Management of massive subcutaneous emphysema with a surgical tracheostomy

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ABSTRACT

Introduction: Interventions for massive subcutaneous emphysema is rarely reported in the literature with lack of comparative studies and strong preferences over one treatment option compared to another. Tracheostomy is a conservative measure as compared to primary closure of tracheobronchial injury for the management of massive subcutaneous emphysema.

Case report: A 62-year gentleman who developed massive subcutaneous emphysema on the 12th post-operative day following two laparoscopic abdominal surgeries and an exploratory laparotomy. A computer tomographic scan was performed showing a suspicious tenting of the trachea at right posterolateral wall at the level of T2 vertebra with locules of air seen anterolaterally to the trachea. A subsequent microlaryngobronchoscopy performed showed no defect in the subglottic region, nor tracheobronchial tree. He was successfully managed with a surgical tracheostomy whereby the emphysema showed dramatic resolution on the second postoperative day.

Conclusion: Surgical tracheostomy demonstrated a success in managing massive subcutaneous emphysema.

Key Words: Conservative, emphysema, tracheostomy, tracheobronchial injury.

INTRODUCTION

Tracheobronchial injury is an uncommon but potentially devastating problem and may be life threatening. With the improvement in hospital care and support, these injuries are encountered with increasing frequency. The majority of tracheobronchial injury is due to trauma and about 70% of patients die before admission and 21% of those reaching the hospital die within 2 hours[1]. Iatrogenic injuries are often due to procedures such as esophagectomy, bronchoscopy, traumatic intubation and also tracheostomy[2]. The incidence of iatrogenic causes ranges from 0.5% to 0.19% [3].

Tracheobronchial injuries are often identified clinically during intraoperative period or during ventilation in the intensive care unit. They usually present with air leak during surgery and often easily recognized by the surgeon. Whereas in the intensive care unit setting, evidence of subcutaneous emphysema with evidence of pneumomediastinum may suggest tracheobronchial injury. Performing a computed tomography scan enables the clinician to localize the air leak and occasionally identify the lesion. As a standard practice, a computed tomography scan finding and a diagnostic microlaryngobronchoscopy are two important investigations to identify the location of the lesion for further intervention.

While subcutaneous emphysema is a recognized early complication of tracheostomy[2], we would like to describe surgical tracheostomy as a treatment of massive subcutaneous emphysema.

CASE REPORT

A 62-year-old male with achalasia developed worsening dysphagia and gastroesophageal reflux disease. He had significant dilatation of the esophagus leading to esophageal failure. He underwent a thoracoscopic, laparoscopic total esophagectomy and neck anastomosis with feeding jejunostomy. On the 9th post-operative day, he developed severe abdominal pain associated with melenaic stools. A diagnosis of intra-abdominal bleeding was made, and he subsequently underwent an exploratory laparotomy for arrest of bleeding. He was kept intubated and ventilated in the intensive care unit following laparotomy due to sepsis. Three days later, the patient developed massive subcutaneous emphysema extending from the zygoma up to the chest at the level of 5th intercostal space [Figure 1]. The laryngeal cartilage framework was palpable, and the trachea was central with subcutaneous emphysema over the neck. A computer tomographic scan was performed showed a suspicious tenting of the trachea at right posterolateral wall at the level...
of T2 vertebra with locules of air seen anterolaterally to the trachea [Figure 2]. A microlaryngobronchoscopy showed no defect in the subglottic region, trachea nor main bronchus. Following the findings, a tracheostomy was performed in the same setting. A wide skin incision was utilized with dissection of the subcutaneous tissue and strap muscles. The tracheal incision was performed on the third tracheal ring. The wound was closed loosely with daflon 4/0 to allow dissipation of the subcutaneous emphysema. Postoperatively, the patient showed significant resolution of the subcutaneous emphysema over a period of two days [Figure 3]. With the resolution of the subcutaneous emphysema, the patient was able to be weaned off the ventilator one day following surgical tracheostomy and tracheostomy was subsequently decannulated on the third post-operative day.

**DISCUSSION**

Cervical emphysema is a result of entry of air or gaseous material into the soft tissue planes within the neck. Various etiologies have been accounted for these occurrence and can be divided into iatrogenic and non-iatrogenic. The common iatrogenic causes associated with tracheal injury are tracheostomy, traumatic endotracheal intubation, bronchoscopy and esophagectomy[2]. The
Tracheal injury is often identified clinically intraoperatively or during ventilation in intensive care unit. Evidence to support tracheal injury is when the patient have difficulty ventilating or unknown source of subcutaneous emphysema. A chest radiograph is often helpful in diagnosis subcutaneous emphysema by evidence of striated lucencies within the soft tissue. If the emphysema is extensive involving the anterior chest wall outlining the pectoralis major muscle, it may give rise to a ginkgo leaf sign. A computed tomography scan readily shows the anatomic location of the pockets of air amongst the soft tissue with evidence of extremely dark low attenuation areas within the subcutaneous space. Some studies describe air paralleling along the trachea as sign of tracheobronchial injury on a computed tomographic scan. A CT scan is able to show evidence of air leakage within the soft tissue and occasionally show its communication with the injury however, not always does the findings correspond with tracheoscopy findings. CT scans only have up to 85% sensitivity for detecting tracheal injury. A direct laryngoscopy and tracheoscopy combined with computed tomography is the standard practice in assisting in identifying tracheal injury.

Tracheal injuries regardless of mechanism are life threatening events and surgical repair of these injuries have been described as the treatment of choice. This is based on the assumption that the injury may lead to mediastinitis or subsequent tracheal stenosis. However, there are no comparative studies available in the literature to support this modality of choice. Moreover, primary repair carries a high risk of stricture formation and narrowing of the trachea. Beiderlinden et al, contradicts this assumption as conservatively treated tracheal injuries has healed well without the feared complications. Often conservative treatment is advocated for small tears over the trachea less than 2 cm in length. Spontaneous recovery of these lesions has been increasingly reported after conservative treatment. This is made possible by bridging the tracheal injury by intubating the patient or performing a tracheostomy distal to the site of injury. Our experience with this case proves that it is not necessary to perform the tracheostomy distal to the site of injury and tracheostomy is a viable option, even for thoracic tracheal injuries which is the most likely cause in this case. Additionally, further intubating the patient will require prolonged ventilation and may lead to subsequent events. A tracheostomy is of better choice as this allows the patient to be easily weaned of the ventilator and also provide a pathway for breathing. The immobilization provided allows the lesion to heal spontaneously. A tracheostomy also helps to reduce the airway pressure within the trachea. This is proposed theoretically to prevent tension on the margins of the wound by reducing airway pressure during breathing, coughing or Valsalva maneuver hence promoting healing of the wounds. The sealing of the lesion occurs naturally by tissue layers sliding and producing the same functional results as in a primary open surgical repair. Nonetheless, performing a tracheostomy also helps with clearance of tracheobronchial secretions without risk of further damaging the tracheal wall. More to that, by performing a tracheostomy as compared to extensive tracheal surgery, no tracheal cartilage is removed hence there is no shortening of the trachea and lessens the risk of tracheal stenosis. Beiderlinden et al, contradicts this assumption as conservatively treated tracheal injuries has healed well without the feared complications.
CONCLUSION

Interventions for massive subcutaneous emphysema is rarely reported in the literature with lack of comparative studies and strong preferences over one treatment option compared to another. Surgical tracheostomy, as demonstrated in this case was successful in treating massive subcutaneous emphysema due to iatrogenic thoracic tracheal injury following laparoscopic esophagectomy.

REFERENCE


