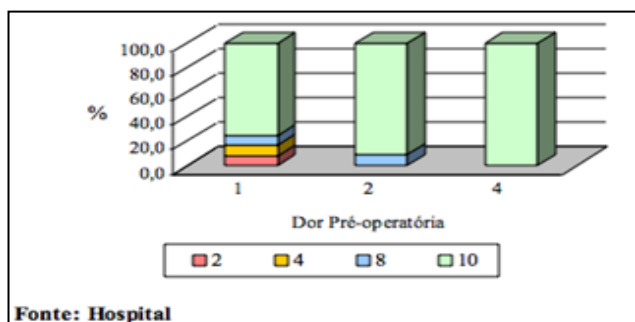
Graph 2: Analysis of results according to dominant side



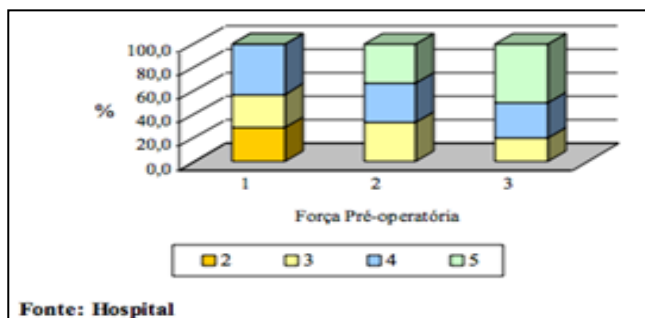
Graph 3: Analysis of results according to previous surgeries



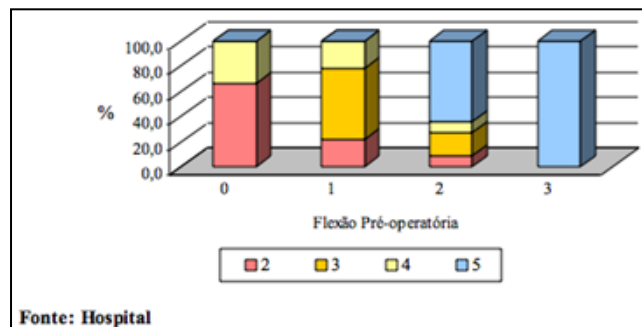
Graph 4: Analysis according to surgical result



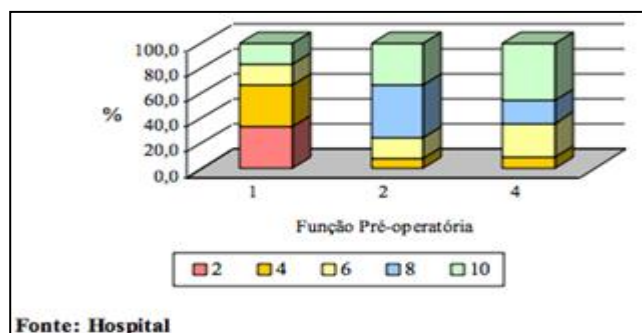
Graph 5: Analysis of post-surgical pain related to the previous state



Graph 6: Analysis of post-surgical strength related to the previous state



Graph 7: Analysis of post-surgical forward flexion related to the previous state



Graph 8: Analysis of post-surgical function related to the previous state

## Conclusion

In massive irreparable rotator cuff tears, specially in young patients, the latissimus dorsi and teres major transfer with bone graft provides good results as recovers stabilizing function of tendons, increasing shoulder strength.

Biceps tendon is a critical factor to achieve better results in range of motion, strength and functionality. Acting agonically with transposed tendons, allows physiological shoulder movement. The deltoid integrity is a crucial fact to final result. The present study demonstrates that the transfer of the latissimus dorsi and teres major seems to be a good option of treatment when aimed functional recovery and pain decrease.

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