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ORIGINAL ARTICLE

Management of Tracheobronchial Injuries with Subcutaneous Emphysema

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ABSTRACT

Background: Subcutaneous emphysema is infiltration of air under dermis layers in tracheobronchial injuries and needs to be immediately addressed for proper management.
Aim: To assess the management protocols for tracheobronchial injuries with subcutaneous emphysema.
Study design: Retrospective study.
Place and duration of study: Dept of Thoracic Surgery, Sandeman Provincial Hospital Quetta from 01-01-2020 to 31-03-2021.
Methodology: Fifty patients were assessing for their management techniques in tracheobronchial injuries with subcutaneous emphysema. Patients with conservative as well as surgical management were completely analyzed. Their data regarding traumatic injury was recorded.
Results: The mean age of patients was 22.3±5.2 years with 85% being males and 15% females enrolled. Patients who had less traumatic injury and were managed by conservative treatment has better recovery rate than surgically operated cases.
Conclusion: Timely management with surgical procedure in severe injuries is required for better recovery outcomes.
Keywords: Tracheobronchial injury, Subcutaneous emphysema, Traumatic surgery

INTRODUCTION

Subcutaneous emphysema (SE) is de-novo production or penetration/infiltration of air in the subcutaneous skin layers. Subcutaneous tissue is present under the dermal layer of skin. Non extensive subcutaneous spread due to expansion of air in deep tissue is considered as less clinical significance. However, in cases of formation of SE indicates that air occupation has been done in deep body regions which cannot be seen without imaging aids[1-5].

This can develop pneumomediastinum or pneumo-retroperitoneum as well as pneumothorax. The air then travel through these regions with pressure gradience between the areas of intra alveolar and the perivascular-interstitum[6]. This further makes it spread in the complete body including head to abdomen through the connecting fascial planes as well as anatomical-planes. Consequently, this air spread can result into respiratory or cardio-vascular failure.[7] Subcutaneous emphysema is therefore related with not only with surgical traumatic incidences but also high risk of infections. Various injuries like of thoracic or sinus cavity, bone structure such as of face or perforation of bowel can result into SE[8-9].

Tracheobronchial injuries (TBI) are uncommon yet need to be addressed immediately as consequences of missing one such injury can be lethal. Mostly fibroptic bronchoscopy is performed at the earliest hour on patients with TBI. In conditions where the patient is not hypoxic TBI is suspected. Further in conditions of acute hypoxia bronchoscopy has proven to be efficient in assisting intubation as well as tube placement in correct order.[10] Tracheal bronchoscopy is also very useful in managing appropriate therapy plan for the patient like of SE. The requirement of open surgery or stent placement are relied on tracheal bronchoscopy. The present study was intended for evaluating the management techniques against TBI with SE. This would evidently assist in better and efficient way of saving lived with TBI[10,11].

MATERIALS AND METHODS

This was a retrospective study conducted in the Department of Thoracic Surgery, Sandeman Provincial Hospital Quetta from 1st January 2020 to 31st March 2021. The study was approved by ethical committee. A total of 50 patients admitted with TBI due to SE were retrospectively analyzed for their applied management strategies. All patients with injury in trachea or main stem were included in the study.TBI cases with injury penetration in cervical trachea were first intubated for stopping the cervical air leakage and then were diagnosed. Chest and spinal x-ray were the first radiological imaging conducted for diagnosis. High quality imaging was conducted to identify the separation between tracheas and or the bronchialair-column. The complete seclusion of the mainstream bronchus resulted in identifying atelectasis or collapsed lung away from helium and more towards the diaphragm. Intrathoracic-tracheal and or bronchial-injury were also identified through excessive air-leakage causing pneumothorax in patients. In cases of laryngeal injuries CT scan of upper neck and chest were conducted. Patients who were hemodynamically unstable were contraindicated for CT imaging. CT bronchography and bronchoscopy was performed in many cases for management of air leakage.Patients with ruptured trachea or bronchus identified through bronchoscopy underwent the surgical management. Initial protocol in TBI patients is either through direct-suture or through resection in addition to an end to end anastomosis. The surgical approach to the injured airway depends on its location. Acute suffocation patients went under emergency surgery. Blood-gas analysis was conducted in all patients on ventilator support. Injury mechanism, any associated injury, presenting patient symptoms, were documented. In cases where transsected-cervical trachea retracted in the mediastinum a finger was placed infront of esophagus for palpating and locating distal trachea. This was further gripped with clamps and ensuring distal-intubation by then retreating it towards cervical wound. Data was analyzed by SPSS version 24.0 software with applying chi square statistics and t -test. p value < 0.05 was considered as significant.

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RESULTS

The mean age of patients was 22.3±5.2 years. Out of the total cases 20% were young boys. Highest traffic accident cases have resulted in tracheobronchial injuries with SE followed by fall or a gunshot (Fig. 1). There were 85% males in the present study and 15% were females. The Computer topography scan showed presence of TBI with SE in patients (Fig. 2).

Conservative treatment was only applied in patient having spontaneous breathing with minimal assistance of mechanical-ventilation and has had no evidence of compromised esophageal/mediastinal (Table 2).

Sixty percent of the patients with tracheobronchial injuries had deep cervical-emphysema and pneumomediastinum. Pneumothorax development was also seen in 70% cases. Primary saturation, tracheotomy, muscle pleura flap, chest tube and ventilator support was used according to complication state (Table 2).

Table 1: Comparison of comparison and surgical TBI management

Variable	Conservative treatment <4cm (n=20)	Surgical treatment >4cm (n=30)
Recovery	15 (75%)	13 (43.3%)
Complications	4 (13.3%)	10(33.3%)
Mortality	1 (3.3%)	9(23.3%)

Table 2: Strategy for management of TBI (n=50)

Management	Gunshot & accidents (n=41)	Severe maxillofacial trauma (n=5)	Injuries of distal trachea, carina and proximal main stem bronchi (n=4)
Flexible bronchoscopy	10(24.3%)	-	-
Tracheostomy	31(75.6%)	-	-
Air way control	-	5 (100%)	-
Long endotracheal tube	-	-	4 (100%)

Fig 1: Patient categorization according to the traumatic event causing TBI

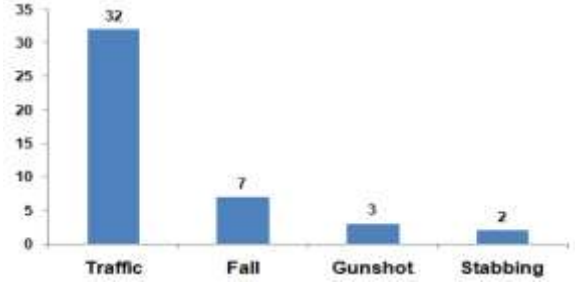
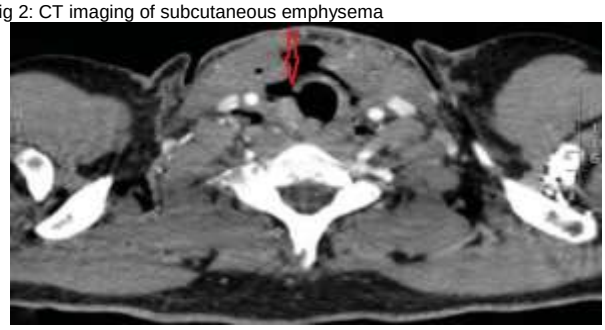


Fig 2: CT imaging of subcutaneous emphysema



DISCUSSION

Various methods are used for TBI treatment depending upon on the severity of the damage: surgical repair and conservative management (CM). No positive end-expiratory pressure (PEEP) and low tidal volumes can be used in CM because airway pressure causes perforation in trachea[12,13]. Tracheal stents (TS) is now considered a better option in management of airway obstructions and in tracheobronchial injuries[14-15]. Evidences are available to using stunts in the management of posterior wall of TI[16].

Tracheobronchial injuries can lead into cardiac arrhythmias, difficult extubation, esophageal perforation and breathing difficulties[17-19]. The proper management of the tracheobronchial injury site at an earliest time is the main management protocol. Accidental repairs can be performed by direct suturing in conditions where tracheal defect is detected during cardiothoracic surgery. In other conditions transection of tracheobronchial morphology can be repaired by formulating slide bronchoplasties so to enlarge lumen[20-22].

CONCLUSION

Conservative and surgical methods need to be opted according to the case requirement for increasing recovery rate. Timely management with surgical procedure in severe injuries is required for better recovery outcomes.

Conflict of interest: Nil

REFERENCES

1. Dixit R, George J. Subcutaneous emphysema in cavitary pulmonary tuberculosis without pneumothorax or pneumomediastinum. Lung India 2012;29(1):70-2.
2. Aghajanzadeh M, Dehnadi A, Ebrahimi H, Fallah Karkan M, Khajeh Jahromi S, Amir Maafi A, Aghajanzadeh G. Classification and management of subcutaneous emphysema: a 10-year experience. Indian J Surg 2015.
3. Kukuruza K, Aboeed A. Subcutaneous Emphysema. [Updated 2021 Jul 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021
4. Schneider T, Volz K, Dienemann H, Hoffmann H. Incidence and treatment modalities of tracheobronchial injuries in Germany. Interact Cardiovasc Thorac Surg 2009;8(5):571-6.
5. Miñambres E, Burón J, Ballesteros MA, Llorca J, Muroz P, Gonzalez-Castro A. Tracheal rupture after endotracheal intubation: a literature systematic review. Eur J Cardiothorac Surg 2009;35(6):1056-62.
6. Conti M, Pougeoise M, Wurtz A, Porte H, Fourrier F, Ramon P, et al. Management of post-intubation tracheal membrane rupture. Chest 2006;130(2):412-8.
7. Welter S. Repair of tracheobronchial injuries. Thorac Surg Clin 2014;24:41-50.
8. Chen JD, Shanmuganathan K, Mirvis SE, Killeen KL, Dutton RP. Using CT to diagnose tracheal rupture. AJR Am J Roentgenol 2001; 176(5):1273-80.
9. Welter S, Essaleh W. Management of tracheobronchial injuries. J Thorac Dis 2020;12(10):6143-51.
10. Cardillo G, Carbone L, Carleo F, Batzella S, Jacono RD, Lucantoni G, et al. Tracheal lacerations after endotracheal intubation: a proposed morphological classification to guide non-surgical treatment. Eur J Cardiothorac Surg 2010;37(3):581-7.
11. Ajai K. Malhotra, Michel B. Aboutanos, Rao Ivatury, Therese M. Diagnostic and therapeutic roles of bronchoscopy and video-assisted thoracoscopy in the management of thoracic trauma. Asensio JA, Trunkey DD. Current therapy of trauma and surgical critical care. Mosby 2008; 261-8,
12. Marchese R, Mercadante S, Paglino G, Agozzino C, Villari P, Di Giacomo G, et al. Tracheal stent to repair trachealinjury after a double-lumen intubation. Ann Thorac Surg 2012; 94(3):1001-3.
13. Dey S, Bhattacharyya P, Medhi J, Nellappa AK. Successful tracheal stent placement for central airway obstruction using dexmedetomidine and regional airway anesthesia. J Anaesthesiol Clin Pharmacol 2014;30(3):438-9.
14. Kimura M, Kuwabara Y, Ishiguro H, Tanaka T, Takeyama H. Tracheoesophageal fistula due to a damaged tracheal stent. Case Rep Surg 2014; 2014:926387
15. Shin JH, Kim SB, Kim JH. Management of tracheomediastinal fistula using a self-expanding metallic tracheal stent. Cardiovasc Intervent Radiol 2009;32:843-5.
16. Madden B, Data S, Hussain I, McAnulty G. Tracheal stenting for rupture of the posterior wall of the trachea following percutaneous tracheostomy. Monaldi Arch Chest Dis 2001;56(4):320-1.
17. Escorsell A, Pavel O, Cardenas A. Variceal bleeding study G: esophageal balloon tamponade versus esophageal stent in controlling acute refractory variceal bleeding: a multicenter randomized, controlled trial. Hepatology 2016;63:1957-67.
18. Nadler J, Stankovic N, Uber A, Homberg MJ, Sanchez LW, Wolfe RW, et al. Outcomes in variceal hemorrhage following the use of a balloon tamponade device. Am J Emerg Med 2017;35(10):1500-2.
19. Choi JY, Jo YW, Lee SS, Kim WS, Oh HW, Kim CY, et al. Outcomes of patients treated with Sengstaken-Blakemore tube for uncontrolled variceal hemorrhage. Korean J Intern Med 2018;33(4):696-704.
20. Grewal HS, Dangayach NS, Ahmad U, Ghosh S, Gildea T, Mehta AC. Treatment of tracheobronchial injuries: a contemporary review. Chest 2019; 155(3):595-604.
21. Grillo HC. Repair of tracheobronchial trauma. In: Grillo HC. Surgery of the trachea and bronchi. London: BC Decker Inc. Hamilton 2002; 631
22. Bölükbas S, Schirren J. Parenchyma-sparing bronchial sleeve resections in trauma, benign and malign diseases. Thorac Cardiovasc Surg 2010;58:32-7.