

## Case Report

---

# Rehabilitation after a grade III latissimus dorsi tear of a soccer player: A case report

Christodoulos Fysentzou\*

*Department of Physical Therapy, University of St. Augustine for Health Sciences, St. Augustine, FL, USA*

### Abstract.

**BACKGROUND:** Latissimus dorsi, grade III tendon tears are an uncommon injury. There are very few cases reported in the literature, but most importantly, no cases could be found that relate to soccer.

**OBJECTIVE:** To present a successful, non-operative rehabilitation program for a professional athlete, after a grade III latissimus dorsi tear.

**CASE DESCRIPTION:** A 37 year old healthy, elite professional soccer goalkeeper was injured during a championship game. The athlete fell on his left side with an outstretched and externally rotated upper extremity in order to catch a ball that was going very close to the left pole of his goal-post. After on-field and off-field clinical examinations, the diagnosis was a left latissimus dorsi tendon tear which was later confirmed by MRI as a grade III tear.

**INTERVENTION:** During the first two weeks, intervention consisted of anti-inflammatory treatment and light therapeutic exercises. As the pain was subsiding and the strength was returning, the treatment shifted to purely strengthening and functional training.

**RESULTS:** Four weeks after the injury, the athlete presented with pain 0/10 in all functional activities and full ROM in both active and passive movements. Before discharge, the athlete underwent a sport specific training program, without any complains, that cleared him to participate in normal training with the rest of the team. Three months after the injury the strength of the player's left shoulder was 5/5 in all movements.

**CONCLUSION:** The protocol used yielded an accelerated return to sport (soccer) and function compared with other published research after a grade III latissimus dorsi tendon tear. One year later, the goalkeeper was still playing in the same competitive level without any re-injuries or complains, which means that this treatment protocol withstood the test of time.

**Keywords:** Grade III latissimus dorsi tear, latissimus dorsi tear in soccer, physical therapy after latissimus dorsi tear, latissimus dorsi tear rehabilitation, latissimus dorsi tear in football

## 1. Introduction

Grade III latissimus dorsi tendon tears are an uncommon injury. There are very few cases reported in the literature but most importantly, no cases could be found that relate to soccer. The cases that are reported in the literature involve baseball pitchers [1], water

skiers [2,5,6], a rock climber [3], a steer wrestler [4], and a golfer [7]. Four out of seven published articles about latissimus dorsi tears, describe surgical procedures for repair [2,3,5,6] but there is no mention of any rehabilitation post-operatively. One study describes the radiological procedure that was followed in order to diagnose the tear [7], but there is no mention on the treatment followed. Only two published studies describe non-operative rehabilitation programs [1,4], but even these two studies fail to offer specific treatment guidelines. This case report will present a successful non-

---

\*Corresponding author: Christodoulos Fysentzou, 6 Thalassas str, Oroklini, 7040, Larnaca, Cyprus. Tel.: +357 99487208; E-mail: chris@fysentzou.com.

operative rehabilitation program of a professional soccer goalkeeper after a grade III latissimus dorsi tear.

The latissimus dorsi muscle originates from the spinous processes of T6 to T12, ribs 9 or 10 to 12, the lumbar and sacral spinous processes through the thoracolumbar fascia, the posterior third of the external lip of the iliac crest, and a slip from the inferior scapular angle [8]. The latissimus dorsi muscle fibers converge towards the axilla to spiral beneath the teres major muscle and to insert onto the crest of the lesser tuberosity and the medial aspect of the bicipital groove of the humerus [2]. The latissimus dorsi muscle functions as an extensor, adductor and powerful internal rotator of the shoulder. As an adductor of the shoulder, the latissimus dorsi serves not so much to draw the arms in, but to lift the trunk against braced upper limbs. The muscle can act as a powerful extensor either to pull a load backwards or to draw the body towards a fixed object [9]. A combination of such activities occurs as a goalkeeper pushes to get up from the ground after a plonjon. A “plonjon” is when a goalkeeper jumps parallel to the ground, as he is moving, in order to catch a ball.

Based on Ackland et al. [10], the latissimus dorsi and pectoralis major individually, throughout abduction and flexion, are potential destabilizing muscles for the glenohumeral joint. However, when there is co-activation of the two potentially destabilizing muscles of opposing lines of action, they may combine to produce a resultant compressive joint force, leading to stabilization of the glenohumeral joint. Furthermore, the latissimus dorsi also acts as a stabilizer for the shoulder girdle by assisting in scapular depression, retraction and downward rotation and is innervated by the thoracodorsal nerve (C6, 7, and 8).

The purpose of this case report is to present a non-operative rehabilitation program for a high level professional athlete after a grade III latissimus dorsi tear. This case report, presents a physical therapy treatment plan in combination with a strengthening and functional exercise program for an accelerated and effective return to soccer.

## 2. Case description

A 37 year old healthy, professional soccer goalkeeper was injured during a championship game. Near the end of the game, the athlete jumped and fell on his left side with an outstretched and externally rotated upper extremity in order to catch a ball that was going

very close to the left pole of his goal-post. In simpler description, the position that caused him the injury was the left arm being abducted, externally rotated and horizontally over-flexed. That is when he described that he heard a “pop” at the left proximal humerus. The athlete immediately complained of a sharp stabbing pain at the posterior-medial aspect of the left proximal 1/3<sup>rd</sup> of the humerus. He described the feeling like a muscle tear. During the on-field examination, he had pain with adduction of the shoulder and a palpable tender mass on the posterior aspect of the axilla. All other left upper extremity movements were normal. The athlete was unable to continue to play due to increased pain and was substituted.

After substitution, the athlete was taken in the dressing rooms for an examination. The athlete was bracing his left shoulder with his right hand and was carrying himself in a slightly extended lumbar spine and side-bend to the right side.

## 3. Patient evaluation

During patient evaluation, the athlete was asked to point to where the location of his pain was. With one finger he pointed to the posterior-medial aspect of the proximal 1/3<sup>rd</sup> of the left humerus, where the latissimus dorsi muscle attaches. When he was asked how much his pain was from 0 to 10 (0 = no pain and 10 = excruciating pain), the athlete stated that with adduction of the shoulder and when he is pushing down towards the treatment table, he was feeling 10/10. All other movements were 0/10.

During structural examination, the athlete's shoulder heights were level, and the scapulas were symmetrically aligned. Slight inflammation was observed at the posterior-medial aspect of the proximal humerus with a slight reddish appearance.

Palpation for condition revealed slight warmth at the posterior – medial aspect of the proximal humerus. During deep palpation the athlete complained of tenderness and heaviness of the left shoulder. Due to the above findings the athlete exhibited muscle guarding and was carrying his left shoulder in a slightly extended, adducted and internally rotated position. All other anatomical landmarks and muscles were normal during palpation.

Cervical active range of motion (AROM) and right shoulder AROM in all planes were smooth, rhythmic and within normal limits (WNL). Left shoulder AROM was limited by pain in horizontal adduction at 30° and

at end range shoulder flexion. All other AROM movements of left shoulder were WNL.

Passive ROM (PROM) of cervical spine, right shoulder and left shoulder were all WNL with normal end-feels. PROM of left shoulder horizontal adduction was limited to 35° due to muscle guarding and pain; left shoulder flexion was limited at end range secondary to a painful and swollen end-feel.

When resistance was applied, the athlete complained of pain when the left shoulder was in full flexion and was asked to initiate shoulder extension. Also the athlete was complaining of pain during adduction of the shoulder and when he was asked to push down, with the left hand, towards the treatment table, against resistance.

The primary muscles responsible for the movements of the shoulder were tested bilaterally, during manual muscle testing (MMT), in order to be able to compare the strength of the two shoulders. The athlete's muscle strength was normal, (5/5), in all shoulder movements bilaterally except from the following movements of the left shoulder: extension was 3+/5 [11,12], left shoulder adduction was 2+/5, and when performing the chair push up as per Dutton [8], the strength was 2+/5. No signs and symptoms were present in order to suggest neurovascular involvement.

The following special tests were completed and were all negative. For rotator cuff involvement, the Neer impingement [8] (sensitivity 93%), Hawkins-Kennedy [8,13] (sensitivity 78%), and Empty Can [8] (sensitivity 86%) tests. For biceps involvement, the Speed's [8,13] and the Yerganson's [8,13] tests, and for instability, the Apprehension [8] (sensitivity 63%), Load and Shift [8,13] (sensitivity 100%), and the Crank [8,13] (sensitivity 91%) tests. Specific special tests related to the Latissimus dorsi included the Latissimus Dorsi weakness test [13] and the Bud Lift [8,11] test which were both positive. During the Latissimus dorsi weakness test [13], the patient is in a standing position with the arms elevated in the plane of the scapula to 160°. Against resistance of the examiner, the patient is asked to medially rotate and extend the arm downwards as if climbing a ladder. The second test, is the bud lift test [8,11]; the patient sits on a treatment table, places his hands at the edge of the treatment table and lifts his body off the table and maintains his balance. Inability to maintain the position indicates weakness in both tests. After searching the literature, we could not find the sensitivity and specificity of the previously mentioned latissimus dorsi tests.

Based on the results from the on-field and off-field evaluations, the summary of findings for the left shoulder are the following:

- 1) Inability to adduct the shoulder and depress the scapula secondary to pain (rated 10/10).
- 2) Tenderness during deep palpation at the posterior-medial aspect of the proximal 1/3<sup>rd</sup> of the humerus, where the latissimus dorsi inserts.
- 3) Increased redness and temperature at the latissimus dorsi insertion.
- 4) Muscle guarding during palpation and during active and passive movements.
- 5) Limited shoulder adduction to 30° with AROM secondary to pain.
- 6) Shoulder horizontal adduction limited to 35° with PROM due to pain.
- 7) Decreased shoulder flexion during PROM with swollen and painful end-feel.
- 8) MMT of shoulder extension done according to Hislop et al. [11] revealed strength 3+/5.
- 9) MMT of shoulder adduction and chair push up according to Dutton [8] revealed strength 2+/5.
- 10) Two positive latissimus dorsi special tests that indicate a tear.

After the on-field and off-field examination, the suspected diagnosis was a left latissimus dorsi tendon tear. The next day, the athlete visited the team's orthopedic surgeon that agreed with the diagnosis of a latissimus dorsi tear. To verify and to rule out any other possible tendon or joint injuries, the doctor prescribed an MRI scan that took place the same day. The MRI verified the diagnosis of a grade III latissimus dorsi tear at its attachment to the humerus. According to Napier et al. [14], a grade III tear is a severe strain with complete disruption of the myotendinous junction with or without muscle retraction.

The combination of limited published literature, limited experience with latissimus dorsi repairs, relatively good strength and range of motion on examination, and that the latissimus dorsi is a secondary muscle [7] and not a prime mover, lead the orthopedic surgeon to decide not to proceed with surgery but instead to proceed with conservative treatment; specifically physical therapy and strengthening.

#### 4. Plan of care

The short term goals for the treatment plan were to see the athlete 2x per day for the first 2–3 weeks in order to 1) eliminate the inflammation, 2) decrease pain to 5/10 with shoulder adduction and when pushing down towards the floor, 3) increase shoulder strength by 1 grade in the weak movements, 4) eliminate mus-

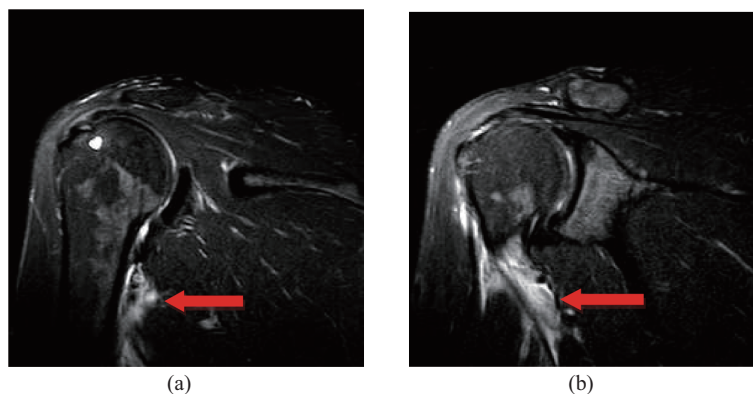


Fig. 1. (a) The latissimus dorsi retracted from its bony attachment. (b) Grade III tear of the myotendinous attachment and bony attachment of the latissimus dorsi.

cle guarding, and 5) start very basic functional exercises. The interventions to achieve the above goals were, GameReady, ice, Hi-volt electrical stimulation, lymphatic drainage massage, basic light grade I and II mobilizations, ultrasound, interferential current, therapeutic exercises (TherEx), soft tissue mobilizations and massage.

The long term goals were to see the athlete 1–2x per day up to week 8 in order to 1) eliminate pain with all movements, 2) increase strength to 4+/5 with all movements, 3) become fully functional in his job as a soccer goalkeeper, and 4) return back to normal training for his sport. The interventions to achieve the above goals were strengthening and functional training both in the gym and out on the soccer field.

Based on the very limited published research, the prognosis was to return the goalkeeper back to normal training, the earliest in 8 weeks. Also due to the lack of available research describing the rehabilitation process of a grade III latissimus dorsi tear, the treatment program was planned based on the treatment approach that is followed in any other acute sport injury. Therefore, the plan was to start with purely anti-inflammatory treatment and slowly progress to strength and functional training, based on the improvement seen on the athlete's signs and symptoms.

## 5. Implementation of intervention/re-assessment

Immediately after the examination in the dressing rooms, the athlete received 20 minutes compression and ice using the GameReady machine at high pressure, 5°C. A compression bandage, to prevent edema formation [15], was applied at the glenohumeral joint, supporting the left shoulder in slight extension, adduc-

tion and internal rotation. The specific position was chosen in order to put the latissimus dorsi muscle in slack. The athlete was instructed to apply ice every 2 hours for 15 min and was asked to take 75 mg of diclofenac (Non Steroidal Anti-Inflammatory Drug) every 12 hours until he saw the orthopedic surgeon the next day.

Physical therapy was initiated the day after the injury. For the first 2 weeks, the athlete was having 2 treatments per day; 1 in the morning and 1 in the afternoon. The sessions comprised of anti-inflammatory treatment, easy isometric exercises and some exercises with low weight; always in pain-free load and range of motion. See Tables 1 and 2 for the detailed program of the first 2 weeks of rehabilitation.

In acute injuries, the inflammatory stage is the first stage of the healing process. The inflammatory process is characterized by swelling, redness, heat and impairment or loss of function. The swelling is due to an increase in the permeability of the venules, from where plasma proteins and leukocytes leak into the site of injury [8]. On top of that, and based on Janda [8], muscular development cannot occur in the presence of pain, because pain has the ability to create a high degree of muscle inhibition that can alter muscle-firing patterns. This is a natural defense mechanism of the body. The acute inflammatory stage may last from 1 to 6 days. After the 6th day, if inflammation is still present then something has to be done in order for the healing process to progress to the next stage which is the proliferation stage, and not to allow it to become a chronic injury.

At the beginning of the 3<sup>rd</sup> week, the anti-inflammatory treatment was terminated and the treatment process shifted into pure kinesiotherapy with strengthening and functional exercises. The decision to progress

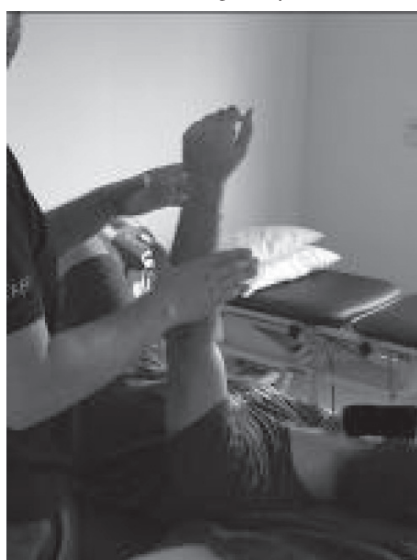
Table 1  
Acute phase (week 1)

Day	Intervention
1 pm	– 15 min Hi-volt electrical current with GameReady®. (Hi-volt with negative polarity in order to repel inflammation [15]).
2 am	– 5 min light lymphatic drainage massage towards the axilla. To “push” the inflammation and edema towards the lymph nodes in order to be excreted from the body for faster recovery [16]. – 10 min Hi-volt with GameReady® at the end of treatment.
2 pm	– 15 min Hi-volt with GameReady® – 5 min light lymphatic drainage massage towards the axilla. – Active scapula 4-way exercises (elevation, depression, retraction, protraction) in order to avoid atrophy of the shoulder stabilizer muscles. 2 sets of 10 reps (2 × 10) in each direction. – 10 min Hi-volt with GameReady®.
3 am	– 10 min Interferential current (IFC) with GameReady®. (IFC because it penetrates deeper than Hi-volt, increases blood flow to the area, reduces pain and causes muscle stimulation [15,18]. – Phonophoresis with Perskindol cream, 1MHz (for deeper penetration), pulsed 50%, 0.5 w/cm <sup>2</sup> , 5 min (for acute pain, anti-inflammatory effects and to promote healing) [15,18]. (Perskindol cream is an anti-inflammatory cream that infiltrates the area of the injury using phonophoresis for faster and more localized results.) – 5 min lymphatic drainage – 15 min Hi-volt with GameReady®
3 pm	– 10 min IFC with GameReady®. – 5 min lymphatic drainage – Scapula 4-way exercises (2 × 10) – Bicep curls with 1.0 Kilograms (Kg) (2 × 10) – Shoulder 4-way isometric exercises against the wall (flexion (flex), extension (ext), internal rotation (IR), external rotation (ER)) (2 × 10) – 10 min GameReady® after treatment. (For the anti-inflammatory effects that cryotherapy has and also in order to avoid soreness after the exercises.)
4 am	– 10 min IFC with GameReady®. – Ultrasound (US), 1 MHz (for deeper penetration), pulsed 50%, 0.5 w/cm <sup>2</sup> , 5 min (for acute pain, anti-inflammatory effects and to promote healing) [15,18]. – 10 min massage. (Massage is used for muscle relaxation in order to avoid muscle guarding and to increase blood circulation in order to promote healing [16].) – 5 min soft tissue mobilizations. (At the muscles of the shoulder girdle and pectoralis major in order to increase blood circulation to the area, avoid fibrosis of the healing muscles and tissues and also for the analgesic effect that can offer to the patient [17].) 1) Shoulder flex standing with 1.0 Kg (2 × 10) 2) Shoulder abduction (abd) standing with 1.0 Kg (2 × 10) 3) Bicep curls 1.0 Kg (2 × 10) 4) Shoulder 4-way exercises with medium resistance (red) flat band (2 × 10) 5) Left shoulder bend over rows 1.0 Kg (2 × 10)
4 pm	– 10 min GameReady® after Treatment – Exercises 1 through 5 from day 4 am (same load, sets and reps) and 10 min ice after the exercises: Exercises 1 through 5 from day 4 am (same load, sets and reps) and 10 min ice after the exercises
5 am	– 10 min IFC with GameReady®. – US 1 Mhz, 50% pulsed, 0.5 w/cm <sup>2</sup> , 5 min. – 10 min massage. – 5 min soft tissue mobilizations 1) Shoulder flex standing with 1.5 Kg (3 × 10) 2) Shoulder abd standing with 1.5 Kg (3 × 10) 3) Bicep curls 1.5 Kg (3 × 10) 4) Shoulder 4-way exercises with red flat band (3 × 10) 5) Left shoulder bend over rows 2.5 Kg (2 × 10) 6) Rows with red flat band (2 × 10) 7) Tricep kickbacks 1.0 Kg (2 × 10)
5 pm	– 10 min GameReady® after Treatment – Exercises 1 through 7 from day 5 am (same load, sets and reps) and 10min ice after the exercises
6 am	– 10 min IFC with GameReady® – US 1 Mhz, 50% pulsed, 0.5 w/cm <sup>2</sup> , 5 min – 10 min massage – 5 min soft tissue mobilizations



Table 1, continued

Day	Intervention
	<ul style="list-style-type: none"> <li>– Shoulder flex standing with 3.0 Kg (<math>3 \times 10</math>)</li> <li>– Shoulder abd standing with 3.0 Kg (<math>3 \times 10</math>)</li> <li>– Bicep curls 3 Kg (<math>3 \times 10</math>)</li> <li>– Shoulder 4-way exercises with strong resistance (green) flat band (<math>3 \times 10</math>)</li> <li>– Single arm bend over rows 3Kg (<math>3 \times 10</math>)</li> <li>– Rows with green flat band (<math>3 \times 10</math>)</li> <li>– Triceps kickbacks 3 Kg (<math>3 \times 10</math>)</li> <li>– Schwinn arm bike for 6 min</li> <li>– <sup>1</sup>Manual stabilizations with light resistance (3sets of 15sec (<math>3 \times 15''</math>))</li> <li>– Proprioceptive Neuromuscular Facilitation (PNF) Diagonal 1 (D1) and Diagonal 2 (D2) flex/ext (<math>2 \times 7</math>)</li> <li>– 10 min GameReady<sup>®</sup> after Treatment</li> </ul>
6 pm	– Rest
7	– Off

Table 1  
Exercise glossary<sup>1</sup>Manual stabilizations with light resistance

the athlete from the anti-inflammatory program to the strength and functional training program was taken after consulting the team's orthopedic surgeon and based on the following signs and symptoms: decrease pain from 10/10 to 3/10 during adduction of the shoulder and depression of the scapula, no palpable inflammation at the area of injury, increased tolerance to therapeutic exercises and full ROM in all planes. The 3<sup>rd</sup> week's program was very intense; found on Table 3. The progression of the program and the athlete's tolerance to exercise was improving amazingly day by day.

During the 4<sup>th</sup> week, the athlete was taken out in the soccer field and initiated some pain-free, basic goal-keeping tactic exercises that can be found at Table 4. By the end of the 4<sup>th</sup> week he was able to start full practice with the team.

Five weeks status post injury, the athlete was included in the starting 11 during a championship game and he completed all 90 minutes of the match successfully. One year after the injury, the athlete was still playing without any complains and he was doing his maintenance exercises, found at Table 5, 2 times per week.

## 6. Outcomes

Two weeks after the injury, the anti-inflammatory treatment was terminated and shifted into a purely strength and functional training program. During the 5<sup>th</sup> week after the injury, the athlete returned back to normal training with the rest of the players of the team. At discharge, 5 weeks after the injury, the athlete had 0/10 pain with PROM, AROM and all resisted movements of the left shoulder. Three months after his injury, he presented with full ROM and strength 5/5. The athlete was able to perform all his functional activities as a high level soccer goalkeeper without any complains or discomfort. The latissimus dorsi weakness test [13] and the bud lift test [8,11], that were positive at initial evaluation were both negative at discharge. No follow-up MRI was done secondary to the patient's level of participation in his sport.

## 7. Discussion

There are only a hand full of cases reported in the literature that report an acute latissimus dorsi tear and all of them have to do with professional or high level athletes. This shows one of two things. One that the latissimus dorsi muscle is rarely torn and only in extreme cases of over usage of the upper extremity; or the

Table 2  
Intermediate Phase (week 2)

Day	Intervention
1 am	<ul style="list-style-type: none"> <li>– 10 min IFC with ice</li> <li>– 5 min massage</li> <li>– 5 min soft tissue mobilizations</li> <li>1) Bicep curls 3.5 Kg (3 × 10)</li> <li>2) Rows with extra strong resistance (black) flat band (3 × 10)</li> <li>3) Shoulder 4-way exercises with black flat band (3 × 10)</li> <li>4) Schwinn arm bike for 6 min</li> <li>5) PNF D1 and D2 flex/ext (3 × 10)</li> <li>6) Single arm bend over rows 3.5 Kg (3 × 10)</li> <li>7) Tricep kickbacks 3.5 Kg (3 × 10)</li> <li>8) Push-ups (2 × 7)</li> <li>9) Manual stabilizations (3 × 25")</li> <li>– 10 min ice after Therapeutic Exercises (TherEx)</li> </ul>
1 pm	– Exercises 1 through 9 from day 1 am (same load, sets and reps) and 10 min ice after the exercises.
2 am	– 10 min IFC with ice
3 am	<ul style="list-style-type: none"> <li>– 5 min massage</li> <li>– 5 min soft tissue mobilizations</li> <li>1) Bicep curls 3.5 Kg (3 × 10)</li> <li>2) <sup>1</sup>Ball roll on the wall (3 × 30 circles clockwise and 3 × 30 circles counterclockwise)</li> <li>3) Schwinn arm bike for 8 min</li> <li>4) PNF D1-D2 flex/ext 10 Kg (3 × 10) on Cybex Cable Column (CC) machine.</li> <li>5) Rows 30 Kg (3 × 10) on CC machine.</li> <li>6) Shoulder 4-way 10 Kg (3 × 10) on Cybex FT 360 Functional Trainer (FT) machine.</li> <li>7) Single arm bend over rows 3.5Kg (3 × 10)</li> <li>8) <sup>2</sup>Bud Lift (2 × 10)</li> <li>9) Tricep kickbacks 3.5 Kg (3 × 10)</li> <li>10) <sup>3</sup>Push-up position on Dynadiscs (5 × 15")</li> <li>11) Planks on elbows on fitness ball (5 × 15")</li> <li>– Ice after TherEx</li> </ul>
2 pm	– Exercises 1 through 11 from day 2 and 3 am (same load, sets, reps, time) and 10 min ice after the exercises.
3 pm	
4 am	– 5 min fast stroking massage to increase blood circulation and warm up the muscles.
5 am	<ul style="list-style-type: none"> <li>– 5 min soft tissue mobilizations</li> <li>1) Bicep curls 5 Kg (3 × 10)</li> <li>2) Bicep hummer curls 5Kg (3 × 10)</li> <li>3) Tricep kickbacks 6 Kg (3 × 10)</li> <li>4) FT Shoulder 4-way 20 Kg (3 × 10)</li> <li>5) Schwinn arm bike for 10 min</li> <li>6) CC Rows 50 Kg (3 × 10)</li> <li>7) <sup>4</sup>FT shoulder in hyper flexion initiating extension 20 Kg (3 × 10)</li> <li>8) Lat pull down 50 Kg (3 × 10)</li> <li>9) <sup>5</sup>Shoulder horizontal IR/ER with black flat band (3 × 10)</li> <li>10) FT PNF D1-D2 flex/ext 30 Kg (3 × 10)</li> <li>11) Single arm bend over rows 10 Kg (3 × 10)</li> <li>12) Push-ups position on Dynadiscs (5 × 20")</li> <li>13) Bud Lift (10 × 20")</li> <li>– Ice after TherEx</li> </ul>
4 pm	– Exercises 1 through 13 from day 4 and 5 am (same load, sets, reps, time) and 10 min ice after the exercises
5 pm	
6 + 7	– Off

second reason is that the injury may be usual but the functional deficits are minimal, that only elite athletes that are using their upper extremities intensively might feel the difference and be disabled by them. As Spinner

et al. [7] described, a latissimus dorsi and teres major rupture could easily go unrecognized and undiagnosed.

This case report is about a professional soccer goalkeeper that requires maximum shoulder strength; flex-

Table 2  
Exercise glossary



<sup>1</sup>Ball roll on wall



<sup>2</sup>Bud Lift



<sup>3</sup>Push-up position on Dynadiscs



<sup>4</sup>FT shoulder in hyperflexion  
initiating extension



<sup>5</sup>Shoulder horizontal IR / ER with black flat band



Table 3  
Strengthening and functional exercises (week 3)

Exercise description	Day (sets x reps/time <sup>''</sup> )						
	1	2	3	4	5	6	7
All exercises were performed 2x per day.							
Schwinn arm bike (in minutes)	10'	10'	10'	10'	10'	10'	
Bicep curls 10 Kg	3 × 10	3 × 10	3 × 10				
<sup>1</sup> Prayer's stretch	3 × 30''	3 × 30''	3 × 30''	3 × 30''	3 × 30''	3 × 30''	
Door stretch	3 × 30''	3 × 30''	3 × 30''	3 × 30''	3 × 30''	3 × 30''	
Foam roller on latissimus dorsi	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	
FT shoulder 4-way 20 Kg	3 × 10	3 × 10	3 × 10				
Lat pull down 50 Kg	3 × 10	3 × 10	3 × 10				
<sup>2</sup> Lat push down on fitter	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	
FT PNF D1-D2 flex/ext 30 KG	3 × 5	3 × 5	3 × 5	3 × 5	3 × 5	3 × 5	
CC rows 60Kg	3 × 10	3 × 10	3 × 10				
Single arm bend over rows 10 Kg	3 × 10	3 × 10	3 × 10				
<sup>3</sup> Single leg stance (SLS) on bosu and throws on trampoline	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	
2 Kg medicine ball (MB)							
<sup>4</sup> SLS on bosu and throws on trampoline 2 Kg MB with shoulder in horizontal ER going into IR	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	
Bud lift	7 × 20''	7 × 20''	7 × 20''	7 × 20''	7 × 20''	7 × 20''	
Lat pullover on exercise ball 7 Kg	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	
FT shoulder in hyper flexion initiating extension 20 Kg	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	3 × 10	
<sup>5</sup> Body blade horizontal orientation				3 × 20''	3 × 20''	3 × 20''	
<sup>6</sup> Jump and push 2 Kg MB on air				2 × 10	3 × 10	3 × 10	
<sup>7</sup> Drop down on left side and push 2 Kg MB				10x	2 × 10	3 × 10	



Table 3  
Exercise glossary



<sup>1</sup> Prayer's stretch



<sup>2</sup> Lat push down on fitter



<sup>3</sup> SLS on bosu and throws on trampoline 2Kg MB



<sup>4</sup> SLS on bosu and throws on trampoline 2Kg MB with shoulder in horizontal ER going into IR



<sup>5</sup> Body blade horizontal orientation



<sup>6</sup> Jump + push 2Kg MB on air



<sup>7</sup> Drop down on left side and push 2Kg MB

ibility; function and quickness of the upper extremities in order to be able to practice his job. He sustained an acute grade III latissimus dorsi tear on the field without any pre-existing shoulder injuries. Previously published reports about recovering from a latissimus dorsi tear have been divided in 2 groups. The one group has proceeded with conservative treatment and the other with surgical procedure. Butterwick et al. [4] reported the successful conservative treatment of a steer-wrestler and they suggest that the natural history of the injury needs to be followed for a longer period of time before deciding if conservative management is the ideal treatment method. Schickendantz et al. [1] re-

ported on 10 cases of baseball pitchers that sustained latissimus dorsi tears and were treated successfully with non-operative, conservative treatment methods. He described that 9/10 players returned back to pitching 3 months after the injury but only 1 player played at the same level of competition in the same season. The treatment plan described in Schickendantz's [1] report is quite vague; therefore it is not possible to compare it with the present case report.

The rest of the articles that are published about latissimus dorsi tears, describe surgical treatments rather than non-operative. Le et al. [6] suggests that both surgical and non-surgical treatments may provide favor-

Table 4  
Sport specific training (weeks 4 and 5)

Day	Intervention
1	<ul style="list-style-type: none"> <li>– FT Shoulder 4-way for warm up 15 Kg (<math>3 \times 10</math>)</li> </ul>
Warm up in the Gym	<ul style="list-style-type: none"> <li>– Single arm bend over rows 10 Kg (<math>3 \times 10</math>)</li> <li>– CC Rows 60 Kg (<math>3 \times 10</math>)</li> <li>– Lat push down on Fitter (<math>3 \times 10</math>)</li> <li>– FT PNF D1-D2 flex/ext 30 Kg (<math>3 \times 10</math>)</li> <li>– FT shoulder in hyper flexion initiating extension 20 Kg (<math>3 \times 10</math>)</li> <li>– Body Blade horizontal orientation (<math>5 \times 20''</math>)</li> <li>– Door stretch (<math>3 \times 30''</math>)</li> </ul>
1 continue in the soccer field	<ul style="list-style-type: none"> <li>– Slow abdominal sit-abs with catching and throwing the ball with both hands</li> <li>– Slow side abdominal sit-abs with catching and throwing the ball with both hands (alternating sides)</li> <li>– Slow side abdominal sit-abs with catching and throwing the ball with one hand (alternating sides)</li> <li>– Standing and catching the ball overhead with over flexed arms and throwing it back to the trainer.</li> </ul>
2	<p>Same program as day 1, (warm up in the gym and then exercises on the soccer field) with the addition of:</p> <ul style="list-style-type: none"> <li>– The goalkeeper sits on the floor and the trainer passes the ball once to the goalkeeper's right side and once to the left and the goalkeeper reaches to catch it.</li> <li>– The goalkeeper sits on the floor and the trainer shoots the ball at the goalkeepers head level, once to the goalkeeper's right side and once to the left and the goalkeeper reaches to catch it.</li> </ul>
3	<p>Same program as Day 1 with the addition of:</p> <ul style="list-style-type: none"> <li>– Shuffles to the right side and catching the ball off the floor after a pass from the trainer and then repeat the same towards the left side.</li> <li>– Exactly the same exercise as the previous one but at this time the trainer kicks the ball to waist level height for the goalkeeper to catch.</li> <li>– Exactly the same exercise as the previous one but at this time the trainer kicks the ball to eye level height for the goalkeeper to catch.</li> <li>– The trainer shoots the ball straight to the goalkeeper but strong and from a close distance in order to work on his reflexes.</li> <li>– Same exercise as above but this time the shoots go to the right and left of the goalkeeper. The goalkeeper has to drop down to the floor in order to catch the ball.</li> </ul>
4	<p>Only the soccer field programs of days 1, 2 and 3. Day's 3 program was with stronger shoots from the trainer and faster drop downs from the goalkeeper, with the addition of the following:</p> <ul style="list-style-type: none"> <li>– Shuffles to one side to touch a cone and then jump to the opposite side to catch a shoot that is at floor level first and then at waist height level.</li> <li>– Strong shoots from all the positions from outside the 16m box for improving the positioning of the goalkeeper in his post.</li> </ul>
5	<ul style="list-style-type: none"> <li>– Warm up with the rest of the team</li> <li>– Various reaction exercises to improve speed and reflexes</li> <li>– Long balls from the sides of the field for the goalkeeper to reach and catch the ball or to reach and punch the ball out.</li> <li>– Goalkeeper participated in the within team tactic game.</li> </ul>
6	Same program like day 5 but with less intensity.
7	Off

Table 5  
Maintenance Program that the athlete was using in the gym 2x per week

Exercise description	Load (KG)	Sets	Reps/time
FT Shoulder 4-way for warm up	15	3	10
Single arm bend over rows	10	3	10
Bicep curls	10	3	10
CC Rows	60	3	10
Lat push down on Fitter		3	10
FT PNF D1-D2 flex/ext	30	3	10
MB throws on trampoline with shoulder in horizontal ER going into IR	2	3	10
Bud Lift		10	30 sec
FT shoulder in hyper flexion initiating extension	20	3	10
Body Blade horizontal orientation		5	30 sec
Prayer's stretch		3	30 sec
Door stretch		3	30 sec

able outcomes but when it comes to professional athletes, he suggests that the surgical option is better because competitive athletes require complete restoration of function and muscle strength. Henry and Scerpella [2], who are also in favor of the surgical treatment option, stated that the conservative treatment of the latissimus dorsi produces measurable deficits in shoulder strength and function compared to the operated athlete. They go on to state that this deficit may be unacceptable in an athlete with high functional shoulder demands. Lim and colleagues [5] reported better results in the shoulder operated on 10 months post-op, than in the normal shoulder in isokinetic testing in a 38 year old male competitive slalom water skier with high grade disruption of latissimus dorsi tendon that was repaired with a single incision.

Therefore, based on the above mentioned published literature the following conclusions can be drawn. For high level athletes with high functional shoulder demands, the ideal solution is the surgical procedure. After a surgical procedure though and in order to reach the pre-injury strength levels of the shoulder, the athlete needs approximately 6 months of rehabilitation. On the other hand, the conservative treatment published literature stated that 9/10 of the injured athletes returned to pitching 3 months after the injury but at a lower level. Finally, in the present report, the goalkeeper returned back to the same level of competition 5 weeks after the injury and when his muscle strength was checked through manual muscle testing 3 month after the injury, it was the same as the uninjured side.

## 8. Conclusion

Although there are only a few published cases that describe the rehabilitation of a grade III latissimus dorsi tear, it is very likely that these injuries are under-reported because the functional deficits and the associated symptoms are such that they do not significantly affect the majority of patients in their everyday levels of activity. As mentioned in the limited research available regarding this injury, all cases involved high level athletes that use their upper extremities not to draw the arms in, but to lift the trunk against “fixed” upper extremities or to pull a load backwards or to draw the body towards a fixed object or use extreme forces in extreme ROMs of the upper extremities. Both conservative and surgical approaches have yielded good results in competitive athletes but both methods have their pros and cons. The protocol used in this case re-

port yielded an accelerated return to sport (soccer) and function compared with other published research. Also this protocol withstood the test of time and the goalkeeper was still playing in the same competitive level as before without any re-injuries or dysfunctions one year after the injury.

## Acknowledgements

None declared.

## Conflict of interest

None to report.

## References

- [1] Schickendantz MS, Kaar SG, Meister K, Lund P, Beverley L. Latissimus dorsi and teres major tears in professional baseball pitchers. A case series. *Am J Sports Med.* 2009; 37(10): 2016.
- [2] Henry JC, Scerpella TA. Acute traumatic tear of the latissimus dorsi tendon from its insertion. A case report. *Am J Sports Med.* 2000; 28(4): 577.
- [3] Livesey JP, Brownson P, Wallace WA. Traumatic latissimus dorsi tendon rupture. *J Shoulder Elbow Surg.* 2002; 11(6): 642.
- [4] Butterwick DJ, Mohtadi NG, Meeuwisse WH, Frizzell JB. Rapture of latissimus dorsi in an athlete. *Clin J Sport Med.* 2003; 13(3): 189.
- [5] Lim JK, Tilford ME, Hamersly SF, Sallay PI. Surgical repair of an acute latissimus dorsi tendon avulsion using suture anchors through a single incision. *Am J Sports Med.* 2006; 34(8): 1351.
- [6] Le HBQ, Lee ST, Lane MD, Munk PL, Blachut PA, Malfair D. Magnetic resonance imaging appearance of partial latissimus dorsi tendon tear. *Skeletal Radiology.* 2009; 38: 1107.
- [7] Spinner RJ, Speer KP, Mallon WJ. Avulsion injury to the conjoined tendons of the latissimus dorsi and teres major muscles. *Am J Sports Med.* 1998; 26(6): 847.
- [8] Dutton M. *Orthopaedic Examination, Evaluation & Intervention.* USA: McGraw-Hill, 2004.
- [9] Bogduk N, Johnson G, Spalding D. The morphology and biomechanics of latissimus dorsi. *Clinical Biomechanics.* 1998; 13: 377.
- [10] Ackland DC, Pandy MG. Lines of action and stabilizing potential of the shoulder musculature. *J. Anat.* 2009; 215: 184.
- [11] Hislop HJ, Montgomery J, Daniels and Worthingham's *Muscle Testing. Techniques of manual examination.* 7<sup>th</sup> ed. Pennsylvania: W.B. Saunders, 2002.
- [12] Magee DJ. *Orthopedic Physical Assessment.* 4<sup>th</sup> ed. Pennsylvania: W.B. Saunders, 2002.
- [13] Kendall FP, McCreary EK, Provance PG. *Muscles Testing and Function.* 4<sup>th</sup> ed. Pennsylvania: Lippincott Williams & Wilkins, 1993.
- [14] Napier N, Shortt C, Eustace S. Muscle Edema: Classification, Mechanisms, and Interpretation. *Semin Musculoskelet Radiol.* 2006; 10(4): 258.

- [15] Cameron MH. Physical Agents in Rehabilitation. From Research to Practice. 2<sup>nd</sup> ed. Missouri: Saunders, 2003.
- [16] Domenico GD, Wood EC. Beard's Massage. 4<sup>th</sup> ed. Pennsylvania: W.B. Saunders, 1997.
- [17] Cantu RI, Grodin AJ. Myofascial Manipulation. Theory and Clinical Application. 2<sup>nd</sup> ed. Texas: Pro-ed, 2006.
- [18] Hecox B, Mehreteab TA, Weisberg J. Physical Agents. A Comprehensive text for Physical Therapists. 1<sup>st</sup> ed. USA: Prentice – Hall, 1994.