Author’s response to reviews

Title: Anesthetic Management of Tracheal Laceration from Traumatic Dislocation of The First Rib: a Case Report and Literature of the Review

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Author’s response to reviews:

Dear Editor,

Thank you very much for your constructive comments by the reviewers concerning our manuscript titled “Anesthetic Management of Tracheal Laceration from Traumatic Dislocation of The First Rib: a Case Report and Literature of the Review”. We have thoroughly considered all of the comments of the reviewers and substantially revised our manuscript. More importantly, we proposed for the first time the difficult airway management in patients with tracheobronchial lacerations. We wish to resubmit the revised manuscript for publication in BMC Anesthesiology. A point-by-point response to all of the reviewers’ comments is included below this letter.
We have tried our best to address all of the concerns raised by the reviewers. We hope that with the modifications and improvements we have made based on the reviewers’ comments and the quality of our manuscript will meet the publication standard of this journal.

Once again, thank you very much for your attention and consideration of our manuscript.

Sincerely,

Jianjun Li

Response to reviewers’ comments:

Ayse Baysal, MD (Reviewer 1):

1 Abstract: the sentence: "A 56-year-old man with no significant medical history suffered tracheal laceration secondary to the dislocation of first rib from blunt trauma to the right chest" I would state a 56 year old man with no significant medical history presented with difficulty breathing after a blunt trauma to his chest to the emergency room and was diagnosed with dislocation of the first rib and tracheal laceration after a chest tomography (CT) study.

Reply: Thank you for your careful evaluation of the manuscript and critical and valuable comment, which have helped improve the quality of our manuscript. The sentence has been revised and the detailed revision can be found on lines 6-9, page 2.
2 In abstract: "Slow induction of anesthesia while maintaining spontaneous ventilation was performed and a 5.5 mm endotracheal tube was placed under the guidance of flexible bronchoscopy." What do you mean by slow induction anesthesia, in the case report you said general anesthesia, this could have been an awake intubation with local anesthetic infiltration, please explain how you decide to perform general anesthesia and I would omit the word slow induction anesthesia in the abstract.

Reply: Thank you for raising this important issue. We apologize for the inconsistent expression in abstract and main text. In fact, we performed general anesthesia with maintaining spontaneous ventilation during induction. The detailed revision can be found on lines 11-12, page 2. Additionally, the patient was agitated and cannot cooperate with us because of chest pain and hypoxemia when he was transferred to operation room. In order to prevent larger tears caused by unintended movements during intubation, we administered general anesthesia with spontaneous ventilation rather than awake intubation with local anesthetic infiltration. The related discussion can be found on lines 1-5, page 10.

3 In the abstract: Postoperative period was reported as uneventful, I would be interested in learning about how did the pneumothorax and right chest concussion related pulmonary events resolved. You also stated that patient was discharged on postoperative day 41. Please insert the date of extubation into the abstract.

Reply: Thank you for raising this important issue. The patient was transferred to the ICU intubated after first surgery. He received elective surgical repairs of sternum fracture, multiple rib fractures and hemopneumothorax under general anesthesia on day 5 after first surgery and was extubated on postoperative day 7. The subsequent course was uneventful. Comprehensive rehabilitation was performed for 2 weeks and he was discharged home on postoperative day 41. We have added related detail about second surgery and extubation in the abstract and main text. The detailed revision can be found on lines 19-22, page 2, lines 1-3, page 3 and lines 13-21, page 7.
4 Case Discussion.

1- The preference of general anesthesia versus awake intubation and local anesthetic infiltration needs to be discussed.

Reply: Thank you for your advice, which we agree completely. Awake intubation with local anesthetic infiltration may be a safer option in many difficult airway management. However, the patient was agitated and cannot cooperate with us when he was transferred to operation room. In order to prevent larger tears caused by unintended movements during intubation, general anesthesia with spontaneous ventilation rather than an awake intubation with local anesthetic infiltration was performed. We have added related discussion. The detailed revision can be found on lines 1-5, page 10.

2- As far as I understand from the report that the ETT was easy with flexible broncoscopy please provide data regarding how you ventilate throughout the case, what was the mechanical ventilation during the case, how was it postoperatively and when was the extubation.

Reply: Thank you for raising this important issue. Initially, our patient was managed on the narcotic machine on spontaneous ventilation with fraction of inspired oxygen 100%, tidal volume 330 ml, frequency 30, SpO2 95% and PetCO2 40mmHg after anesthesia induction with a 5.5 mm endotracheal tube. Depth of anesthesia was maintained to achieve a Bispectral Index Score of 40–60. Subsequently, a 7.5mm endotracheal tube was exchanged. Once confirmed location of the endotracheal tube, cisatracurium 14 mg and fentanyl 0.15 mg were administered intravenously. The patient was managed on mechanical ventilation with interval positive pressure ventilation. The respiratory parameters were: fraction of inspired oxygen 60%, tidal volume 550 ml, frequency12, airway peak pressure 22 cm H2O, SpO2 98% and PetCO2 38 mmHg. The patient was transferred to the ICU intubated. In ICU, he was managed on the ventilator with synchronized intermittent mandatory ventilation and continuous positive airway pressure. In order to improve pulmonary function, elective surgical repairs of sternum fracture, multiple rib fractures and hemopneumothorax under general anesthesia were performed on day after first surgery and the patient was extubated on postoperative day 7. The detailed revision can be found on lines 20-22, page 6 and lines 8-18, page 7
3- In Discussion part:

I would discuss the placement of ETT into the correct position without causing a persistent pneumothorax and I found this reference:

Other important radiographic findings that are associated with tracheobronchial tears include incorrect location or overdistention of the endotracheal tube (ETT) cuff and a persistent pneumothorax that is unrelieved by appropriate placement of a thoracostomy tube. Degree of confidence

The most specific signs of tracheobronchial tears are of an appropriately placed ETT that clearly extends beyond the expected tracheal lumen and a classic fallen-lung sign. Other signs are less conclusive and usually require bronchoscopic confirmation. Tracheobronchial tears may not be visible if the tracheal mucosa remains intact or is sealed by fibrin.

Reply: Thank you for your critical and valuable comment, which have helped improve the quality of our manuscript. We have added related discussion on other important radiographic findings, especially the fallen-lung sign. The detailed revision can be found on lines 17-22, page 8 and lines 1-6, page 9.

4-I think ECMO needs further discussion.

ECMO might be a reliable tool during reconstruction of tracheal lacerations. I think what do you mean needs a better explanation because readers need to know about this option and what needs to be done for this ECMO procedure can be explained in a sentence.

Reply: Thanks for your kind suggestion, which we agree completely. We have added more explanation about ECMO in the section of discussion. The detailed revision can be found on lines 12-19, page 10.
5 It is not clear if you can not entubate, what are the other options in a difficult airway management? Please place DIFFUCULT AIRWAY MANAGEMENT diagram if necessary to explain your steps in dealing with difficult intubation in tracheal injuries.

Replay: Thank you for raising this important issue. In the patients with tracheobronchial lacerations, ventilatory management options include intubation under general anesthesia with spontaneous ventilation, awake intubation with local anesthetic infiltration, cricothyrotomy, tracheostomy, extracorporeal membrane oxygenation (ECMO), cardiopulmonary bypass and cross-field ventilation. In our patient, intubation under general anesthesia with spontaneous ventilation is a better choice compared with awake intubation with local anesthetic infiltration because our patient cannot cooperate during the intubation. A smaller endotracheal tube would be used if we can not entubate with a 5.5 mm endotracheal tube. Further, the extracorporeal membrane oxygenation (ECMO) or cardiopulmonary bypass may be our option to provide a constant and adequate oxygenation. In patients with tracheobronchial lacerations, we propose for the first time the difficult airway algorithm as a guidance tool in the Figure 5. The detailed revision can be found on lines 18-22, page 9.

6 Quality of written English Please indicate the quality of language in the manuscript: Needs some language corrections before being published

Reply: Thank you for raising this important issue. Language editing has been made by Professor Jiapeng Huang from University of Louisville of USA.

Zainab Ahmad, MD (Reviewer 2):

Review is as follows:

1. Case report seems to be interesting and amenable to publication

Reply: Thank you for your careful evaluation of the manuscript and critical and valuable comment, which have helped improve the quality of our manuscript.
2. However authors should highlight anesthetic management including preoperative stabilisation, OT preparation, induction, intraoperative management and post op care

Reply: Thank you for your kind suggestion, which we agree completely. We have highlighted our anesthetic management in the case. The detailed revision can be found on lines 11-15, page 5, lines 8-22, page 6 and lines 1-19, page 7.

3. Pls also include post op complications and condition of patient including management when patient was returned to OT

Reply: Thank you for raising this important issue. The patient was subsequently transferred to operation room from emergency department. In the operation room, He was agitated, in respiratory distress and his vital signs were: HR 108 beats/min; RR 30 breaths/min; BP 90/58 mmHg and SpO2 80%. The operation was successful and the patient was transferred to the ICU intubated. In ICU, he was managed on the ventilator with synchronized intermittent mandatory ventilation and continuous positive airway pressure. In order to improve pulmonary function, elective surgical repairs of sternum fracture, multiple rib fractures and hemopneumothorax under general anesthesia were performed on day 5 after first surgery and the patient was extubated on postoperative day 7. Comprehensive rehabilitation was done for 2 weeks. No severe postoperative complications were observed and he was discharged home on postoperative day 41. The detailed revision can be found on lines 10-13, page 6 and lines 12-21, page 7.

4. Please add tracheo brochial instead of tracheal in Line 2 and line 10 page 3

Reply: Thank you for raising this important issue. Changes have been made. The detailed revision can be found on Line 2 and 11, page 4.

5. Line no 5 and 6 not clear on page 3

Reply: Thanks for your question. Language editing has been made. The two sentences showed epidemiology of traumatic tracheobronchial lacerations. About 19% of tracheobronchial lacerations occur in the trachea only, 32% are in the left main stem bronchus only, and 47% are in the right main stem bronchus only. Tracheobronchial lacerations are the second most common causes of death and more than 75% of patients die before they arrive to the emergency department. The detailed revision can be found on lines 4-8, page 4.
6. Line 17 and 18 need clarity on why these injuries are now presenting

Reply: Thank you for raising this important issue. A blunt or penetrating laryngotracheal injury can result in acute airway obstruction and death at the scene of an accident or crime. In recent years, advances in emergency services, including better pre-hospital evacuation procedures and heightened trainings, have improved survival rates. More patients with tracheobronchial lacerations presented to the emergency department. The detailed revision can be found on lines 16-18, page 4.

7. Please also include epidemiology regarding your topic

Reply: Thank you for raising this important issue. The epidemiology information of traumatic tracheobronchial lacerations were provided in the background. The incidence was between 0.5% and 2% among patients with multiple injuries. About 19% of tracheobronchial lacerations occur in the trachea only, 32% are in the left main stem bronchus only, and 47% are in the right main stem bronchus only. Tracheobronchial lacerations are the second most common causes of death and more than 75% of patients die before they arrive to the emergency department. The detailed revision can be found on lines 1-8, page 4.

8. Pls give history of injury and mechanism of trauma.

Reply: Thank you for raising this important issue. The history has been provided in the section of case presentation. The patient sustained blunt trauma to his right chest and his first right rib is dislocated. The obvious dislocation resulted in the trachea into two parts, 5.3 mm in diameter on the left and 6.6 mm on the right. The detailed revision can be found on lines 8-11, 20-21, page 5, and lines 1 and 8-10, page 6.

9. Pls include clinical examination of patient and examination just before induction.

Reply: Thank you for raising this important issue. We have provided the clinical examination of the patient before induction. Before induction, he was agitated, respiratory distress and his vital signs were unstable: HR 108 beats/min; RR 30 breaths/min; BP 90/58 mmHg and SpO2 80%. The detailed revision can be found on lines 10-13, page 6.
10. How long after chest tube insertion patient worsened and why?

Reply: Thank you for raising this important issue. Chest tube was inserted to decompress pneumothoraces and hemopneumothorax, and breathing difficulties were alleviated. Unfortunately, rapid worsening of subcutaneous emphysema indicated continuous air leak from laceration after 3 hours. The potential reason may be larger tears caused by unintended movements in the emergency department. The detailed revision can be found on lines 1-5, page 6.

11. How was hemodynamic instability treated?

Reply: Thank you for raising this important issue. We maintain the blood pressure stable by intravenous phenylephrine throughout the case. The revision can be found on lines 13-14, page 6.

12. Pls include Figure labels

Reply: Thank you for raising this important issue. Figure labels has been provided in the revised manuscript and the detailed revision can be found on page 14.

13. Pls emphasise on implications and lesson learnt for anesthetic management

Reply: Thank you for raising this important issue. We highlighted the importance of multi-dimensional analysis of a high-resolution CT in diagnosing the tracheal laceration induced by the first rib. Flexible bronchoscopy is particularly instructive for successful difficult airway management in the urgent tracheobronchial laceration. ECMO may be a reliable tool utilized during reconstruction of tracheal lacerations. The importance of effective communication between anesthesiologists and surgeons can’t be over-emphasized in these challenging cases. The detailed revision can be found on lines 2-9, page 11.

14. Conclusions are too non specific

Reply: Thank you for raising this important issue. Changes have been made in the conclusions in abstract and discussion. The detailed revision can be found on lines 4-7, page 3 and lines 2-9, page 11.