Doi: 10.32677/IJCR.2017.v03.i04.020

Case Report

Thoracic reconstruction of exposed lung by contralateral pectoralis major muscle flap

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Received - 04 August 2017 Initial Review - 06 September 2017 Published Online - 30 September 2017

ABSTRACT

Chest wall defects are defined as defects with variable loss of skin, muscles, and rib cage with exposed pleura or lung. The exposed lung is a life-threatening emergency and requires urgent intervention to restore airtight closure. We use contralateral pectoralis major muscle turnover flap to obliterate dead space and airtight closure for full thickness right-sided chest wall injury with exposed lungs.

Key words: *Muscle flap, Pectoralis major, Thoracic reconstruction*

Chest wall defects are defined as defects with variable loss of skin, muscles, and rib cage with exposed pleura or lung. These are common following oncological resections, radiation necrosis, and trauma [1]. The loss of the chest wall causes a breach in the integrity of the pleura with resultant lung exposure. This may cause decreased ventilation and is a life-threatening emergency. Such injuries, therefore, require immediate intervention. Mortality rates of up to 33% have been reported for patients with flail chest injuries [2-4]. The goal of the treatment is to stabilize the thoracic cage and restore the airtight closure of thoracic cavity while obliterating any potential dead space. The complication rate varies from 24% to 46% with respiratory complications being the most common [5,6]. We report the case of a patient who met with a road traffic accident with a composite defect of the thoracic wall and exposed lungs and cover the defect with contralateral pectoralis major turnover muscle flap. We used contralateral pectoralis major muscle only flap as an alternative to latissimus dorsi flap and ipsilateral pectoralis major muscle turnover flap to cover exposed lung.

CASE REPORT

A 20-year-old man presented to the emergency department following a roadside accident with trauma over the right upper chest wall with tissue loss. He had difficulty in breathing at presentation and gave a history of profuse bleeding from the wound in the chest wall. However, there was no history of loss of consciousness, vomiting, seizure, or bleeding from any of the orifices. He was complaining of persistent pain in the right chest wall with exacerbation during deep inspiration. He had previously been healthy.

His examination showed tachycardia, hypotension, and a respiratory rate of 30 breaths per minute and temperature of 37°C. Pulse oximetry revealed an oxygen saturation of 70% on room air. On local examination, a wound of size ~ 12 cm × 8 cm was present on the right side of the chest wall just below the clavicle with loss of underlying tissues. There was fracture of the clavicle, and the first rib and lung movements were visible through the chest wound (Fig. 1). Subcutaneous emphysema or crepitus in the chest and neck area was present. On auscultation, the patient had decreased breath sounds on the right side. Heart sounds were regular with no murmurs. The rest of the examination was unremarkable.

Laboratory reports were unremarkable except for a mild leukocytosis of 15,000/mm^3. Chest X-ray revealed a fracture of the clavicle and 1st rib with a small pulmonary contusion with pleural effusion. Focused assessment sonography in trauma and computed tomography head were normal. A right-sided thoracotomy tube drained continuous air and slight blood. The patient underwent exploration with debridement of wound with the fixation of fracture clavicle and 1st rib by steel wire (Fig. 2). Pectoralis major muscle flap was elevated from the contralateral inframammary incision (Fig. 3). After raising flap, it was turnover and retrieved through a tunnel made over sternal area (Fig. 4). Flap was used as an interposition muscle flap to cover wound after bony fixation and to maintain airtight wound closure. Flap was based on major vascular pedicles present at the clavicle level. The patient was kept on elective ventilation postoperatively and extubated on 4th post-operative day (POD). The patient recovered well (Fig. 5) and was discharged after two we eks after removal of the thoracotomy tube.

DISCUSSSION

All chest wall injuries can be graded by chest wall injury scale given by the American Association for the Surgery of Trauma

Figure 1: Wound on anterior chest wall with exposed lung apex

Figure 2: Fixation of # clavicle and 1st rib with steel wires

Figure 3: Contralateral pectoralis major muscle pedicled flap

Organ Injury Scaling Committee (Table 1) [7]. This grading scale was used for research purpose and to identify injury severity.

Chest trauma is common following roadside accidents and came third behind the head and extremity trauma in major accidents. Within the thorax, the chest wall itself is the most often injured, followed by the lungs, heart, and diaphragm [8]. The majority of chest wall injuries can be managed conservatively or by tube thoracostomy. However, loss of chest wall substance (traumatic thoracotomy) with massive air leak is an indication for urgent surgery that requires airtight close of the thorax along with reconstruction of lost tissue. Defects of the anterior chest wall are the most difficult of all to reconstruct while full-thickness defect with exposed lungs is really challenging. Defects <5 cm do not require skeletal stabilization while defect >5 cm requires skeletal stabilization as it may lead to flail chest and respiratory insufficiency, as a result of paradoxical respiratory motion and abnormal ventilation. By proper skeletal reconstruction, flail chest may be avoided and preserve respiratory function. Various

Figure 4: Muscle flap retrieved through wound

Figure 5: Scar of wound after 12th post-operative day

Table 1: Chest wall injury severity scale

Grade	Injury type	Description of injury
I	Contusion	Any size
	Laceration	Skin and subcutaneous
	Fracture	<3 ribs, closed; no displaced clavicle, closed
II	Laceration	Skin, subcutaneous and muscle
	Fracture	>3 adjacent ribs, closed
		Open or displaced clavicle
		No displaced sternum, closed
		Scapular body, open or closed
III	Laceration	Full-thickness including pleural penetration
	Fracture	Open or displaced sternum, flail sternum
		Unilateral flail segment (<3 ribs)
IV	Laceration	Avulsion of chest wall tissues with underlying rib fractures
		Unilateral flail chest (>3 ribs)
V	Fracture	Bilateral flail chest (>3 ribs on both sides)

options are available for chest wall reconstruction such as prosthetic implant reconstruction and autologous bone grafts.

As proved by many studies [9-12], open reduction and internal fixation have several advantages such as reduce ventilator requirements, early extubation, improved pulmonary function early return to work, and decreased mortality. In our patient,

skeletal stabilization was done with wire fixation as the fracture ends are approximating easily. Our patient got extubated on day 3 and started doing day today activity on day 10. Jiménez-Quijano et al. [13] also done steel wire fixation for the chest wall fixation with excellent results.

Well-vascularized soft tissue cover is required for good wound healing, infection control, and preservation of normal ventilatory function. The combination of these prosthetic materials as well as advances in the knowledge and use of my cutaneous and pedicled tissue flaps allow even the largest of defects to be reconstructed. Various local and regional muscles such as latissimusdorsi, pectoralis major, rectus abdominis, and external oblique are in the armamentarium of the plastic surgeon for the chest wall reconstruction. These can be used safely used either as cutaneous or muscle only flap. We used pectoralis major muscle of opposite side as pedicled muscle only flap as it was easy to harvest and in close proximity to the wound. Same side of flap was not harvested because of trauma zone around pedicle of pectoralis major muscle flap. Flap was based on main pedicle present at clavicle level. Reach of the flap can be increased by muscle release from lateral side of the clavicle. Latissimus dorsi muscle flap also was a good option for this defect but requires position change for flap harvest. Mild soakage was present from wound site for 1st two weeks, and it was managed with irrigation and daily dressing. It healed in 3rd week, and donor site wound also healed well without any complication. Eventually, the patient was discharged on 21st POD. Hence, adequate debridement, skeletal stabilization, and adequate vascularized soft tissue cover are the mainstay of such full-thickness chest wall defect.

CONCLUSION

The vast majority of chest trauma is appropriately managed no operatively. However, full-thickness chest wall defects are best managed operatively for the better patient stabilization in terms of respiratory dynamics and improved recovery as muscle flap favors early wound healing.

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Funding: None; Conflict of Interest: None Stated.

How to cite this article: Kumar R, Mishra B, Upadhayay DN, Sharma N. Thoracic reconstruction of exposed lung by contralateral pectoralis major muscle flap. Indian. J Case Reports. 2017;3(4):229-231.