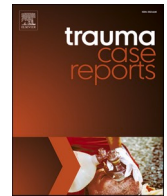




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Traumatic rupture of the pectoralis major muscle with associated thrombosis of the cephalic vein as part of a seat belt injury following a motor vehicle accident: A case report

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ABSTRACT

Traumatic rupture of the pectoralis major muscle is a rare concomitant injury in polytrauma patients often resulting in delayed diagnosis. We present the case of a young male patient who, among other injuries, suffered a complete rupture of the right-sided pectoralis major muscle at the humeral insertion point following a motor vehicle accident. Duplex sonography demonstrated an associated thrombosis of the cephalic vein, which was treated initially with intravenous heparin, and long-term with low-molecular weight heparin according to current guidelines. An open refixation of the muscle belly at the humeral insertion point was performed two weeks after the initial trauma. Post-operative follow-up presented a good overall outcome in terms of function and aesthetics. The authors emphasize the need of continuous clinical re-evaluation in the treatment of severely injured patients in order not to overlook relevant injuries.

Introduction

Based on current literature, rupture to the pectoralis major muscle is rare injury entity, usually occurring in young male athletes performing weightlifting exercise. [1]

In this specific patient group, the injury is normally resulting from indirect trauma with an altered muscular architecture. Injury resulting from direct trauma represents another condition, which has only very rarely been reported. [2,3]

The authors present the case of a 31-year-old male polytrauma patient (ISS score of 26) who suffered a complete rupture of the pectoralis major muscle on the right side after a road traffic accident (RTA). In a review conducted by ElMaraghy and Devereaux in 2012, a total of 365 cases of pectoralis major rupture were reported between 1822 and 2010, with an increasing frequency over the past 20 years. In 83% of the mentioned cases, the injury resulted from indirect trauma. Weight training, including the bench press maneuver, was noted to be the most frequent mechanism of indirect injury, occurring in nearly 48% of the reported cases. [4,5]

To our knowledge, this is the third reported case of a traumatic pectoralis major rupture resulting from an RTA. The first was documented by Foroulis et al. in 2004. [6] The second was reported by Harvey et al. in 2008, which was treated using a mesh repair 2 years after the accident. [2]

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Case presentation

A 31-year-old male patient was admitted to our emergency room following a motor vehicle accident, in which the patient suffered a head-on collision with a tree at a velocity of approximately 120 km/h.

After initial paramedic treatment, intubation and stabilization at the scene of the accident, the patient was transferred to our level I trauma center in a stable condition. Primary survey according to the ATLS (advanced trauma life support) standard showed no injuries concerning airway, breathing or circulation. Initial examination demonstrated a fracture of the left femoral shaft, a left sided comminuted patella fracture, as well as a closed pilon fracture of the left ankle joint. First clinical examination showed no signs of associated blunt thoracic trauma. There was no evidence for external trauma in sense of ecchymosis, edema, or erythema of the thorax, no rib fractures, pneumothorax or haemothorax. The remainder of the physical examination and full body CT-scan did not demonstrate any further injuries. After initial stabilization and diagnostics, the patient was directly transferred to the operating theatre and received open reduction and plate fixations for the above-mentioned lower limb fractures. Afterwards, the patient was admitted to the intensive care unit. The patient quickly recovered and was admitted to peripheral ward on the next day.

During continuous clinical re-evaluation with tertiary survey on the peripheral ward, the patient complained of a slight swelling and pain in the right arm and on the right side of the chest wall, as well as a generalised weakness when using his right arm in all directions. Physical examination revealed a visible deformity on the right side of the anterior axillary region during contraction of the pectoralis muscle body (Fig. 1 and Fig. 2).

Further diagnostic evaluation with sonography of the region demonstrated a complete tear of the pectoralis major muscle on the right side. The pectoralis muscle was reported to be separated from the attachment site on the greater tuberosity of the humeral head. A 3.6×1.5 cm hematoma was measured (Fig. 3). Doppler ultrasonography revealed a thrombosis of the proximal portion of the right cephalic vein. Anticoagulation therapy with the use of intravenous heparin was then applied over a course of one week followed by low molecular weight heparin, in accordance with current guidelines. Regarding the pectoralis major injury operative care was indicated.

The rupture was treated by means of two Ultra-TWINFIX suture anchors (Smith & Nephew plc, London, UK) and FiberWire sutures (Arthrex GmbH, Munich, Germany).

The chest was prepped and draped according to standard surgical procedure with the sterile arm freely movable. A 6-cm long incision in the skin in line with the deltopectoral sulcus was made, which was followed by preparation through the fascia. The pectoralis major muscle was identified, afterwards the insertion site on the humerus was located directly lateral to the biceps tendon. Two resorbable FastFix-Anchors with FiberWire pairs were then fixated directly next to the tendon insertion site. The four knot pairs were then fixated at the tendinous muscle body on the chest wall.

Follow-up

The patient received an arm shoulder immobilisation brace following the procedure and was instructed to immobilise the shoulder for external rotation and abduction for the first two postoperative weeks. Between the second and fourth postoperative week, abduction was limited to 30 degrees without allowing for external rotation. In the fifth and sixth postoperative weeks, the patient was restricted to 0 degrees external rotation and 45 degrees abduction. From the sixth postoperative week onwards, the patient was allowed 20 degrees external rotation with a maximum of 90 degrees abduction. The patient was allowed a free range of motion in the elbow joint. The further postoperative course did not present any complications. The patient was discharged shortly after in good condition.

Follow up examination 1 year after the procedure showed a satisfying clinical result with a free range of motion and intact muscle function after reconstruction (Fig. 4).



Fig. 1. pre-operative photograph demonstrating no visible deformity during muscle relaxation.



Fig. 2. pre-operative photograph demonstrating right sided chest deformity with rupture of the pectoralis major during muscle contraction.

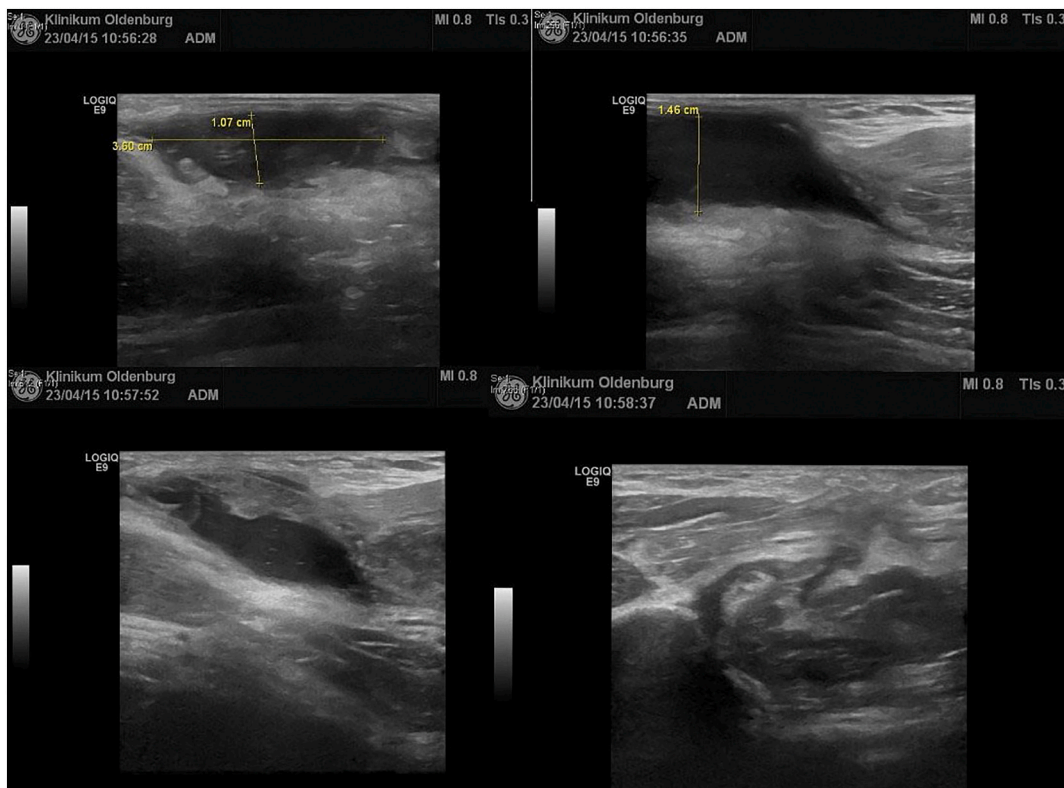


Fig. 3. pre-operative photograph demonstrating sonography of the ruptured pectoralis major muscle.

Discussion

The majority of documented pectoralis major ruptures have occurred in young male athletes performing weight bearing exercise. [1] In the presented case, the authors assume a combination of a dashboard and a seat belt injury. The dashboard injury resulted in the lower extremity fractures. We assume that the pectoralis muscle injury resulted through a forced hyperextension and external rotation of the right shoulder through the three-point lap-diagonal seat-belt restraint. 'Seat belt syndrome' describes the array of soft tissue injuries that can occur in the event of an RTA, which were originally described to occur more often in patients who were wearing a seatbelt. [7] The rupture of the pectoralis major muscle as a result of seat belt following an RTA has been reported previously by Harvey et al. in 2008 along with Foroulis et al. in 2004. [2,6] Relevant injuries (fractures, luxation injuries to the carpus and tarsus), as



Fig. 4. photograph at one-year follow-up during muscle contraction showing the intact reconstruction.

well as concomitant injuries in particular to cruciate ligaments, are often primarily overseen in polytrauma patients. Based on the ATLS treatment guidelines, these injuries are not relevant in the initial hospital phase. However, in the overall treatment, these injuries must be assessed and addressed. Therefore, as described in the Advanced Trauma Life Support (ATLS) guidelines, priorities for treatment in severely injured patients were established based on the sequence beginning with the primary survey, followed by a detailed secondary survey. [8] The sequence of examinations and procedures is adjusted to the condition of the patient. The tertiary survey is important to detect all injuries sustained by polytrauma patients and the status of patients should be re-evaluated daily, as described by Ferree et al. [9] All trauma patients admitted to our clinic are evaluated and examined according to the ATLS guidelines of trauma management. In this particular case, this injury was detected during the tertiary survey on the peripheral ward. This case highlights that a systematic physical examination during the tertiary survey, and constant re-evaluation, is crucial to avoid overlooking relevant injuries.

To our knowledge, there have not been any reported cases of an associated cephalic vein thrombosis. The use of duplex-sonography in patients with these injuries is an important diagnostic tool to allow for the early detection and treatment of potential thromboses.

In consensus with other study groups, we recommend operative restoration of pectoralis major ruptures. The meta-analysis of Bak et al. concluded that surgical treatment of the rupture of the pectoralis major muscle resulted in significantly better outcomes when compared with conservative therapy. [1] Early operative treatment was also recommended by Äärimaa et al. in their retrospective study involving 33 operatively treated cases. Foroulis et al. as well as Strohm et al. have described the repair of the pectoralis major muscle belly using full thickness absorbable sutures. [5,6,10]

Conclusion

We report the successful treatment of an acute traumatic rupture of the pectoralis major muscle with cephalic vein thrombosis on the right side following a road traffic accident. This mechanism of injury is rare; this is the first reported case which describes the thrombosis of the cephalic vein related to the injury. We conclude that refixation with the use of suture anchors and FiberWire sutures is an acceptable method in the acute therapy, and that duplex-sonographic evaluation is an important diagnostic adjunct in patients with these injuries in order to detect relevant thromboses of the deep upper extremity veins. Continuous clinical re-evaluation remains crucial in the treatment regime in severely injured patients in order to not oversee relevant injuries.

Declaration of competing interest

The authors declare no potential conflict of interests.

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Contributions

The authors contributed equally.

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Informed consent was obtained from the patient.

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