

Peer Review File

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Review Comments

Reviewer A

Thanks for the privilege to review this comprehensive description of tracheo-bronchial injury management. I have learned some new aspects. This paper is well written, easy to understand and includes a lot of details and considerations not mentioned in other papers. I would suggest minor changes as follows:

Reply: Thank you very much for taking the time to review our work as well as for your encouraging comments and very helpful feedback! We are thankful for the changes you recommended, which do indeed improve the quality of our submission.

1. Line 70-72: please check if the percentage of TBI refer to all trauma patients or to thoracic trauma patients

Reply: You are correct. We verified the incidences mentioned, and re-worded the paragraph in question to reflect an incidence of 2 to 3 percent among patients with cervical and/or thoracic blunt or penetrating trauma and an *overall* incidence of 0.5 to 0.9 percent.

Changes in text: The relevant section should now read “Traumatic TBIs are relatively uncommon, with a incidence of 2 to 3 percent **among patients with cervical or thoracic trauma**, including patients who die at the scene, and an incidence of 0.5 to 0.9 percent among **all** patients evaluated in the trauma bay.(4,5)”

2. Line 89: 15% TBI rate when emergency intubation is performed... seems to me very high and is not mentioned in the references (11-13). Please cross check the 15% rate

Reply: You are correct. The 15 percent is indeed an error. We reviewed sources 11 through 13, and what we found is an incidence of one percent of airway injury during emergency airway procedures (and specifically during dilatational tracheostomy creation). Several authors state that the true incidence is actually unknown and

possibly higher than what is currently reported (if we include minor mucosal lacerations and lesions that do not actually require intervention), but you are absolutely correct that 15 percent is very high and incorrect.

Changes in text: We modified the text accordingly, which should now read “The incidence of these iatrogenic injuries ranges from 0.005 percent for routine single-lumen endotracheal intubation to 0.05 percent for double-lumen intubation to 0.2 percent for tracheostomy creation, and to as high at **one** percent during emergency airway procedures.(11–13)”

3. Line 413: while the repair of the trachea is described in detail including the type of suture the repair of the esophagus should be completed with the same details.

Reply: VISHNU – Thank you. We have included pertinent details of esophageal repair

Changes in text: VISHNU - 456-461 Primary repair of esophagus requires identification of the extent of mucosal injury by longitudinal esophageal myotomy. After identification and debridement, primary repair is accomplished over a 40- or 46-F Maloney bougie, the mucosal tear is repaired with interrupted 4-0 absorbable suture, and the muscularis is reapproximated with a running or interrupted 3-0 suture followed by buttress

4. Line 427: The use of Papaverin is completely new to me. Do you have any reference for this?

Reply: VISHNU – The use of papaverine is to elicit graft/pedicle intercostal muscle viability by increase in flow (augmentation of flow before and after injection) and to provide vasodilation from the vasospasm caused during the procedure. The procedure related vasoconstriction stems from the harvest itself and aberration of the graft microvasculature. Hence, this is mostly a surgeon preference rather than standard of care. Yes, there are references and please find them below. Also, would like to point out that the reference might not be specific to intercostal muscles. I have personally performed this with senior thoracic colleagues.

1. Christian T Bonde , Niels-Henrik Holstein-Rathlou, Jens J Elberg. Blood flow autoregulation in pedicle flaps. *Plast Reconstr Aesthet Surg*, 2009 Dec;62(12):1671-6. doi: 10.1016/j.bjps.2008.07.039

2. Einar Stranden. Methods for the evaluation of vascular reconstruction. *Heart Drug* 2004;4:201-217 DOI:101159/000082191
3. Berkane Y, Mocquard C, Aillet S, Watier É, Bertheuil N, Menez T. How to Secure Pedicled Flaps Using Perioperative Indocyanine Green Angiography: A Prospective Study about 10 Cases. *World J Surg Surgical Res.* 2021; 4: 1319
4. Thesis done by Fulvio Lorenzetti in BLOOD FLOW IN FREE MICROVASCULAR FLAPS (<https://helda.helsinki.fi/bitstream/handle/10138/23054/bloodflo.pdf;jsessionid=59C71436C9702CABC6F0022CCEB27752?sequence=2>) – The thesis is based off the following original publication by the same author
Fulvio Lorenzetti, Asko Salmi, Juhani Ahovuo, Erkki Tukiainen, Sirpa Asko-Seljavaara Postoperative changes in blood flow in free muscle flaps: a prospective study. *Microsurgery* 1999;4:196-199.

Fulvio Lorenzetti, Sinikka Suominen, Erkki Tukiainen, Hannu Kuokkanen, Erkki Suominen, Jyrki Vuola, Sirpa Asko-Seljavaara. Evaluation of blood flow in free microvascular flaps. *Journal of Reconstructive Microsurgery* 2001;17:163-167.

Fulvio Lorenzetti, Hannu Kuokkanen, Karl von Smitten, Sirpa Asko-Seljavaara. Intraoperative evaluation of blood flow in the internal mammary or thoracodorsal artery as a recipient vessel for a free TRAM flap. *Annals of Plastic Surgery* 2001; 46: ·

Fulvio Lorenzetti, Juhani Ahovuo, Sinikka Suominen, Asko Salmi, Sirpa Asko-Seljavaara. Colour Doppler ultrasound evaluation of haemodynamic changes in free TRAM flaps and their donor sites. *Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery* (in press, 2001).

Fulvio Lorenzetti, Erkki Tukiainen, Anders Albäck, Milla Kallio, Sirpa Asko-Seljavaara, Mauri Lepäntalo. Blood flow in a pedal bypass combined with a free muscle flap. *European Journal of Vascular and Endovascular Surgery* (in press, 2001)

Changes in text: VISHNU – No changes.

5. Line 444: "after" or "post", not both...

Otherwise this overview is impressive.

Reply: Apologies for the typo. We removed “post”.

Changes in text: The text should now read “In the first month after trauma, missed injuries of the trachea or bronchi lead to formation of granulation tissue and possibly strictures.”

Reviewer B

First of all, I would like to thank you for the opportunity to review the narrative review of Antonescu and colleagues concerning traumatic injuries to the trachea and bronchi.

Reply: Thank you very much for taking the time to review our work and for your constructive feedback! The changes you recommended do indeed improve our submission.

Introduction

1. The introduction is relatively short and does not include references to important pieces of literature concerning TBIs. In addition, what is the exact rationale for the aim? Definition

Reply: Thank you for your comment. You are right, the introduction is indeed short, but intentionally so. We felt that we were presenting the relevant background rationale and significance as well as associated relevant references in the subsequent sections labelled “Definition” and “Incidence and importance”. As for the rationale of this review, we were invited to contribute a narrative review of the evidence, incorporating our own experience, opinions, and perspective. The aim of our review was therefore to outline the clinical importance of these injuries, the diagnostic approach, and management options.

Changes in text: N/A

2. TBI as abbreviation has already been introduced.

Reply: You are correct. We removed the redundancy under the paragraph “Definition”.

Changes in text: This should now read as “Anatomically, TBIs encompass the larynx, trachea, primary carina, and mainstem bronchi to where they bifurcate into lobar or secondary bronchi.”

After reading the first part of the manuscript, major concerns were raised. In the abstract the authors stated that they systematically searched the PubMed database, however, this does not return in the methods section. More concerning, the entire methods section, as well as a discussion section is missing. The manuscript reads as if a short introduction is followed by a summary of the available literature that is subjectively selected by the authors. Objectivity should be demonstrated by the methods section. We would recommend the authors to rewrite their article according to the PRISMA guidelines. After rewriting we would be happy to re-review the article as it may add to the currently available literature.

Reply: We apologize for the confusion created by the abstract. This was indeed meant to be a *narrative* review, as requested, not a systematic review. As such, we have modified the abstract to reflect this. As to the remainder of the text, our understanding was that we should share up-to-date literature on the topic as well as our knowledge and perspective, which we felt we should do through two sections on the diagnosis and management of tracheobronchial injuries.

Changes in text: The “Methods” section of the abstract should now read as follows “*Methods:* The published literature on the diagnosis and management of traumatic airway injuries was searched through PubMed. Additional references were identified from the bibliography of relevant publications identified. The evidence was then summarized in a narrative fashion, incorporating the authors’ knowledge, experience, and perspective on the topic.”

Reviewer C

Thank you for the opportunity to review the manuscript “Traumatic injuries to the Trachea and Bronchi: A Narrative Review” for Mediastinum.

The authors present a good overview of the mechanism of injury and the management of traumatic injuries of trachea.

The explanation of the mechanism of injury and signs and symptoms are very well written and comprehensible. The description of management of these patients is according to the latest literature. Indications for conservative and surgical management are comprehensible and specialities like risk of stenosis because of granulation tissue and esophagoscopy in case of penetrating tracheal injury are mentioned.

The selection of Figures is very good. All interesting aspects are present.

Reply: Thank you very much for your comments and constructive feedback! We made the modifications you recommended, and are confident that they have improved the quality of our work. Thank you!

There are some annotations:

- The authors mention “%” in line 83 and 116. Unfortunately it is not clear from which cohort the % are calculated.

Reply: You are right, this was not clear from the way we wrote it. We referred back to the citations and modified the body of the text to be more specific and clearer.

Changes in text: “Traumatic TBIs are relatively uncommon, with a incidence of 2 to 3 percent among patients with cervical or thoracic trauma, including patients who die at the scene, and an incidence of 0.5 to 0.9 percent among all patients evaluated in the trauma bay.(4,5)” and “Penetrating injuries are more common than blunt ones, with relative incidences of 4.5 and 0.5 to 2 percent of all penetrating and blunt trauma respectively.(1)”

- Mediastinal emphysema might also lead to vocal changes.

Reply: Great point, thank you! We added this useful comment.

Changes in text: The relevant sentence should now read “An interesting variant of subcutaneous emphysema is mediastinal emphysema, which can theoretically be identified by auscultating for Hamman’s sign (defined as a mediastinal crunching sound synchronous with the patient’s heartbeat) and can also lead to vocal changes in the non-intubated patient.(20)”

- Authors might mention, that most tracheal injuries should be managed in high volume centers.

Reply: You bring up an excellent point, and we added a sentence to this effect under

“Indications for intervention”.

Changes in text: This should read as “Given the infrequent occurrence of TBIs and the multidisciplinary approach to diagnosis and management as well as the potential morbidity and mortality associated with missed injuries and complications from repair, these are best managed in high-volume centers.”

Grammar and syntax are fine and the manuscript is easily readable.

In summary I recommend the manuscript for publication in Mediastinum.

Reply: Thank you again so much for your very positive and constructive feedback!!

We very much appreciate your time and input!!

Reviewer D

I have carefully reviewed your interesting paper. Please, consider the following issues:

Reply: Thank you so much for your feedback and recommendations to improve our work! We appreciate your time and comments, and have made changes according to these, which indeed have improved the quality of our submission.

1. Although the authors note that the manuscript does not address iatrogenic tracheal injury, as this work is the review type, it is advisable to provide more detailed information on this type of complication.

Reply: You make a very good point. We therefore added a paragraph to that effect in the section on “Mechanism of injury”.

Changes in text: We made the following changes to address your point: Under “Incidence and importance”, we rephrased “The remainder of this review will not specifically address **inhalational and/or** chemical TBIs and will **focus on** injuries found within the thoracic cavity.” And under “Mechanism of injury”, we added a full paragraph that reads “**As previously mentioned, iatrogenic tracheal injuries usually result either from endotracheal intubation or inadvertent overinflation of the endotracheal tube balloon.**(10) The former usually presents as a longitudinal tear of the membranous trachea, both in its cervical and thoracic location, whereas the latter generally affects the proximal trachea primarily.(11) Iatrogenic trauma can also occur at the time of tracheostomy creation, whether this is done in an open fashion or

percutaneously, with laceration of the posterior membranous trachea.(10) Other instances when TBIs can occur include procedures such as rigid bronchoscopy, removal of endobronchial stents, and dilatation of bronchial strictures.(11) Finally, TBI can also occur at the time of esophageal surgery, due to proximity of the airway and esophagus. Risk factors that have been identified for this type of injury include older age, presence of a proximal tumor, presence of squamous cell carcinoma, and neoadjuvant chemoradiation.(8) The management of iatrogenic TBIs follows the same principles outlined below with the exception that it typically requires either operative or interventional techniques with stent placement.(11,20–22) Iatrogenic injuries are often preventable, and appropriate training as well as meticulous technique are paramount to avoid the sequelae of the injury itself and of the ensuing intervention.(23)”

2. It would be interesting to present images of bronchoscopy.

Reply: We unfortunately do not have any good bronchoscopic images to contribute. We have each reviewed our own patients as well as medical records at our institution, and have not found appropriate endoscopic images.

Changes in text: N/A

3. Page 10 line 306-308: "In the patient who is already intubated, it may be necessary to withdraw the endotracheal tube to allow adequate visualization of a more proximal injury." - It's controversial and I think this method can lead to a worsening of the patient's condition. Additional information is required.

Reply: You are correct that this is certainly a risky move not to be attempted by inexperienced operators. We did however find several publications mentioning this as a means of identifying a proximal tracheal injury, but of course this should be done by experienced hands in a controlled setting such as the OR. We made changes to the relevant section in the text to reflect this and updated our references.

Changes in text: We added this explanatory sentence “In the patient who is already intubated, it may be necessary to withdraw the endotracheal tube to allow adequate visualization of a more proximal injury.(4,25,26) This remains somewhat controversial and should only be performed in a controlled setting such as the operating room, over a fiberoptic bronchoscope to maintain access, by physicians experienced in advanced airway techniques.”

4. It would be acceptable for me as a reader to summarize the information at the end of the manuscript in the form of a conclusion.

Reply: This is a great suggestion!

Changes in text: This is the conclusion we added “In this narrative review, we defined the entity of traumatic injury to the trachea and bronchi and highlighted its importance despite its relatively low incidence. Mechanisms of injury, including penetrating, blunt, and iatrogenic, were presented. The clinical presentation, including but not limited to voice changes, subcutaneous emphysema, and stridor was also introduced and evidence-based recommendations for appropriate imaging modalities were made. Most patients will get a CXR in the trauma bay, however direct visualization of the injury with a bronchoscope as well as cross-sectional imaging (CT) to identify associated injuries remain a necessity in the approach to the patient with suspected TBI. Management can occasionally be conservative, but is generally either operative or interventional. Operative repair follows the of key principles of thoughtful choice of incision and exposure, conservative debridement to healthy mucosa, creation of a tension-free anastomosis, preservation of the blood supply, interposition of healthy tissue in the face of combined injuries, and creation of a tracheostomy. Penetrating injuries and those recognized and repaired promptly have more favorable outcomes, underscoring the importance of a streamlined approach and management in a center with experience in such complex injuries.”