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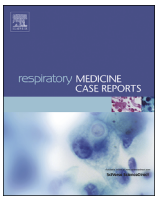

Case Report

A swollen face and neck after dental surgery: Think of subcutaneous emphysema and pneumomediastinum

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ABSTRACT

Pneumomediastinum and subcutaneous emphysema are defined as the pathological presence of free air in the mediastinum or subcutaneous tissue, respectively. In the majority of cases, pneumomediastinum is secondary to an iatrogenic cause, but has rarely been described after a routine dental extraction. This condition is generally self-limiting, but major complications can occur, such as mediastinitis, which is more frequently associated with iatrogenic pneumomediastinum. To highlight the importance of including this presumably underdiagnosed complication in the differential diagnosis, we present a case of a 50-year-old man with dysphagia, facial pain and swollen face and neck following a dental extraction.

1. Introduction

Pneumomediastinum and subcutaneous emphysema, defined as the presence of free air in the mediastinum or subcutaneous tissue, respectively, can occur spontaneously (in the absence of any underlying disease), or due to a secondary cause. Secondary pneumomediastinum can be further subdivided into traumatic, non-traumatic and iatrogenic causes. The latter is considered the most frequent cause of a pneumomediastinum [1,2]. In the majority of cases, this is a complication due to abdominal operations, head and neck surgery, dental surgery, intubation, mechanical ventilation, endoscopic procedures, pleural cavity instrumentation, central vascular access procedures and chest operations. However, it has also been described as a rare complication following a routine dental extraction [2–5]. It is assumed that this complication is underdiagnosed. Firstly, because of underreporting due to a possible asymptomatic course of the disease. Secondly due to a lack of attribution of the general symptoms, such as dyspnoea, chest pain or cough, to a possible complication after routine dental procedures, such as root canal treatment, filling therapy or dental extraction. Since life-threatening complications can emerge from subcutaneous emphysema extending into the mediastinum, it is important to recognize the symptoms and clinical signs and to raise awareness that it can develop after different dental treatments. To highlight the importance of including this presumably underdiagnosed complication in the differential diagnosis, we present a case of pneumomediastinum and subcutaneous emphysema, which developed following a second molar extraction with an air-turbine handpiece [2,5,7].

2. Case presentation

A 50-year-old man, without any relevant past medical history, presented at the emergency department with dysphagia, facial pain and swelling of the face and neck. These symptoms began earlier that day after a planned dental extraction of the second molar of the right lower quadrant. Due to peri-procedural difficulties, an air turbine dental drill was required to extract the damaged tooth. The

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patient was not intubated in order to perform the procedure and no Valsalva manoeuvre was performed. There were no immediate post-procedural complications and the patient did not complain of dyspnoea, cough or chest pain.

At presentation at the emergency department the arterial blood pressure was 124/70 mmHg with a regular heart rate of 88 beats per minute, oxygen saturation at room air of 98 % and a body temperature of 36.8 °C. Physical examination revealed swelling of the right cheek and the anterior neck up to the sternocleidomastoid muscles and just distal of the clavicles bilaterally. Palpation demonstrated crepitus in this area. An oropharyngeal inspection was normal with stitches in the area of the extraction site. The remaining physical examination, including lung auscultation, was normal.

Laboratory findings showed a normal white blood cell count with a discrete left shift, in the absence of other elevated inflammatory markers. A computed tomography (CT) scan of the chest revealed extensive subcutaneous emphysema ranging from the mandible, more pronounced on the right side, extending in the cervical subcutaneous tissue bilaterally, up to the supraclavicular region on both sides and along the anterior thoracic wall. Additionally, a pneumomediastinum was identified, with the pathological presence of free air mainly in the anterior mediastinum (Fig. 1).

The patient was admitted for observation and received prophylactic broad spectrum antibiotics (amoxicillin/clavulanic acid). The following day the patient could be discharged in good general condition. Red flag symptoms and signs such as fever and progressive dyspnoea or dysphagia were absent.

Follow-up via outpatient clinic was organised one week later with a chest X-ray. The patient did not develop fever or dyspnoea and the symptoms of dysphagia were no longer present. On physical examination, there was no residual swelling visible and no palpable crepitus. A follow-up chest X-ray revealed a favourable evolution with only minimal remaining subcutaneous emphysema above the right clavicle (Fig. 2).

3. Discussion

Pneumomediastinum is defined as the pathological presence of free air in the mediastinum. In the majority of cases, pneumomediastinum is secondary to an iatrogenic cause. Rarely, it can occur as a complication following dental extraction. A review of the literature, from 1973 until August 2023, reveals a total of 44 reported cases of pneumomediastinum following a single dental extraction,

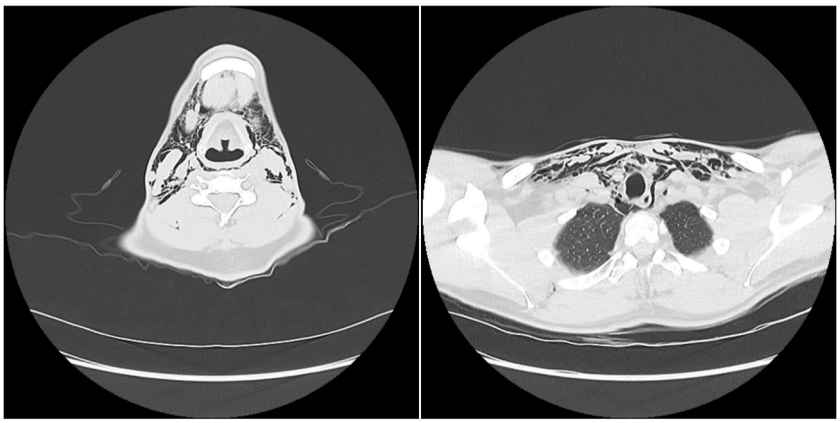

Fig. 1. Computed tomography (CT) thorax illustrating the extensive subcutaneous emphysema and anterior pneumomediastinum.

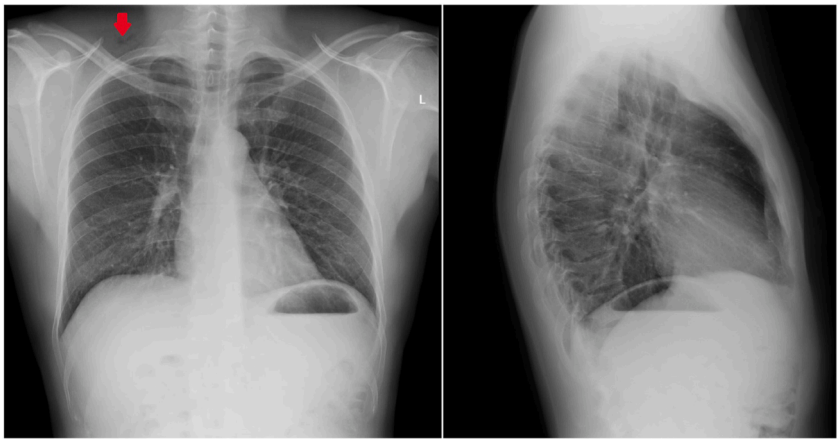

Fig. 2. Chest X-ray demonstrating remaining subcutaneous emphysema above the right clavicle (red arrow).

usually resulting from the use of high-speed dental drills, which is designed for cutting teeth and uses air or air and water to cool the dental bur [1,5–12]. The mandibular molars are more frequently involved, which is not only supported by the presented case, but also by 21 of the 33 cases (63.6 %) reported by Spille et al. [2,5]. In particular the removal of the second and third molar from the lower jaw seems to be the main reason for development of mediastinal emphysema. This is due to their closer anatomical relationship with head and neck deep spaces. The roots of the second and third mandibular molars are in connection with the submandibular space. Therefore, air can diffuse from the submandibular space to the parapharyngeal space and subsequently to the retropharyngeal space, which is believed to be the main route of communication between the mouth and the mediastinum [1,5–8,12].

The main presenting symptoms comprise of shortness of breath, cough, chest pain and dysphagia and may occur within minutes to hours or even days after dental procedures. Crepitus over the cheek and neck is the most important clinical sign to differentiate subcutaneous emphysema from other diagnoses, which can raise the suspicion for other complications such as pressure on the orbit or nerve damage. However, when the subcutaneous emphysema is extending to the thorax it can cause possible life-threatening complications, such as airway obstruction, pneumomediastinum, pneumothorax or pneumopericardium. Isolated subcutaneous emphysema is generally painless, but if it is accompanied by dyspnoea, chest pain or dysphagia it should raise awareness for the possibility of a pneumomediastinum [2,5,7,8,12].

The diagnosis can be made by detailed history, clinical examination including palpable crepitus and radiologic imaging such as chest X-ray or CT scan. However, it is generally underdiagnosed due to its frequently asymptomatic course and attribution of the relatively common presenting complaints of dyspnoea, cough and chest pain, to a musculoskeletal or other etiology, as well as a lack of recognition on chest X-ray. Additionally, a contributing factor is the lack of awareness that these symptoms may arise secondary to a complication following an everyday dental treatment, such as root canal treatment, filling therapy or, as pointed out in the above described case, a dental extraction [1,4,5,7].

The differential diagnosis of subcutaneous emphysema and soft tissue swelling following dental procedures should include allergic reactions, hematoma, cellulitis and angioedema, in addition to other well-known complications after dental procedures [2,5,7].

As this condition is generally self-limiting with a good prognosis, in the majority of cases a conservative approach is applied and symptoms disappear after 2–7 days. The routine use of oesophagoscopy or bronchoscopy for evaluation of the aerodigestive system remains controversial, but in general, it is suggested to only perform these when the clinical or radiological suspicion for oesophageal or main airway injuries is high. Complications related to pneumomediastinum are pneumothorax, airway obstruction and mediastinitis. Although infrequent, mediastinitis is a major complication of pneumomediastinum and is associated with a higher risk of mortality. Furthermore, mediastinitis has been reported more frequently in association with iatrogenic pneumomediastinum when compared to traumatic and spontaneous pneumomediastinum. Dirol et al. stated that in their study the rate of mediastinitis in the iatrogenic pneumomediastinum group was up to 40 %. In case of pneumomediastinum following dental treatments it is strongly recommended to administer a prophylactic broad-spectrum antibiotic treatment. This is motivated by the fact that, along with the air, not only local products (such as cooling spray, non-sterile irrigations, etc.) and dental fragments (possibly from an infected tooth) can diffuse into various spaces leading to the mediastinum, but also an aggregate of microorganisms present in the oral flora, which has one of the highest diversities of bacteria in the human body. In case of pneumomediastinum in combination with fever, leucocytosis or elevated C-reactive protein or sedimentation rate, mediastinitis must be suspected and an intravenous antibiotic treatment is necessary. In the majority of the reported cases of pneumomediastinum following dental treatments a preventive antibiotic treatment is administered. Amoxicillin-clavulanic acid is most frequently used and should be sufficient for the typical buccal flora. Furthermore, the patient should be advised to limit actions that could increase the intraoral pressure, and therefore possibly aggravate the pneumomediastinum, such as coughing, performing a Valsalva manoeuvre, etc. [1,2,5,7,10,12].

With regard to preventive measures, limiting the use of an air-turbine handpiece to limit the injection of air is a possibility. However, other mechanisms can cause air to diffuse into the various spaces per- and postoperatively, for example by coughing, performing a Valsalva manoeuvre, excessive use of mouthwash, etc. Additionally, it is important to mention that the use of high-speed air turbines increases the comfort of dental surgery for patients and allows for a minimally-invasive procedure [10,12]. Other possible measures to implement are the use of handpieces with sterile irrigation, limiting mucoperiosteal flaps and muscular disinsertion and cleaving the tooth before extraction [12]. To prevent air from diffusing into the para- and retropharyngeal spaces special equipment can be used to isolate the tooth and cover the gingiva during dental treatments, such as rubber dams. The latter is used as an isolation method in restorative treatments to control moisture and microbes in order to enhance the quality of dental restorations. The recent Cochrane review published by Miao et al. revealed that there is low-certainty evidence that the rubber dams may lead to fewer failures of the restorations, but high risk of bias was noted. Further research is needed to evaluate the effects of rubber dams in this context. However, this could potentially be an option in the future to control the buccal flora when dental treatments are performed [13].

4. Conclusion

With this case, we emphasise the importance of including subcutaneous emphysema and pneumomediastinum in the differential diagnosis in case of swelling of the face and neck after a routine dental procedure. Although rare, subcutaneous emphysema and pneumomediastinum should always be considered as potential complications of dental extraction and other invasive procedures.

Ethical considerations

Informed consent was obtained from the patient for publication of the article.

Declaration of competing interest

We declare that we have no potential conflicts of interest to disclose.

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