DELAYED TRACHEAL PERFORATION POST TOTAL THYROIDECTOMY

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ABSTRACT Delayed tracheal perforation is a rare occurrence post thyroidectomy. We present a 72-year-old female patient that underwent elective total thyroidectomy and right upper parathyroidectomy, with bilateral central lymph node dissection and modified radical neck dissection. The post-operative period was complicated by high-risk premorbid status and multiple failed extubations, in addition to ischaemic tracheal areas visualised on the bronchoscopy on postoperative day (POD) 8, with subsequent computerised tomography (CT) scan showing anterior neck collections and perforation. A tracheal perforation involving the anterolateral wall (2nd and 3rd rings) was repaired surgically, followed by a tracheostomy. Suspicion of tracheal injuries should always be considered if the patient fails to liberate from the mechanical ventilation post-operatively, warranting prompt conservative and/or surgical management. Potential devascularisation, secondary to diathermy-induced injury and pressure exerted by endotracheal tube cuff onto already weakened/friable trachea, should be considered probable aetiological factors.

KEYWORDS Total thyroidectomy, Tracheal injury, Tracheal perforation, Tracheostomy

Introduction

Thyroidectomy is a common low-risk surgical procedure where complications, though rare (3-5%) [1-3], can include: vocal cord palsy or paralysis caused by laryngeal nerve injury, hypocalcaemia, hypoparathyroidism, haematoma, wound infection and tracheal injury [1-5]. Identifiable intra-operative injuries, relatively easy to manage, mainly occur in the less vascularised Berry ligament or are related to diathermy/cautery [3]. Tracheal rupture as a post-operative thyroidectomy complication is a rare event, occurring in less than 0.06% of cases [1-3], manifesting up to four weeks after surgery [2,4,5,7], with less than twenty cases reported worldwide [1]. It is an airway emergency with potentially long-term consequences; however, consensus regarding injury mechanism is unclear in the few cases reported [6,7].

We reviewed a case of tracheal necrosis with subsequent rupture, which presented 21 days following total thyroidectomy.

Case report

A 72-year-old female, affected by a very extensive right thyroid lobe medullary carcinoma with lymph node metastasis in the supraclavicular area, underwent elective total thyroidectomy and right upper parathyroidectomy, with bilateral central lymph node dissection and modified radical neck dissection, where intra-operatively blood loss was negligible. There was no visible evidence of surgical or thermal-induced tracheal wall damage. The patient has a background of type 2 diabetes mellitus; hypertension; severe chronic obstructive pulmonary disease (COPD; GOLD 3 FEV1 48% predicted), requiring chronic use of steroids; sleep apnoea (using non-invasive ventilation on a twice weekly average, for 2-3 hours maximum); right side goitre; heart failure; obesity (Body Mass Index (BMI) 38), active heavy smoker (>15 cigarettes daily for 50 years) and an overall poor baseline function (Medical Research Council dyspnoea grade 3).

The immediate postoperative period was complicated by a

DOI:10.5455/IJMRCR.172-1683327531
First Received: May 5, 2023
Accepted: May 27, 2023
Associate Editor: Ivan Inkov (BG)
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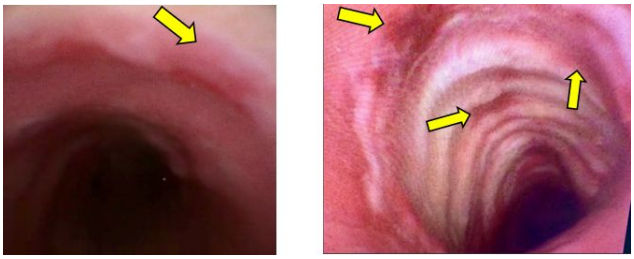
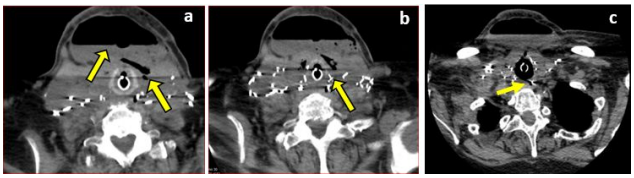
failed extubation in the recovery unit, attributed to her sleep apnoea/COPD and prolonged intra-operative period (7 hours), warranting intensive care (ICU) admission. During her ICU stay, she had three failed extubations on POD3, POD7 and POD15, all followed by immediate stridor and hypoxaemia, with subsequent re-intubation under direct laryngoscopy. On POD8, bronchoscopy and video laryngoscopy were performed, where ischaemic and patchy necrotic areas were identified on the 2nd and 3rd anterolateral tracheal rings (Figure 1), with a degree of laryngeal and arytenoid cartilage oedema.

Figure 1: POD8 bronchoscopy showing various necrotic patchy areas on the anterior/lateral tracheal wall.



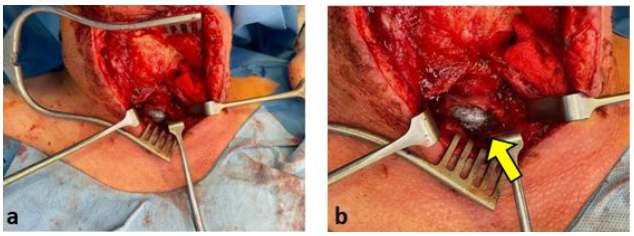
Physical examination on POD21 revealed an increased anterior neck swelling, highly suggestive of surgical wound infection and collection, with neck and chest CT scan showing extensive anterior collection within the surgical site and air/fluid level suspicious of potential communication with upper aero-digestive tract, though no surgical emphysema evidence was seen (Figure 2a; 2b; 2c).

Figure 2a & 2b: CT image showing extensive anterior collection extending from below the mandible level to the thoracic inlet with air/fluid level; **Figure 2c:** Suspicion of potential aero-digestive communication



The decision was made to surgically review the patient, with emergency neck exploration, on POD22, revealing a 2 cm-wide irregular tracheal defect on the 2nd and 3rd rings of the right anterolateral tracheal wall. Wound collection (gas and pus between the strap muscles and skin) was evacuated, revealing necrotic tissue and tracheomalacia (Figure 3a & 3b).

Figure 3a & 3b: Image showing anterior tracheal defect post seroma drainage, with endotracheal tube cuff visible



The initial surgical exploration suggested iatrogenic injury caused by endotracheal tube (ETT) balloon pressure on a necrotic tracheal wall. Perforation and scarred tissue were identified, and the trachea was further repaired on POD33, followed by surgical tracheostomy. Subsequent CT imaging demonstrated improved resolution of the collection with some residual soft tissue thickening within the subcutaneous tissue of the anterior neck and minimal tracheal wall stenosis.

The patient was subsequently weaned from mechanical ventilation and decannulated on POD58; however, within 24 hours, a new tracheostomy re-insertion was required due to respiratory distress and stridor. A repeat bronchoscopy revealed that the cause of obstruction was not attributable to tracheal defects but to mucous plugging. Video fluoroscopy was performed on POD63; despite showing a degree of dysphasia, reduced laryngeal elevation, and epiglottis deflection, the patient was deemed safe for oral intake and successfully decannulated on POD86. The patient was discharged from ICU on POD93 and from the hospital on POD99, reporting some degree of breathing difficulty and neck tightness, with shoulder and back pain limiting her mobility.

Discussion

Tracheal perforation post-total thyroidectomy is a rare and unusual complication with a presentation that can be immediate (usually intra-operative and repaired immediately) or delayed, where its development can vary from 4 to 40 days [2-7], and a median time of 8 days [3], however very few cases are reported [2,6,7]. Precipitating risk factors described in the literature consider surgical and non-surgical elements. Non-surgical factors identified are female gender (52%) [1,2,4,5]; thyrotoxic goitre [2,4,5]; previous radiotherapy (47%)[1]; prolonged/multiple intubations with high endotracheal cuff pressure [1,2,4,5]; postoperative period uncontrolled cough [2,4,5]. Contributing surgical factors include the extent of surgical time and dissection involved [2,5]; excessive bleeding during surgery [4]; postoperative infection (26%) [1,2]; diathermy/cautery use (47%) causing further tracheal trauma [1,4,5] and possible injury to the inferior thyroid artery lateral branches (main vascular supply to the upper tracheal segment) [6,7]. Vascular variations of the inferior thyroid artery could also contribute to intra-operative iatrogenic vascular injury [4-7].

Unlike other case reports, where isolated factors were described to explain the delayed tracheal injury, in this particular patient, the signs of delayed tracheal perforation showed on physical examination and confirmed by CT scan on POD21, could be attributed to both patient characteristics, the surgical procedure itself and postoperative period. Some factors described in the literature are present in our case, such as female gender, goitre, high BMI and respiratory pathology (COPD and sleep apnoea). Additional precipitating risk factors include surgical and mechanical injury. A lengthy surgical procedure, the cervical and mediastinal lymph node dissection during thyroidectomy, and a possible excessive diathermy use could have led to tracheal wall devascularisation, disrupting the blood supply to the inferior thyroid artery lateral branches, resulting in ischaemia and necrosis to the upper segment of the trachea [6,7] which may not be noticed immediately. Mechanical trauma from prolonged ETT cuff pressure exertion intra-operatively and multiple re-intubations during ICU stay induced ischaemia and worsened tracheal wall necrosis, later confirmed by bronchoscopy and surgical findings. The anterior neck collection, a consequence of necrotic debris and localised haematoma, was

another causative factor for devascularisation injury, also described in the literature [1, 5-7], adding to tracheal wall necrosis and perforation.

Management can be conservative with follow-up bronchoscopies (32%), surgical (42%), or a mix of conservative and surgical management (initially conservative, then followed by surgery) (26%) [1,6,7]. Our patient's initial management was conservative, although surgical exploration was performed as she failed to thrive, with a patent anterolateral tracheal wall necrosis and perforation. Our comprehensive literature review revealed no unified approach regarding managing devascularisation injury related to surgical or mechanical factors [1,2,5-7]; in our patient decision was made to withhold the insertion of a tracheostomy tube. Instead, ETT was positioned with the cuff distally to the perforation and followed by definitive management in a specialist centre, where the anterior and lower tracheal margins were repaired and a tracheostomy performed. The patient was decannulated on POD99 and discharged home, with no major changes to her pre-admission respiratory dysfunction (GOLD 3 FEV1 40% predicted).

Conclusion

Though a rare occurrence, in our patient, the tracheal rupture appears to have been precipitated by a triad of patient-related, surgical and mechanical factors (throughout the peri and post-operative period). Pre-morbid status, prolonged intra-operative period, potential diathermy injury (involving the inferior thyroid artery), multiple ETT re-insertions, and post-operatively haematoma led to a delayed tracheal rupture. The immediate post-operative period should include a neck CT scan to identify unnoticed injuries, as this is the gold standard [1]. Clinicians should know that this event may occur up to a month post-procedure. Its management should be standardised, and a multidisciplinary specialist centre should provide aggressive post-operative follow-up.

Conflict of Interest

The authors declare no conflict or competing interests.

Funding

The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

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