Scapulothoracic Dissociation-a Life Threatening Injury

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Scapulothoracic dissociation (STD) is a rare injury that may be life threatening. The mechanism is either high velocity or traction injury. It may involve soft tissue, osseous and neurovascular structures. The high rate of mortality is attributed to heart, lung and major vascular injury. A high index of suspicion is mandatory, even with an intact overlying skin, because patients may succumb rapidly to hemodynamic instability. Kelbel ratio is one of the parameters that is helpful in diagnosing STD. Advanced Trauma Life Support (ATLS) protocol must be followed: "save life and then save limb" must be the principle of management.

Keywords: ATLS, Kelbel ratio, neurovascular injury, STD.

Scapulothracic dissociation (STD) is defined as varying degree of discontinuity of upper limb with its truncal attachment. The term scapulothracic dissociation was coined in 1984 by Oreck et al to describe an injury involving complete closed separation of scapula and upper limb from the thoracic attachment. STD is originally referred to as a traumatic forequarter amputation with intact skin.[1] This injury is associated with varying degree of soft tissue, musculature, skeletal and neurovascular involvement and hence carries high morbidity and mortality.[2] The mechanism of the injury involves either strong direct impact over the shoulder region or severe traction injury. We present a case of traction injury with complete disruption of the neurovascular bundle, presenting 36 hours after injury.

Case report

A 34-year-old gentleman was referred from central Terai region of Nepal with a history of traction injury (entangled in machine) of right upper extremity. In the ER, as per ATLS guidelines, the patient had decreased air entry on right hemithorax, tachypnoea and tachycardia. Further examination revealed a 20x10 cm wound **(Figure 1A)** over there right shoulder region, exposing under lying muscles (deltoid, pectoralis major), which were dusky in color and foul smelling. The thrombosed end of the axillary artery was pulsating through the wound. Distal pulses were absent and the extremity was cold and clammy. The fractured end of the right clavicle could also be also seen. The torn end of the brachial plexus was also visible at the wound, and consequently, sensation and power on the limb were completely absent. The patient also had amputation around PIP joint involving all the fingers **(Figure 1B)**. An AP X-ray of the chest showed a wide

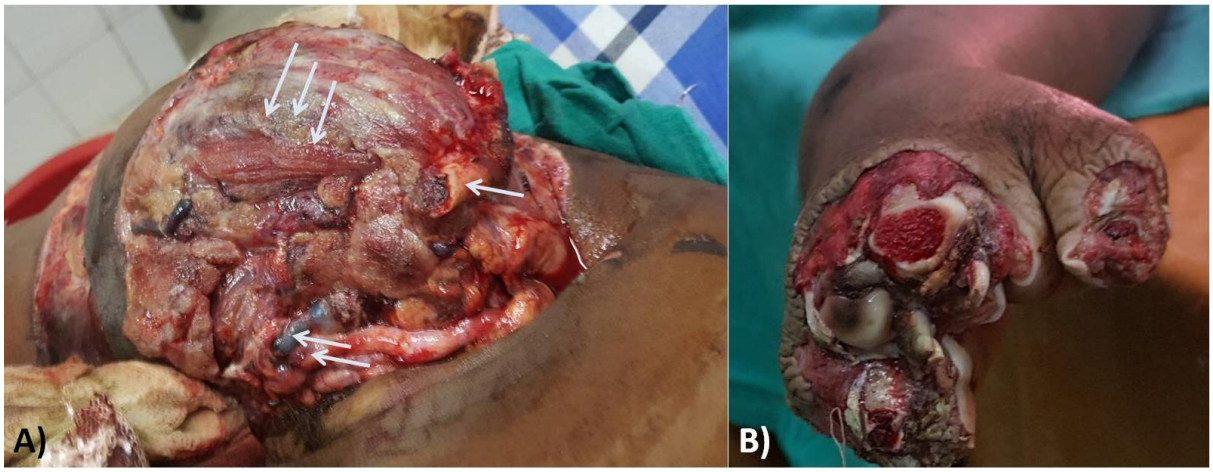

Figure 1: Pictures of external injury, A) 20x10cm wound over the antero-medial aspect of the right shoulder joint, 1 arrow distal end of clavicle, 2 arrows Axillary vein and brachial plexus, 3 arrows Deltoid muscle, B) showing complete amputation of the all the fingers around PIP joint of Right hand with absent of bleeding

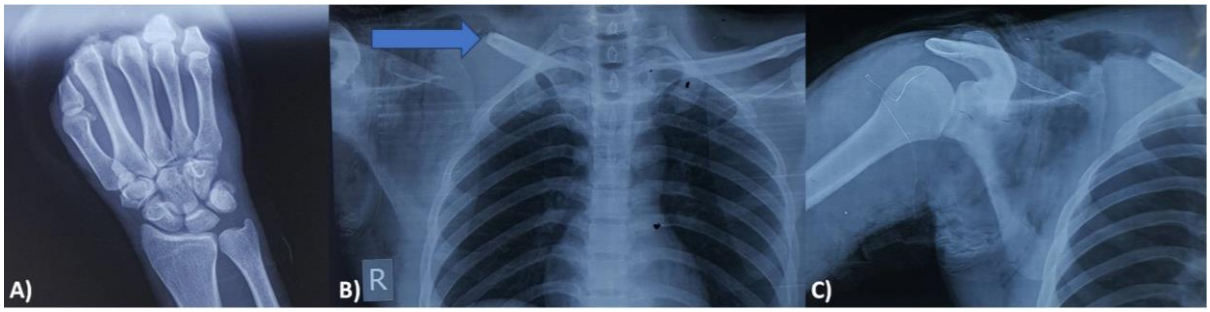

Figure 2: X-Rays, A) X-Ray of Rt hand shwoing amputation of all the fingers, B) AP chest X-Ray showing complete clavicle fracture and widely lateral displacement of right scapula. Kelbel ration >1.5, suggestive of scapulothoracic dissociation, C) showing complete fracture of the right clavicle at the junction of middle 2/3rd and lateral 1/3rd with lateral displacement

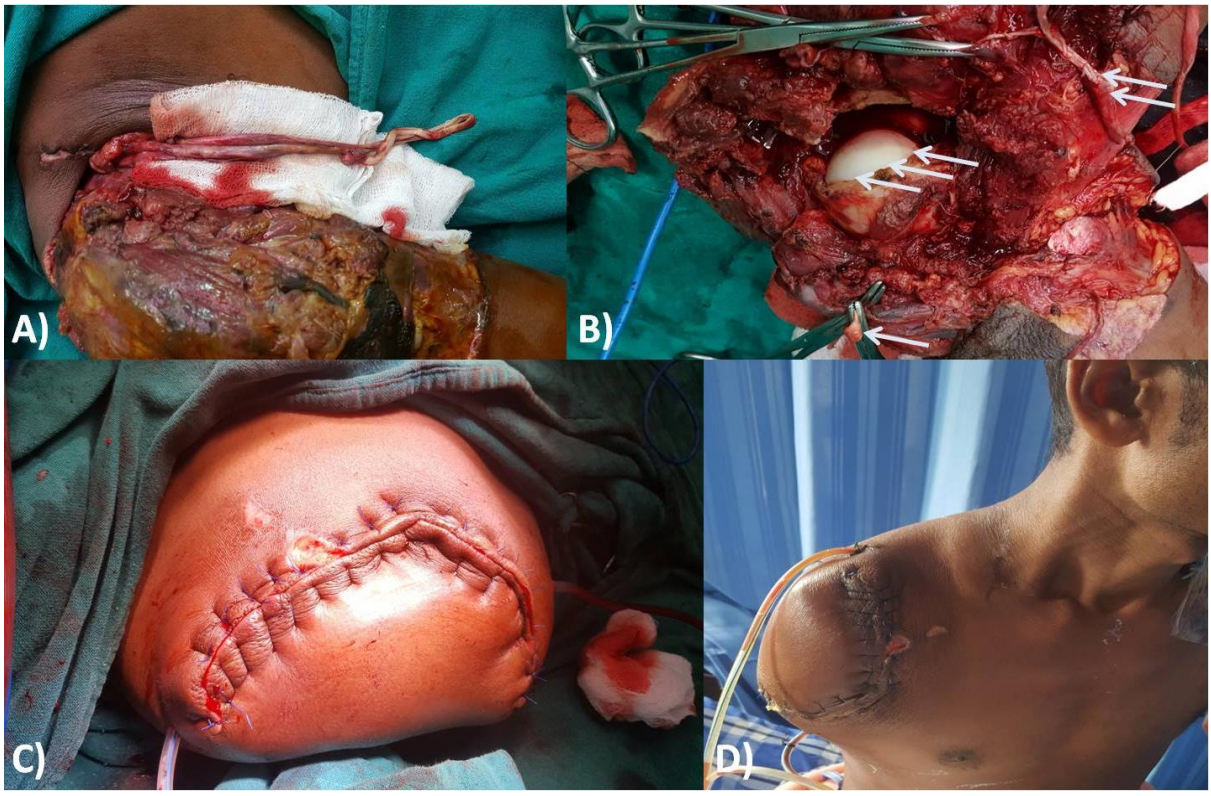

Figure 3: Intraoperative pictures, A) showing completely avulsed brachial plexus with non - bleeding muscles (Unsalvageable limb), B) Right shoulder disarticulation in the process after taking artery in control, 1 arrow, head of humerus, 2 arrows, Proximal end of axillary artery (held with artery force), 3 arrows, Distal end of Axillary artery

laterally displaced right shoulder girdle with a Kelbel ratio (the ratio of the distance between medial boarder of the injured scapula and spinous process to medial boarder of the healthy scapula and spinous process) of more than 1.5 **(Figure 2)**. After resuscitation and compressive bandaging patient was admitted to the high dependent unit. The affected extremity was deemed unsalvageable limb, and an elective shoulder disarticulation was done after proximal axillary artery ligation **(Figure 3 A, B)**. After multiple debridement, the wound was closed with local fasciocutaneus tissue mobilization **(Figure 3 C, D)**. The patient was discharged after two weeks in the hospital.

Discussion

STD is rare and has high morbidity and mortality as evidenced by a 10% mortality mainly due to hypovolemic shock (laceration of the axillary artery), and 21 % early amputation.[3] STD usually occurs when a large tensile force causes a lateral traction injury to the shoulder girdle is applied to the shoulder girdle.[4,5] This may involve significant trauma to heart, chest wall and lungs. Associated injuries can be classified as orthopedic and non – orthopedic injuries.[6] Associated orthopedic conditions are: scapula fractures, clavicle fractures, AC dislocation/separation, sternoclavicular dislocation, Flail extremity (52%), complete loss of motor

and sensory function rendering the extremity non-functional.

Non-orthopedic conditions involve vascular injury: subclavian artery -most common & axillary artery. Neurological injury may be as high as 95% and mainly involves ipsilateral brachial plexus injury (often complete).

Neurological injuries are more common than vascular injury. Brachial plexus injury is most important factor which determines the outcome of the injured limb. Our case had the same multiple injuries as mentioned above.

Damschen[8] has classified this injury broadly in 3 categories (1977) and later 4 category was given by Zelle[9] et al according to their severity:

- I STD: Musculoskeletal injury alone
- IIA: Musculoskeletal injury with vascular disruption
- IIB: Musculoskeletal injury with neurological impairment
- III: Musculoskeletal injury with neurologic and vascular injury
- IV: A complete brachial plexus avulsion (Zelle et al)

Diagnosis id made on the basis of several factors:

History of high energy trauma to upper limb with neurovascular deficit gives the clue of this condition.

Radiograph demonstrating lateral displacement of the scapula or complete acromioclavicular disruption. The lateral displacement of scapula is measured in terms of distance between the spine and the medial border of scapula.[7] Kelbel described the ratio of distances between affected and the non- affected sides to be 1.5 or greater.

STD often coexists with other Osseo-ligamentous and neurovascular injuries, and may present in an occult way under an intact skin, thus causing catastrophic bleeding and consequent shock, if a high index of suspicion is not maintained.

Treatment should be according to ATLS protocol and should follow the principle of "save life and save limb". Angiography may be indicated if bleeding vessels cannot be identified in a hemodynamically stable patient, otherwise urgent thoracotomy is indicated.

Ebraheim et al. has proposed a treatment protocol[10] according to the phases of trauma which include:

- The acute phase (4-6 hours): focuses on diagnosis and resuscitation and vascular repair
- The subacute phase (24 hours to 2 weeks): focuses on management of the sequelae of the initial injury and consideration for amputation.
- The final phase evaluates nerve injury and considers reconstruction options.

Conclusion

Scapulothoracic dissociation is a rare life-threatening injury. Any patient with high velocity injury or a traction injury to upper extremities presenting with hemodynamic instability have to have STD ruled out. Management follows ATLS guidelines, and this may extend to more invasive treatment such as life-saving thoracotomy if bleeding cannot be controlled. In a stable patient, treatment should be guided according to extent of injury to neurovascular structures.

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