



Severe tracheal tear due to endotracheal intubation: a case report

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Background: Tracheobronchial injury is a life-threatening condition with a considerable missed diagnosis rate. The larger the tracheal lesion the more difficult it is to heal. Both conservative and non-conservative treatments are used to treat tracheal injury. This article reports a clinical scenario in which conservative treatment was successfully used to manage a severe tracheal tear.

Case Description: We present the case of a 63-year-old male with a cough for over a year who suffered from a 4-cm tracheobronchial injury (level IIIA, Cardillo classification) after endotracheal intubation for right lower bilobectomy. This injury showed full-layer tissue tearing of the tracheal wall, without esophageal injury or mediastinitis. The tracheal tear was discovered during the bronchoscopy examination on postoperative day one. The patient's vital signs were almost stable, including body temperature, blood pressure, heart rate, and oxygen saturation. We adopted a conservative treatment approach, including oxygen administration, painkillers, broad-spectrum antibiotics therapy, and nutritional support. Using this treatment, the 4-cm long tracheal rupture healed within four weeks. No tracheal tear was found in the bronchoscopy re-examination. The computed tomography scan showed that the mediastinal and subcutaneous emphysema had disappeared entirely. The patient fully recovered well without any complaints of discomfort.

Conclusions: Conservative treatment provides a valuable strategy for treating patients with massive tracheal lesions, representing an effective approach, especially in older patients with underlying diseases whose conditions are not suitable for operative treatments.

Keywords: Tracheal tear; conservative management; case report

Submitted Aug 08, 2024. Accepted for publication Sep 14, 2024. Published online Oct 28, 2024.

doi: 10.21037/jtd-24-1288

View this article at: <https://dx.doi.org/10.21037/jtd-24-1288>

Introduction

Tracheal and bronchial injuries can be divided into spontaneous, traumatic, and iatrogenic injuries. The tracheal lesion (TL) after tracheal intubation introduced in this case is a particular type of iatrogenic injury that can occur in about 0.005% of all intubations, up to 0.19% if a

double-lumen tube is used (1).

There are two main treatment strategies for tracheal and bronchial injuries: conservative management and surgical treatment (2). The latter has been historically considered the gold-standard treatment (3), while the conservative approach has been described in selected cases without exceeding 50% in the reported series (4). Endoscopic

treatment of these lesions is becoming increasingly common, as reported in the literature, being considered a non-conservative strategy on par with surgery (5).

As TLs are potentially life-threatening scenarios, some scholars have suggested that surgery should be performed as soon as possible (6). On the contrary, conservative treatment should be adopted as the initial approach in spontaneously breathing patients with minor TLs with milder symptoms and signs (7).

Conservative medical management at the time of diagnosis includes oxygen therapy, painkillers and antitussive agents, broad-spectrum antibiotic therapy, anti-inflammatory aerosol therapy, and appropriate nutritional support (4). Other strategies consist of intubation with a well-matched endotracheal tube with its cuff advanced distally to the lesion, excluding the overpressure ventilation on the damaged wall (8).

Controversy remains in deciding which treatment is more suitable depending on the range of tracheobronchial injury that should be treated surgically or conservatively, especially in those lesions between 2 and 4 cm.

In previously reported cases of iatrogenic TL reaching 2 cm in length, surgical repair or the placement of stents has generally been applied (9). The decision can be better determined now based on anatomy, clinical status,

comorbidities, and on-site expertise (10). Another important decision criterion for further treatment is represented by the tracheal wall depth of the injury. According to Cardillo's classification (11), a conservative treatment could be adopted initially in patients with tracheal injury comprised between level I and IIIA.

Due to its etiology, the incidence rate of TL can be underestimated, and the best evidence-based management practice needs clarification. We describe here the conservative treatment of a 4-cm-long post-intubation TL with mediastinal emphysema, with a full recovery outcome. We present this case in accordance with the CARE reporting checklist (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-24-1288/rc>).

Case presentation

A 63-year-old male undergoing thoracic surgery suffered a mid-lower tracheal tearing complication secondary to orotracheal intubation. The patient suffered from coughing for over a year. The preoperative computed tomography (CT) scan revealed atelectasis in the middle and lower lobes of the right lung (Video S1). Preoperative bronchoscopy revealed purulent secretion overflowing from the middle lobe bronchus (Figure S1). The patient had a history of tuberculosis, which resulted in obstruction of the middle bronchus and the destruction of the middle and right lower lung lobes.

Following the indication for pulmonary surgery, pure oxygen was administered via a face mask for 5 minutes to wash out the nitrogen in order to proceed to anesthesia induction. A double-lumen tracheal catheter was then positioned with a visual laryngoscope exposure. However, the manoeuvre resulted in challenging progression of the tube after sliding it through the glottis. Other two experienced anesthesiologists were also invited to participate in intubation. After multiple attempts, the tracheal tube was finally placed. A bronchoscopy was performed to confirm the correct positioning of the tracheal tube.

During surgical hemostasis after a right lower bilobectomy completion, the onset of mediastinal emphysema was noted, promptly detached with anterior mediastinotomy and then drained with a dedicated tube to the mediastinal site. Used an electrotonne to remove a portion of the mediastinal pleura. The mediastinal tissue was exposed to the chest cavity. The mediastinal gas also flowed into the chest cavity. The thoracic drainage tube was placed near the mediastinum. Finally, the gas in the

Highlight box

Key findings

- A severe tracheal tear was cured using conservative treatment strategies.

What is known, and what is new?

- The incidence rate of iatrogenic tracheal injury is low, and there are no clear guidelines for treatment. In the literature, tracheal tears less than 2 cm diagnosed by bronchoscopy could be treated conservatively, surgically, or endoscopically.
- However, the mortality rate of patients with tracheal tear exceeding 2 cm remains high, and the choice of treatment measures is particularly crucial.

What is the implication, and what should change now?

- Conservative treatment is a feasible treatment strategy when a severe tracheal rupture occurs, especially when the patient's general condition is fragile or the patient cannot tolerate surgery for exceeding risks.
- More cases of tracheal tears need to be studied. Explore the indications and contraindications for conservative treatment of tracheal tears, as well as the timing for switching from conservative treatment to surgical treatment.

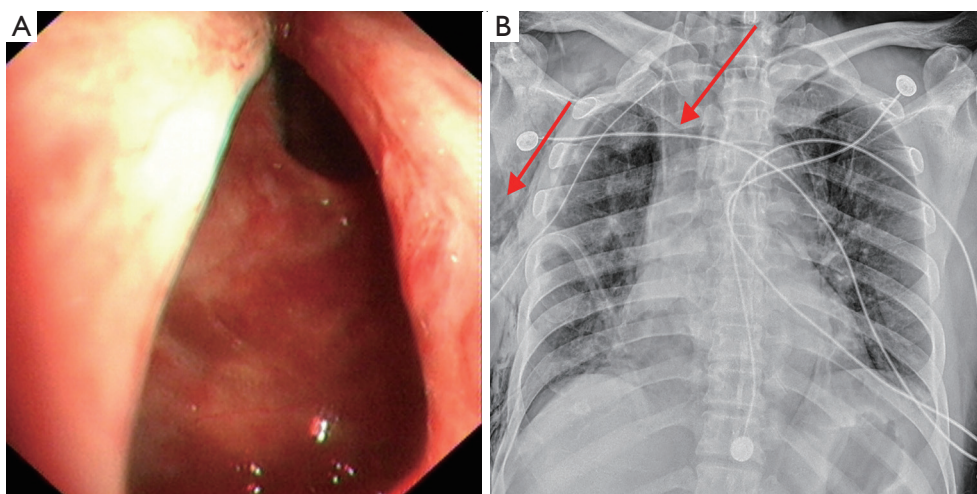


Figure 1 Postoperative day 1: a massive tracheal tear on the membranous part is confirmed by bronchoscopic evaluation (A) following a chest X-ray examination describing a highly suspicious mediastinal emphysema (B). The red arrows indicated subcutaneous emphysema and mediastinal emphysema. The mediastinum becomes wider.

mediastinum was expelled from the body through the thoracic drainage tube. Intraoperative bronchoscopy showed no apparent TL. The limited mobilization of the double-lumen tracheal tube probably kept the injury hidden by the cuff. The anesthesiologist continued to use a double-lumen tube for ventilation until the end of the surgery. After the surgery, the anesthesiologist released the balloon, removed the double-lumen catheter, and replaced it with a single-lumen endotracheal tube.

The patient's symptoms and signs of discomfort, such as chest oppression, chest pain, and air leakage from the chest drainage tube, appeared one day after surgery. Therefore, the patient was transferred to the intensive care unit for further postoperative observation and monitoring.

On postoperative day (POD) 1, the tracheal catheter was removed. The patient was able to breathe spontaneously, experiencing a physiologic cough reflex without severe chest tightness. Due to the widespread subcutaneous emphysema, a prompt bronchoscopy examination was then performed. Pneumothorax and esophageal rupture can also cause mediastinal emphysema. The examination revealed a 4-cm tear in the membranous wall of the middle and lower segments of the trachea (*Figure 1A*). The patient's vital signs remained stable, and the mediastinal to chest drain tube collected effectively the air leak. In addition, the chest X-ray showed no pleural space or effusion in the chest cavity (*Figure 1B*). Considering the very recent lung surgery, conservative treatment strategies were considered

as a primary approach in this clinical context. Within the first week after surgery, blood test and liver and kidney function were monitored every two to three days. One week later, blood tests have been weekly performed. Postoperative sputum culture indicated normal bacterial flora and a broad-spectrum cephalosporin antibiotics were administered. To promote the tear healing, nutrients or necessary substances such as fat emulsion, amino acids, glucose, and human serum albumin were used. On POD 1, the patient was discharged from the ventilator and continued to receive oxygen therapy through a nasal cannula or face mask. The patient's symptoms and signs were gradually alleviated through broad-spectrum antibiotic therapy, fluid replacement, nutritional support, and airway management. On POD 10, bronchoscopy and chest CT showed significant tracheal tear narrowing, the gradual healing of the subcutaneous emphysema, and pulmonary inflammation (*Figure 2* and *Video 1*).

A new bronchoscopic and CT scan assessment on POD 28 showed the complete re-epithelialization of the tracheal tear, with consensual reabsorption of the mediastinal and subcutaneous emphysema (*Figure 3* and *Video 2*). The patient had no complaints of discomfort. We reported a timeline chart summarizing the conservative treatment, and recovery outcomes (*Figure 4*).

Six months later, the patient underwent follow-up and re-examination at a local hospital. The chest CT showed no mediastinal emphysema, pneumothorax, or thoracic

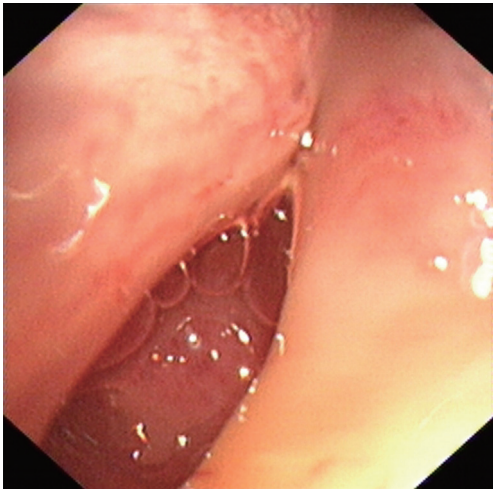


Figure 2 Postoperative day 10: the ongoing healing is showed by bronchoscopy monitoring, with clear signs of re-epithelialization of the membranous wall tear.

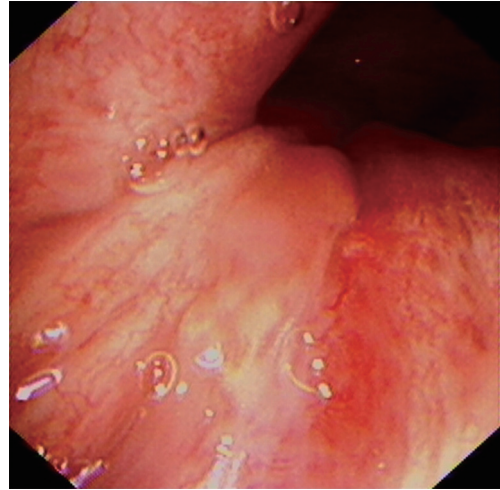
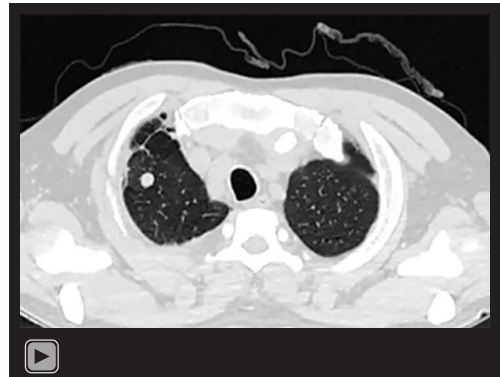


Figure 3 Postoperative day 28: a residual scar on the membranous part of the tracheal wall confirms the full recovery of the postintubation injury. The mediastinal and subcutaneous emphysema had almost disappeared in the computed tomography scan (*Video 2*).



Video 1 The chest CT scan was used to investigate mediastinal emphysema on postoperative day 10, showing a concrete improvement of the radiological scenario.



Video 2 After 28 days post-surgery, the chest CT scan showed the full absorption of mediastinal emphysema.

infection in the chest cavity.

Ethical statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is

available for review by the editorial office of this journal.

International Multidisciplinary Team (iMDT) discussion

Post-intubation tracheal injury is a rare complication in general anesthesia (9). If not promptly treated, it often leads to severe complications and even death. Known risk factors include female sex, increasing age of patients undergoing surgery, overweight and short height, the type of intubation,

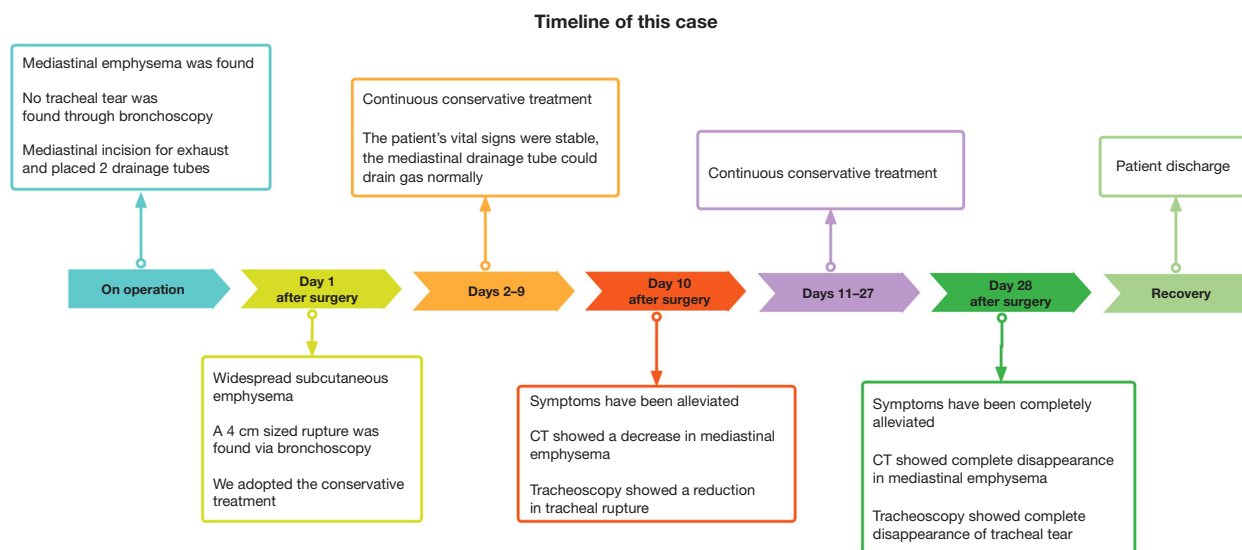


Figure 4 Case timeline. A tracheal lesion occurred during anesthesia intubation. No rupture was found during the intraoperative bronchoscopy examination. On the first day after extubating, an extensive emphysema occurred. Tracheobronchoscopy confirmed a 4-cm tracheal tear. The patient's vital signs remained stable. A conservative treatment was primarily chosen. After re-examination on the 10th and 28th day after surgery, the patient's symptoms gradually improved, and the tracheal injury gradually healed as confirmed by bronchoscopy evaluations. Finally, the patient was discharged smoothly on the 28th day after surgery. CT, computed tomography.

and local weakness of the tracheal membrane (12). The tracheal laceration that occurred at the Shanghai Pulmonary Hospital of China was possibly related to mechanical stress due to the difficult airways which the anesthesiologist had to face. Repeated attempts at tracheal intubation should ultimately lead to tracheal injury. In our case report, the minimal delay between diagnosis and procedure allows us to consider any mechanism other than direct injury in patients undergoing intubation as unlikely.

We also endorse the concept that a lesion caused by a tracheal tube usually occurs in the cervicothoracic membranous wall. In contrast, damage caused by sudden tracheal tube movements due to coughing or neck movements occurs more frequently in the distal membranous wall next to the carina (4).

Tracheobronchoscopy and CT scans are the primary and most accurate methods for establishing a diagnosis and analyzing the severity of the patient's condition. The appropriate treatment and approach are also chosen using these two methods. The corresponding symptoms and signs of patients (e.g., chest tightness, shortness of breath, difficulty breathing, neck and subcutaneous emphysema, pneumothorax requiring drainage through catheters, and continuous large air leakage from drainage tubes) should also be taken seriously (9,13). When a TL is confirmed,

anesthesiologists and thoracic surgeons should quickly evaluate an individualized treatment regimen, avoiding delay to limit the risk of complications such as mediastinitis and pneumothorax (PNX) (14).

Injuries discovered during open or thoracoscopic surgery are repaired simultaneously (14). Although time to diagnosis does not appear to influence a nonnegligible intrinsic mortality rate, delayed surgical repair of the tear doubles the risk of death in patients whose tracheal rupture is detected after surgery (15). In patients with severe comorbidities, surgical closure by open-chest surgery has shown a mortality rate of up to 71% (3). Comorbidities lead to increased mortality rate in patients. Collaboration among multiple teams is required, including doctors, nurses, patients and their families. Put in more time and energy to face the challenges during the recovery process.

Therefore, over the past 20 years, nonsurgical management of TLs has been suggested for selected patients under the following circumstances: stable vital signs, easy achievement of adequate respiratory functional status under mechanical or spontaneous ventilation, short ruptures, absence of sepsis, and delayed diagnosis (16). Other suggested conservative treatment criteria include the absence of esophageal lesions, and non-worsening pneumomediastinum or subcutaneous emphysema (17).

When mechanical ventilation is required because of acute respiratory failure, coma, or multi-organ failure, conservative management involves placement of the tracheal tube distal to the TL, continuous monitoring of cuff pressure, and insertion of an intercostal drain if necessary. This strategy is effective in patients with tears in the cervical part of the trachea. In mechanically ventilated patients with tears near the carina, it is not easy to position the distal cuff to the tracheal rupture and avoid dislocation of the tube tip in the mediastinum. Hence, the tube should be placed near the carina under bronchoscopy with continuous cuff pressure monitoring for a limited period (18).

Conservative treatment in spontaneously breathing patients mainly involves measures such as oxygen inhalation, pain relief, anti-inflammatory and antibiotic therapy, nutritional support, and neck or chest drainage (19). On the other hand, non-conservative treatment measures mainly fall into two categories: surgical treatment and endoscopic treatment. The surgical approach is used to repair the trachea rupture through a neck or chest incision for a broad exposure of the lesion to be corrected (20). Endoscopic treatment has been one of the focuses of thoracic surgeons in recent years. It is often reported in case reports aiming to reduce or eliminate tracheal ruptures and the incidence of invasive surgery (21). The main categories of endoscopic treatment include suturing ruptures under rigid bronchoscopy, applying glue, and placing stents (22). Despite the variety of operative measures, some patients still die after receiving treatment.

Another unclear aspect that plays a crucial role in deciding the correct approach is the length range of the TL that should be treated operatively or conservatively, especially for lesions between 2 and 4 cm (10). The conservative approach is independent of the length of the defect, as reported in the most extensive case reports in the literature (4,8,16,23). In contrast, the depth of transmural involvement and the morphology of the lesion should represent a more precise staging system to aid decision-making. As described by Cardillo *et al.*, the conservative approach can be considered a safe treatment in cases from level I to IIIA (11).

When a tracheal rupture (length: 4 cm) occurred after intubation, we chose a conservative treatment for the following reasons. During the surgery, the surgeon discovered mediastinal emphysema and performed a mediastinal incision for ventilation. No obvious abnormalities were found during the bronchoscopy

examination, which might have been because the tracheal cuff was covering the incision. The patient's postoperative vital signs were stable, he had no severe breathing difficulties, and his blood pressure, heart rate, breathing, and pulse oxygen saturation fell within the normal ranges. During the subsequent treatment period, the patient gradually improved and his symptoms gradually alleviated. After nearly a month of conservative treatment and several bronchoscopy and imaging examinations, the patient recovered completely. The patient complained of no discomfort. During the treatment process, we focused on some worsening indices. Inflammation, respiratory exchanges, and increased mediastinal and subcutaneous emphysema were considered indicators that the treatment strategies needed to be changed.

Discussion among doctors from the Shanghai Pulmonary Hospital Affiliated Tongji University

The treatment process of this patient involved intraoperative tracheal management by anesthesiologists, postoperative supervision by intensive care physicians, as well as perioperative management and intraoperative operations in thoracic surgery. So a multidisciplinary discussion was conducted among anesthesiologists, intensive care physicians and thoracic surgeons.

Department of Anesthesiology

The tracheal tear in this patient was caused by iatrogenic procedures. Anesthesiologists should fully evaluate the patient's age, gender, height, weight, underlying disease history, etc. Select individualized anesthesia methods based on the patient's condition. Reduce anesthesia risks and ensure the safety of surgical patients. This patient has a history of tuberculosis. Preoperative bronchoscopy examination indicates inflammation in the trachea, which is a vulnerable factor. Relevant risks should be fully considered before surgery. Pay attention to intraoperative monitoring, detect damaged trachea as early as possible, and receive treatment timely.

Intensive care physicians

After the surgery, the patient was immediately transferred to the intensive care unit for further monitoring and treatment. On the first day after surgery, the patient's tracheal tube was removed, and the patient developed extensive subcutaneous emphysema immediately. After bronchoscopy examination,

a 4-cm long tear was found in the trachea. After diagnosis of tracheal tear, timely consultation and discussion should be held with the surgeon and anesthesiologist. The choice of treatment plays a particularly critical role in the prognosis of patients. Pay attention to postoperative vital signs, especially ensuring the stability of the respiratory and circulatory systems. Monitor the infection indicators of patients and provide nutritional support to promote healing. Monitor and manage various indicators of patients, and communicate with surgeons timely.

Department of Thoracic Surgery

The patient had endotracheal inflammation before surgery. If respiratory preparation could be provided before surgery, it may be beneficial for the prognosis. During the operation, mediastinal emphysema was discovered. A portion of the pleura tissue was removed and a thoracic drainage tube was placed around it. The gas in the mediastinum was rapidly drained. After thorough evaluation, the patient chose conservative treatment. Through multidisciplinary collaboration, the patient ultimately achieved a good prognosis. During the treatment process of this patient, there are some issues worth pondering and discussing, which are worth further clinical exploration.

Based on the prevention and treatment strategies adopted for this patient, several questions arise

Question 1: What are the risk factors for tracheal rupture caused by intubation, and how can it be prevented?

Expert opinion 1: Dr. Johannes Schweipert

The main reason for injury to the posterior wall of the trachea during both intubation and dilatation tracheotomy is the use of too much force. To prevent this, the best possible view should always be maintained during intubation and only the appropriate force should be used. If in doubt, a video laryngoscope or a bronchoscope must be used. Other reasons may be that the inlay is withdrawn too late or the tube is moved with blocked cuff. Only careful work helps here.

Expert opinion 2: Dr. Paolo A. Ferrari

The main risk arises during intubation in emergencies. Other factors such as mouth opening limitations, laryngotracheal anatomical abnormalities, inadequate curarization, and poor operator skill increase the risk of tracheobronchial injury caused by intubation. The

bronchoscopic examination adds essential information for the anesthesiologist to plan the intubation strategy. In addition, bronchoscopy can be a valuable aid in assisted intubation, either with single or double lumen, in cases of difficult intubation to reduce the risk of tracheal injury.

Expert opinion 3: Dr. Alberto Salvicchi

The available data on tracheal injuries after intubation are relatively small and probably underestimated. It is difficult to prevent a tracheal lacerations or to define specific risk factors. Perhaps the most important aspect is knowing how to recognize this type of trauma so that you can treat it as quickly as possible in the best way possible.

Question 2: If conservative treatment and surgical treatment are both effective treatment options for tracheal rupture, which one should be chosen?

Expert opinion 1: Dr. Johannes Schweipert

The treatment of tracheal injuries is stage-adapted according to Cardillo classification (11). Superficial injuries (levels I and II) are usually treated conservatively. In the case of deeper injuries, such as in this case with herniation of mediastinal tissue and/or mediastinal emphysema (level IIIA), a conservative or interventional treatment attempt can be made if the patient's clinical condition allows it. In the case of injury to the esophagus and/or mediastinitis (level IIIB), surgical treatment must be performed.

Expert opinion 2: Dr. Paolo A. Ferrari

We must consider the extent of injury, clinical condition, and symptomatology. We prefer surgical repair in patients with TLs >4 cm in length associated with esophageal exposure or injury. On the other hand, if the surgical risk exceeds, we start with a conservative approach characterized by strict clinical and endoscopic monitoring, reserving the surgery for only clinical and tracheal injury worsening within 72 hours of monitoring. In our experience, TLs involving the membranous portion, even >4 cm long, without severe mediastinal involvement, benefit from a conservative approach from the beginning.

Expert opinion 3: Dr. Alberto Salvicchi

In a spontaneously breathing or stable patient on non-invasive ventilation, conservative management is recommended based on data from the literature. Surgical repair is mandatory if mechanical ventilation is required or if there is persistent bleeding. Surgical repair was considered the gold standard, mainly in high-grade lesions [IIIA–IIIB, Cardillo classification (11)].

Question 3: In recent years, under bronchoscopy, sutures have been administered, stents have been placed, and biological glue has been used. Can these minimally invasive treatment options replace thoracoscopy or open-chest surgery?

Expert opinion 1: Dr. Johannes Schweipert

Although the methods mentioned have expanded the treatment options and reduced invasiveness, the question of whether they can completely replace operations must be answered in the negative. Deep injuries with mediastinitis and/or involving neighboring organs will continue to require surgical treatment.

Expert opinion 2: Dr. Paolo A. Ferrari

Endoscopic techniques should be considered an implementation. Therefore, it is always good to consider them in the overall treatment strategy. Multidisciplinary discussion on a case-by-case basis is necessary to design the most appropriate course of treatment, reserving the most appropriate endoscopic approach at the most appropriate time. These techniques can limit the need for surgical intervention on the trachea or give additional time for required surgery if the patient is not in the condition to face an up-front operation.

Expert opinion 3: Dr. Alberto Salvicchi

The management of tracheal injuries is still a matter of debate and definitive guidelines are lacking. Certainly, the endoscopic approach is an alternative to surgery or could be a bridge to surgery in unstable patients waiting for the patient to stabilize. These new approaches are a real alternative, but surgery is always the gold standard in the most complex cases. In the absence of definitive guidelines, it is difficult to replace surgery.

Question 4: During conservative treatment, when do other treatment options, such as surgical treatment, need to be implemented?

Expert opinion 1: Dr. Johannes Schweipert

Due to the high mortality of mediastinitis, a broad range of antibiotic therapy and close monitoring of clinical symptoms and inflammatory parameters are required.

If signs of mediastinitis appear, surgery must be performed immediately.

In addition, increasing mediastinal emphysema is an indication for surgery. Thoracic drainage without opening the mediastinum is often not effective enough, so a thoroscopic incision of the mediastinum or a suprajugular drainage may be useful.

Expert opinion 2: Dr. Paolo A. Ferrari

Any clinical change suggestive of a complication is considered the warning light to activate the switch from conservative to operative surgical treatment. These include worsening indices of inflammation and respiratory exchanges, radiologic evidence of mediastinitis, increased mediastinal and subcutaneous emphysema, and delayed re-epithelialization of the TL.

Expert opinion 3: Dr. Alberto Salvicchi

This is a good question, but it is difficult to find a definitive answer as there is little literature and endoscopic procedures are relatively new. We need more time to be able to give a definitive answer.

Conclusions

Due to the lack of guidelines, tracheobronchial laceration is still a problematic clinical entity to manage. In case of a tracheal tear, an up-front conservative approach may be suitable with constant monitoring and appropriate surgical counselling, even for a tracheal rupture exceeding 2 cm in length. Further clinical evidence is needed to prove the efficacy of conservative treatment in treating severe tracheal ruptures.

Acknowledgments

Funding: The study received funding from the China Anhui Province Humanities and Social Science Foundation Group Project (No. SK2021ZD0071).

Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://jtd.amegroups.com/article/view/10.21037/jtd-24-1288/rc>

Peer Review File: Available at <https://jtd.amegroups.com/article/view/10.21037/jtd-24-1288/prf>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://jtd.amegroups.com/article/view/10.21037/jtd-24-1288/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related

to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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References

- Misak VB, Beraković AP, Vukusić I, et al. Postintubation tracheal injuries--case series and literature review. *Acta Clin Croat* 2012;51:467-71.
- Miñambres E, Burón J, Ballesteros MA, et al. Tracheal rupture after endotracheal intubation: a literature systematic review. *Eur J Cardiothorac Surg* 2009;35:1056-62.
- Hofmann HS, Rettig G, Radke J, et al. Iatrogenic ruptures of the tracheobronchial tree. *Eur J Cardiothorac Surg* 2002;21:649-52.
- Jougou J, Ballester M, Choukroun E, et al. Conservative treatment for postintubation tracheobronchial rupture. *Ann Thorac Surg* 2000;69:216-20.
- Vedovati S, Consonni F, Nacoti M, et al. Severe postintubation tracheobronchial rupture. *Paediatr Anaesth* 2018;28:471-3.
- Nyberg HJ, Muto K. Acoustic tracheal rupture provides insights into larval mosquito respiration. *Sci Rep* 2020;10:2378.
- Jorge N, Costa L, Teixeira S, et al. Tracheal Rupture After Trauma: A Successful Conservative Management. *Cureus* 2022;14:e32681.
- Cherchi R, Sarais S, Pinna-Susnik M, et al. Conservative Treatment in Tracheobronchial Injuries—An Institutional Report. *Surgeries* 2021;2:237-43.
- Passera E, Orlandi R, Calderoni M, et al. Post-intubation iatrogenic tracheobronchial injuries: The state of art. *Front Surg* 2023;10:1125997.
- Grewal HS, Dangayach NS, Ahmad U, et al. Treatment of Tracheobronchial Injuries: A Contemporary Review. *Chest* 2019;155:595-604.
- Cardillo G, Carbone L, Carleo F, et al. Tracheal lacerations after endotracheal intubation: a proposed morphological classification to guide non-surgical treatment. *Eur J Cardiothorac Surg* 2010;37:581-7.
- Vlahou A, Ampatzidou F, Bimpa K, et al. Conservative Management of Large Post-Intubation Tracheal Laceration. *Ann Card Anaesth* 2024;27:85-8.
- Marquette CH, Bocquillon N, Roumilhac D, et al. Conservative treatment of tracheal rupture. *J Thorac Cardiovasc Surg* 1999;117:399-401.
- Alçı E, Sahin AG. Management of membranous tracheal rupture due to the endotracheal tube cuff during thyroid surgery. *Ulus Travma Acil Cerrahi Derg* 2024;30:65-7.
- Schneider T, Volz K, Dienemann H, et al. Incidence and treatment modalities of tracheobronchial injuries in Germany. *Interact Cardiovasc Thorac Surg* 2009;8:571-6.
- Conti M, Pougeoise M, Wurtz A, et al. Management of postintubation tracheobronchial ruptures. *Chest* 2006;130:412-8.
- Baldino G, Iannello D, Venuto R, et al. Case of tracheal rupture after endotracheal intubation: clinical risk management and medico-legal considerations. *Clin Ter* 2024;175:203-7.
- Deja M, Menk M, Heidenhain C, et al. Strategies for diagnosis and treatment of iatrogenic tracheal ruptures. *Minerva Anesthesiol* 2011;77:1155-66.
- Carbognani P, Bobbio A, Cattelani L, et al. Management of postintubation membranous tracheal rupture. *Ann Thorac Surg* 2004;77:406-9.
- Mussi A, Ambrogi MC, Menconi G, et al. Surgical approaches to membranous tracheal wall lacerations. *J Thorac Cardiovasc Surg* 2000;120:115-8.
- Aydin S, Oz G, Dumanli A, et al. Management of life-threatening tracheal emergencies. *Ann Ital Chir* 2022;93:626-32.
- Herrmann D, Volmerig J, Al-Turki A, et al. Does less surgical trauma result in better outcome in management of iatrogenic tracheobronchial laceration? *J Thorac Dis*

- 2019;11:4772-81.
23. Gómez-Caro Andrés A, Moradiellos Díez FJ, Ausín Herrero P, et al. Successful conservative management

in iatrogenic tracheobronchial injury. *Ann Thorac Surg* 2005;79:1872-8.

Cite this article as: Tao Z, Xu D, Wan Z, Schweipert J, Ferrari PA, Salvicchi A, Guo L, Zhang W, Jiang L. Severe tracheal tear due to endotracheal intubation: a case report. *J Thorac Dis* 2024;16(10):7211-7220. doi: 10.21037/jtd-24-1288