



Avulsions of Triceps Brachii : associated injuries and surgical treatment ; a case series

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This study reports the clinical presentations, intra operative findings, type of the treatments, outcome of the treatment and specially associated injuries in patients with the avulsion of the distal end of the triceps brachii (TB) tendon. We studied 6 patients with rupture or avulsion of the distal end of the TB tendon. The medical records, imaging files, clinical outcomes at the final follow up visit were reviewed. The clinical outcomes were assessed by Mayo Elbow Score at the final follow-up visit. All patients were male, 4 of them having injury in the left hand as the non-dominant hand. Mean age of them was 34.5 years. All cases had small bony fleck in the posterior of elbow in lateral radiograph. Three patients had associated injuries including intra-articular fractures and medial collateral ligament rupture. In one case V-Y plasty of the distal TB was done. In 4 patients the results of surgery were excellent, one was good and one was fair. Although TB tendon rupture is rare, it should be considered in differential diagnosis of the upper extremity trauma and its associated injuries should be addressed properly.

Keywords : avulsion ; triceps ; treatment.

INTRODUCTION

Avulsion of the distal tendon of triceps brachii (TB) was described by Partridge in 1868 for the first time (12). It remains uncommon although the injury

was reported in the literature as case reports or small case series (7,19).

It occurs as a complete or partial tear, with or without bony avulsion, in healthy tendons or accompanying tendinitis, with or without associated lesions and in acute or chronic settings (8,14,17).

The mechanism of the injury reportedly is falling on an outstretched arm with extended elbow accompanying with eccentric contraction of the triceps brachii muscle (11,19).

Numerous risk factors were proposed for this kind of injury including steroid injection, endocrine or rheumatologic abnormalities (4). Avulsion or rupture of the tendon of the TB may be accompanied by rare associated bony or ligamentous injuries which can make its treatment as a challenging process (4).

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This study was performed to report the risk factors, clinical presentations, imaging, type of the treatments, intra operative findings, outcome of the treatment and specially associated injuries in 6 patients with the avulsion of the distal end of the TB tendon.

MATERIAL AND METHODS

The Ethic Board Committee of our institution approved the study. We recruited totally 6 patients which were treated in our institution from 2006 to 2013 because of the rupture or avulsion of the distal end of the TB tendons. We reviewed the medical documents, imaging files, clinical outcomes at the final follow up visit. Demographic data of the patients, mechanism of the injury, associated bony or ligamentous injuries documented as the intra operative findings, type of treatment, the elapsed time between the injury and treatment, clinical and radiographic results of the treatment. The clinical outcomes were assessed by Mayo Elbow Score at the final follow up visit (6).

RESULTS

In this case-series totally 6 patients with closed distal triceps tendon injuries were evaluated. All patients were male, 4 of them having injury in the left hand as the non-dominant hand and 2 of them having it in the right hand as a dominant one. Mean age of them was 34.5 (22-59) years old.

Three injuries were due to simple fall and two of them were due to falling down (more than 2 meters) over out stretched hand and one was due to vigorous weight lifting during body building training.

All patients except one with isolated triceps avulsion (case number 2) were treated in 1 week after the trauma.

All cases had small bony fleck in the posterior of elbow and were distinctive in lateral view of radiography.

In four patients the results of surgery were excellent, one was good and one was fair. The fair result was for the case number 4 with intra-articular fracture, which had returned to his previous job with lower level of activity. Others returned to their previous jobs with the same prior level of activity.

Demographic and radiographic findings in patients with distal triceps brachii avulsion are summarized in table I. Table II indicated the intraoperative findings, operative technique and final results.

DISCUSSION

Ruptures or avulsions of the TB are rare and have been considered the least common site of tendons ruptures.

The most common mentioned mechanism for this injury is falling down with outstretched hand (1) which was the dominant mechanism for five out six of our patients. Other common mechanism is overhead heavy lifting due to sudden contraction of elbow flexors, which conquers over triceps tendon contraction power and cause triceps tendon avulsion with deceleration mechanism (2). Patients usually report a "Pop" or "Giving way" in their elbow with pain and weakness (3) which was occurred in the case number 1 during body building training and heavy weights lifting meanwhile this patient had positive history for using anabolic drugs containing corticosteroids. There are similar reports of anabolic drugs containing corticosteroids misuse as risk factor for TB avulsion in the literature (1,3).

Diagnosis of TB avulsion is not straightforward and should be based on accurate history taking and physical examinations. Van Riet *et al* mentioned that 45% of acute cases might not be diagnosed at the early stage (18). Acute cases accompany with pain, weakness and sudden "Pop" sign. Ecchymosis in posterior of the elbow and a palpable gap in the proximal of olecranon are the possible signs. Loss of active elbow extension is in favor of complete tendon rupture (avulsion) but patients with partial rupture mostly suffer from weakness in extension of the elbow joint (4). Treatment of patients with missed TB avulsion can be challenging. This was true for one of our patients (case no 2) which was referred to our institution 4 months after the primary injury. He was not able to extend the elbow against gravity and avulsion was distinctive in MRI. Reconstruction became possible after V-Y plasty of the distal TB.

Plain radiography is an essential part of the evaluation process in patient who are suspected to have

Table I. — Demographic and radiographic findings in patients with distal triceps brachii avulsion

Case	Gender	Age (year)	Side of injury	Mechanism	PMH	Delay of DX	Radiography	CT scan	MRI
1	Male	59	right	simple fall	anabolic drugs	less than 1 week	fleck sign	–	bony triceps avulsion & hematoma
2	Male	27	left	simple fall	No	4 months	fleck sign	–	old bony triceps avulsion, no hematoma
3	Male	29	left	simple fall	No	less than 1 week	fleck sign	–	bony triceps avulsion & hematoma
4	Male	37	right	simple fall	No	less than 1 week	fleck sign distal humerus Fx	trochlea & capitellum Fx	–
5	Male	29	left	falling down	No	less than 1 week	fleck sign radial head Fx	comminuted radial head Fx	–
6	Male	22	left	falling down	No	less than 1 week	fleck sign distal radius Fx	comminuted distal radius Fx	–

PMH : Past medical history.

Fx : Fracture.

a TB avulsion. Although some authors believe that “Fleck Sign” is a sign of complete triceps tendon rupture, but Van Riet *et al* (18) have reported that complete rupture happens only in 18% of triceps tendon ruptures and in the same manner in other articles it was mentioned that this sign could happen in partial ruptures too (7,16,17). In all of our patients small bony avulsion (Fleck sign) was positive. So in any patient with possible triceps avulsion, radiographs should be checked precisely and small pieces of fractured bone (Fleck sign) in the posterior of elbow should not be missed.

Avulsion of the TB may be associated coexist with other bony and ligamentous injuries (9).

One of our patients had radial head fracture associating with triceps tendon injury due to falling down from 3.5m on the out stretched hand. In one case series, 15 patients were reported with radial head fracture associating with rupture and avulsion of triceps tendon and a new syndrome was introduced consisting rupture and avulsion of triceps tendon and associating radial head fracture (10).

In case no 4 of our patients, there were comminuted fracture of distal humerus articular surface in coronal plane containing capitellum, trochlea and lateral epicondyle fractures which reduction and fixation was done by lateral incision and then avulsion of triceps tendon was treated by a posterior incision. After 2.5 years of follow up, the patient developed articular osteoarthritis. He was the only patient with the fair clinical results in our series.

Case number 6 is unique in regards to the associated injuries. He had triceps tendon avulsion, intra articular fracture in distal radius, ulnar styloid fracture and simultaneously closed medial collateral ligament (MCL) injury, which was erupted from medial epicondyle. MCL injury was discovered during surgery and addressed by transosseous repair (Fig. 1, 2). The combination of MCL injury and TB avulsion is extremely rare.

Daglar *et al* have reported one case with triceps tendon avulsion associating with MCL and Pronator Flexor avulsion which all was reconstructed during surgery (5).

Table II. — Intraoperative findings, operative technique and final results in patients with distal triceps brachii avulsion

Case	Intraoperative findings	Surgical technique		Mayo score	Clinical results	Radiography	Follow up (months)
		triceps avulsion	associated injury				
1	triceps central half rupture intact narrow sleeve medially & 1/3 laterally	transosseous suture repair	–	100	excellent	healed avulsion	9
2	complete triceps rupture	triceps V_Y plasty three suture anchors	–	95	excellent	healed avulsion	41
3	triceps rupture medial 2/3 intact lateral third	transosseous suture repair	–	100	excellent	healed avulsion	6
4	trochlea & capitellum Fx	transosseous suture repair	mini screw 2, 2.7 mm	65	fair	moderate elbow osteoarthritis	30
5	comminuted radial head Fx	transosseous suture repair	T-plate 2 mm	85	good	Healed Fx, no osteoarthritis	35
6	triceps rupture 2/3 medial MCL and Postero medial capsule disruption from medial epicondyle	transosseous suture repair	distal radius : volar plate MCL : transosseous suture Repair	100	excellent	healed avulsion	9

Fx : Fracture.

Tasaki has mentioned 3 cases with chronic MCL insufficiency among 8 triceps tendon cases which all had had chronic triceps avulsion (16).

Tatebe has mentioned 3 chronic partial triceps tendon injuries which have led to secondary MCL insufficiency (17). They have assumed that because of maintaining the attachment of lateral part of triceps tendon and function of anconeus muscle, elbow extensor vector has changed laterally and caused a long term valgus stress which has resulted in MCL gradual insufficiency. Chamssedin *et al* have reported one case of radial head fracture associated with triceps tendon, MCL and LCL injuries and have correlated it to common mechanism of triceps tendon injury which is falling on outstretched hand which is a common cause of elbow instability (4).

In justification of radius head fracture syndrome associating with triceps tendon injury, Levy *et al* have assumed that in falling on the outstretched hand, body weight force causes an spiral motion in

the extended elbow results in abduction force that create fracture. This force could cause a lot of pressure on MCL primarily but they have mentioned nothing about MCL injury (9,10).

The combination of acute injury associating with MCL rupture, triceps tendon avulsion, distal radius and ulnar styloid fracture in the same side (similar to our case no 6) has not been reported previously in the literature. According to the mechanism of the injury in case no 6, we assumed that during falling down from 1.5 meters height on the outstretched hand, the wrist was hyper-extended and the body weight force has caused distal radius fracture associating with TB avulsion and continuing force of body weight has caused MCL and elbow postero-medial corner injury by an abduction mechanism.

Surgery is recommended for the treatment of the complete triceps tendon rupture by most of the authors (1,2,9). On the other hand there is no consensus in the treatment options for the incomplete or partial ruptures of the TB tendon.



Fig. 1. — Plain x-ray and CT scan imaging of associated distal radius, ulnar styloid fracture and triceps tendon avulsion in patient number 6.

Usually in the low demand cases, conservative treatment is associated without limitations in normal life activities (13).

Strauch has mentioned that partial rupture could be in a wide spectrum from 10% to 90% of tendon width so that the results of conservative treatment might be different (15).

Considering the diversity of the results of conservative treatment in partial ruptures, Van Riet *et al* have recommended surgery for all cases except old ages and low demand patients (18).

Regarding to the high demand nature of our patients, we performed surgical treatment for all of them. If there are any associated injuries, treatment

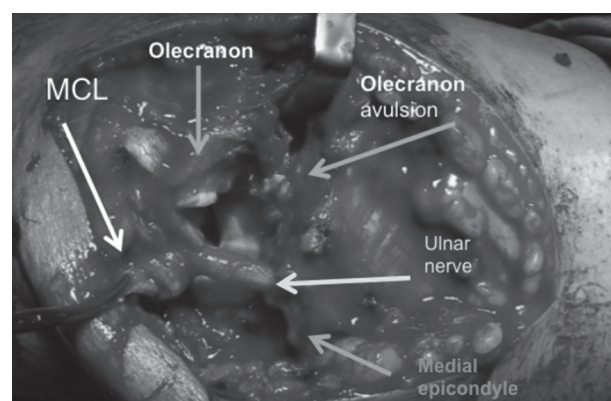


Fig. 2. — Intra operation findings in patient 6, ulnar nerve and ruptured medial collateral ligament (MCL) are exposed.

decision-making should be taken based on the kind of associated injury and patient's condition.

CONCLUSION

Although TB tendon rupture is a rare injury, its missing can burden a challenging condition to the patient, so it should be in differential diagnosis of the upper extremity trauma. Similarly associated injuries including radial head fractures, distal humerus intra articular injuries and specially MCL rupture should be addressed properly in terms of diagnosis and treatment.

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REFERENCES

1. **Bach BR Jr, Warren RF, Wickiewicz TL.** Triceps rupture. A case report and literature review. *Am J Sports Med* 1997 ; 15 : 285-289.
2. **Bennett BS.** Triceps tendon rupture. *J Bone Joint Surg Am* 1962 ; 44 : 741-744
3. **Blackmore SM, Jander RM, Culp RW.** Management of distal biceps and triceps ruptures. *J Hand Ther* 2006 ; 19 : 154-169
4. **Chamseddine AL, Jawish RM, Alasiry AA, Zein HK.** Ruptures and avulsions of the distal tendon of the triceps brachii. *Eur J Orthop Surg Traumatol* 2012 ; 22 : 175-185.
5. **Daglar B, Delialioglu OM, Ceyhan E, Altas O et al.** Combined surgical treatment for missed rupture of triceps tendon associated with avulsion of the ulnar collateral ligament and flexor-pronator muscle mass. *Strat Traum Limb Recon* 2009 ; 4 : 35-39.
6. **Dawson J, Fitzpatrick R, Carr A, Murray D.** Questionnaire on the perceptions of patients about total hip replacement. *J Bone Joint Surg* 1996 ; 78-B : 185-190.
7. **Harris PC, Atkinson D, Moorehead JD.** Bilateral rupture of triceps tendon. Case report and quantitative assessment of recovery. *Am J Sports Med* 2004 ; 32 : 787-792.
8. **Koplas MC, Schneider E, Sundaram M.** Prevalence of triceps tendon tears on MRI of the elbow and clinical correlation. *Skeletal Radiol* 2011 ; 40 : 587-594.
9. **Levy M, Fishel RE, Stern GM.** Triceps tendon avulsion with or without fracture of the radial head. A rare injury ? *J Trauma* 1978 ; 18 : 677-679.
10. **Levy M, Goldberg I, Meir I.** Fracture of the head of the radius with a tear or avulsion of the triceps tendon. A new syndrome ? *J Bone Joint Surg Br* 1982 ; 64 : 70-72.
11. **Mair SD, Isbell WM, Gill TJ, Schlegel TF, Hawkins RJ.** Triceps tendon ruptures in professional football players. *Am J Sports Med* 2004 ; 32 : 431-434.
12. **Partridge R.** A case of rupture of the triceps cubiti. *Med Times Gaz* 1868 ; 1 : 175-186.
13. **Rahmi M, Arssi M, Hattoma N, Doumane B et al.** Traumatic avulsion of the triceps tendon with fracture dislocation of the elbow. A case report. *Pan Arab J Orthop Trauma* 2002 ; 6 : 25-27.
14. **Rettig AC.** Traumatic elbow injuries in the athlete. *Orthop Clin North Am* 2002 ; 33 : 509-522.
15. **Strauch RJ.** Biceps and triceps injuries of the elbow. *Orthop Clin North Am* 1998 ; 30 : 95-107.
16. **Tasaki K, Saitoh O, Komiyama T, Morimoto R et al.** Triceps tendon rupture. *J Jap Elbow Soc* 2001 ; 8 : 163-164.
17. **Tatebe M, Horii E, Nakamura R.** Chronically ruptured triceps tendon with avulsion of the medial collateral ligament : a report of 2 cases. *J Shoulder Elbow Surg* 2006 ; 16 : e5-e7.
18. **Van Riet RP, Morrey BF, Ho E, O'Driscoll SW.** Surgical treatment of distal triceps ruptures. *J Bone Joint Surg Am* 2003 ; 85 : 1961-1967.
19. **Yeh PC, Dodds SD, Smart LR, Mazzocca AD, Sethi PM.** Distal Triceps rupture. *J Am Acad Orthop Surg* 2010 ; 18 : 31-40.