

## Clinical Record

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# Delayed extensive surgical emphysema after Valsalva manoeuvre post Eustachian tuboplasty

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## Abstract

**Objective.** This paper reports a case of balloon Eustachian tuboplasty with delayed presentation of extensive surgical emphysema.

**Methods.** This is a clinical case report with a review of literature.

**Results.** Eustachian tube dysfunction is a functional disorder that results in inadequate middle-ear ventilation, causing aural fullness and tinnitus. A 36-year-old male presented with the sudden onset of an isolated, painful, left-sided neck swelling. The patient underwent balloon Eustachian tuboplasty, which was uneventful, but subsequently developed a sudden onset of isolated left-sided neck swelling on the 5th post-operative day during Valsalva manoeuvre. Neck examination revealed extensive crepitus on the left side of the neck. Examination findings were confirmed by imaging. The patient was conservatively managed and subsequently discharged home.

**Conclusion.** Balloon Eustachian tuboplasty is a safe procedure; however, extra care must be taken to avoid possible complications. Patients should be counselled against Valsalva manoeuvre and heavy weightlifting. They also should be instructed to sneeze with an open mouth and consider the use of stool softeners.

## Introduction

Eustachian tube dysfunction is a functional disorder of the Eustachian tube that results in inadequate middle-ear ventilation, causing aural fullness and tinnitus. In long-standing cases, Eustachian tube dysfunction also can lead to serious otitis media, tympanic membrane retraction and eventually cholesteatoma.<sup>1</sup> Eustachian tube dysfunction is estimated to affect around 1 per cent of adults.<sup>2,3</sup>

Current treatment modalities for Eustachian tube dysfunction, which include pharmacological agents, mechanical devices and nasal surgery, can be ineffective.<sup>1,3</sup> Treatment may entail multiple insertions of ventilation tubes in patients with chronic Eustachian tube dysfunction, leading to complications such as tympanosclerosis, chronic perforation and cholesteatoma.<sup>4</sup>

In the last decade, a lot of work has been conducted and published on balloon Eustachian tuboplasty.<sup>5</sup> In 2019, the National Institute for Health and Care Excellence (NICE) also included balloon Eustachian tuboplasty as a treatment for Eustachian tube chronic dysfunction in a selected group of patients.<sup>6</sup> The NICE aims to improve Eustachian tuboplasty compliance and middle-ear ventilation. The proposed mechanisms of balloon Eustachian tuboplasty include mechanical dilatation of the cartilaginous Eustachian tube and the initiation of histopathological changes to the mucosa that can alter the inflammatory process.<sup>7</sup>

However, balloon Eustachian tuboplasty is still a comparatively new procedure, and its use is not widespread. Thus, balloon Eustachian tuboplasty needs to be verified in terms of its technique, efficacy and possible complications. Although balloon Eustachian tuboplasty complications are mostly minor in nature and are uncommon, it is crucial to document any unexpected major complications, for better understanding for both the patients and surgeons.

Here, we report a rare case of balloon Eustachian tuboplasty with delayed presentation of extensive surgical emphysema and a tract following the lateral pharyngeal wall, which occurred immediately after the Valsalva manoeuvre.

## Case presentation

A 36-year-old male presented to the emergency department with the sudden onset of isolated left-sided neck swelling associated with pain. He denied any history of dysphagia, shortness of breath, erythema, stridor or dyspnoea. There was no prior history of ear infections or ENT surgery. Upon further inquiry, the patient reported he had undergone balloon Eustachian tuboplasty 5 days earlier, in another, distant hospital. The procedure was uneventful, and he returned home the same day. However, on post-operative day 5, while he was performing a regular Valsalva manoeuvre, he suddenly felt a squeak and subsequently air travelling down

his neck from the nasopharynx. Following that, he noticed a painful neck swelling along with crepitus.

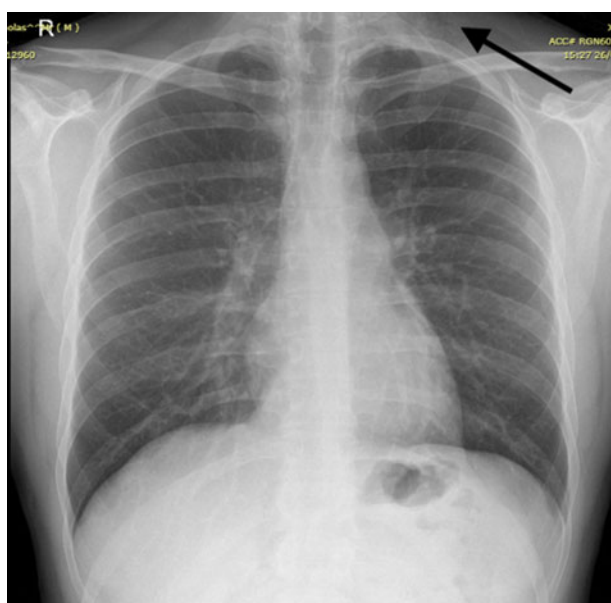
A comprehensive ENT examination revealed a normal ear including pre-auricular and post-auricular examination. Neck examination showed surgical emphysema at levels II and III on the left side of the neck, which was tender on palpation. Flexible nasendoscopy revealed left-sided mild congested nasal mucosa with a left-sided dilated Eustachian tube opening compared to the right side. It was normally opened with deglutition. No congestion or haemorrhage was observed in the post-nasal space. The rest of the endoscopic examination was unremarkable.

Chest X-ray showed air bubbles in the left-sided neck area (Fig. 1). A computed tomography scan, which confirmed the chest X-ray findings, showed extensive surgical emphysema and a tract following the lateral pharyngeal wall (Fig. 2). The case was discussed with the head and neck radiologist who confirmed that this swelling was arising from the left Eustachian tube and was not a false passage. The absence of a false passage confirmed that the procedure had been performed correctly. In addition, the radiologist commented that the large air collection at the site of the left-sided Eustachian tube corresponded to the site of rupture on the anterior, with air tracking through the parapharyngeal, masticator and prevertebral spaces to the superior mediastinum, as reported. Contralateral spread of surgical emphysema through these spaces was also present.

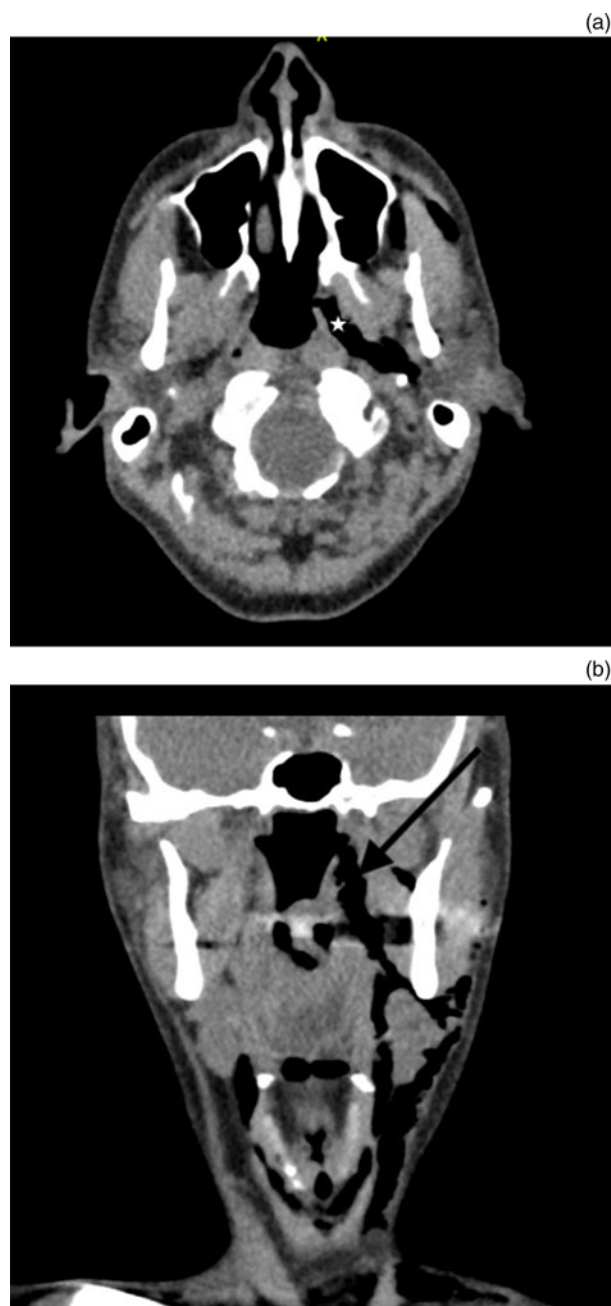
The patient was admitted to the ENT department for conservative management. He was kept nil by mouth, and advised not to blow his nose or cough. The following day, he was feeling better and was discharged home after 2 days of conservative management. As his usual residence was located some distance from the hospital, the patient was followed up over the telephone. He reported no further problems and subsequently was discharged.

## Discussion

Eustachian tuboplasty is a relatively safe procedure, with a risk of major complications of less than 1 per cent,<sup>8,9</sup> although



**Figure 1.** Chest X-ray showed air bubbles in the left-sided neck area (indicated by arrow). R = right



**Figure 2.** (a) Axial computed tomography (CT) scan showing extensive surgical emphysema and a tract following the lateral pharyngeal wall (see star). (b) Coronal CT scan (reconstructed in a plane parallel to Eustachian tuboplasty) showing the passage of the airway from the site of Eustachian tuboplasty to the neck (indicated by arrow).

adverse events have been reported (e.g. nose bleeds, pain, patulous Eustachian tube, soft tissue emphysema, hypoglossal paresis and transient dysesthesia of the tongue). The most common risk is failure of the procedure.<sup>9</sup> We also found two reported cases of pneumomediastinum; both cases were also managed conservatively.<sup>10,11</sup> Very recently, our anaesthesia colleagues from South Korea reported a case of transient asystole. Our colleagues thought this occurred because of stimulation of the vagal or glossopharyngeal nerve, thus triggering the trigemino-cardiac reflex. Fortunately, the condition was transient; nevertheless, it is advisable to build up pressure in the balloon slowly.<sup>12</sup>

Like others, surgical emphysema has been mentioned as a frequent complication in the literature, but most cases reflect minor mucosal tears. Most of the cases were reported within

3 days. They were either related to repeat procedures, or post-operative Valsalva manoeuvre or heavy weightlifting.<sup>9,13</sup> Consequently, most of the review articles have suggested avoiding the Valsalva manoeuvre in the immediate post-operative period.<sup>10,11</sup> A similar situation occurred in our case – the patient was not advised to avoid Valsalva manoeuvres, rather he thought a Valsalva manoeuvre was acceptable if he experienced a feeling of obstruction, which consequently resulted in this complication. Controversy exists in this regard and some clinicians will recommend Valsalva manoeuvre in the immediate post-operative period.<sup>14</sup> Our colleagues from Scotland have suggested that the symptom control rate is better in those groups who perform Valsalva manoeuvre post balloon Eustachian tuboplasty as compared to those who do not.<sup>14</sup>

- Eustachian tube dysfunction needs treatment, which includes pharmacological agents, mechanical devices and nasal surgery
- In the last decade, much work has been undertaken and published on balloon Eustachian tuboplasty
- However, balloon Eustachian tuboplasty is a comparatively new procedure and still needs wide evaluation, especially in the UK
- Complications associated with balloon Eustachian tuboplasty are usually minor, and there is little evidence for or guidance regarding major complications
- This case report highlights an important complication of balloon Eustachian tuboplasty, demonstrating the need for clear post-operative plans to prevent certain complications
- Patients should be counselled against Valsalva manoeuvre and heavy weightlifting, and instructed to sneeze open-mouthed and consider stool softener use

Unlike previously published cases, our patient presented with extensive surgical emphysema on the 5th post-operative day while he was performing the Valsalva manoeuvre. Fortunately, the mediastinum was not involved. As the procedure was conducted in another, distant hospital, the exact type and brand of the balloon, and the specific procedural technique remained unknown. We feel it might have been useful to know how long the balloon was inflated for and whether there were any failed attempts during the catheter insertion.

As in other cases, our patient was admitted to the ENT department for conservative management. Cervicofacial and mediastinal emphysema is usually self-limiting. However, in certain circumstances, it can lead to severe soft tissue infections, and even lead to mediastinitis and sepsis.<sup>15</sup> A study on balloon Eustachian tuboplasty catheter tips found a wide range of bacterial species, including the normal flora of pharyngeal mucosa (e.g. *Corynebacterium*, *Staphylococcus hominis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Proteus mirabilis*, *Escherichia coli*, *Streptococcus pyogenes* and *Klebsiella oxytoca*).<sup>16</sup> Our patient's swab findings do suggest the potential risk of bacterial infection in the sterile peri-tubal tissues and soft tissue compartments of the head, neck and mediastinum. Infection can intercommunicate freely, especially in cases of rupture of the mucosal layer, as suspected in cases of cervicofacial and mediastinal emphysema following balloon Eustachian tuboplasty.<sup>17</sup> Hence, the use of broad-spectrum antibiotics covering both Gram-positive and Gram-negative bacteria seems essential in the event of complications. We used amoxicillin with clavulanic acid in our case.

Although balloon Eustachian tuboplasty is a safe procedure, complications may go unreported. Our case highlights an important complication of balloon Eustachian tuboplasty. Skevas *et al.* conducted a study in which 10 patients had post-operative cervicofacial emphysema, but pneumomediastinum

developed in only 3 of them.<sup>17</sup> In that study, the post-operative emphysema rate was 0.27 per cent. The authors recommended avoiding the Valsalva manoeuvre for 2–6 days post-operatively, and all patients were managed conservatively without any serious signs or symptoms.<sup>17</sup>

Similarly, Luukkainen *et al.* conducted a systemic review of five studies with complication rates of 0.3–21 per cent.<sup>18</sup> Howard *et al.* concluded that balloon Eustachian tuboplasty was a relatively safe intervention, with an overall complication rate of 4.7 per cent in a paediatric population.<sup>19</sup> Although numerous studies have been published on the efficacy and outcome of balloon Eustachian tuboplasty, our literature search indicates that there is paucity of literature regarding the precise rates of possible major complications. Hence, we suggest that further research is required in this area.

## Conclusion

This paper presents a rare case of extensive surgical emphysema and a tract following the lateral pharyngeal wall after tubal dilatation, which was most likely caused by a Valsalva manoeuvre. Balloon Eustachian tuboplasty is deemed a safe procedure; however, extra care must be taken to reduce possible complications. Surgical emphysema and pneumomediastinum should always be discussed during the consenting process. Valsalva manoeuvre should be avoided for two weeks post-operatively. Patients should be counselled against performing the Valsalva manoeuvre, participating in heavy weightlifting or straining. Additionally, patients should be instructed to sneeze with an open mouth, and to consider the use of stool softeners in case of constipation, in the immediate post-operative period.

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