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Pneumoperitoneum, pneumoretroperitoneum, pneumomediastinum, pneumothorax, and extensive subcutaneous emphysema caused by wisdom tooth extraction

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ABSTRACT

Pneumoperitoneum is mainly caused by viscus perforation, in most cases by ulcer. However, it may be caused by non-surgical causes in 10 % of the cases, such as patients on respiratory support, renal dialysis, paracentesis, and anaerobic bacterial infections. In addition, there are some sporadic causes of pneumoperitoneum; one of them is wisdom tooth extraction, which is described in our case.

In the literature review, there were many documented cases of subcutaneous emphysema, pneumothorax, and pneumomediastinum caused by wisdom tooth extraction. However, there was only one case that represented pneumoperitoneum after that procedure.

In this case report, We are reporting a case of a 50-year-old male patient who presented one-week status post wisdom tooth extraction, with significant subcutaneous emphysema involving the face, neck, and upper chest; further workup and assessment showed that the patient has considerable pneumoperitoneum, pneumomediastinum, mild pneumothorax bilaterally, and extensive subcutaneous emphysema on computerized tomography. The patient was managed conservatively, with no need for any surgical intervention, and he was discharged home in a good general condition.

Keywords: case report, wisdom tooth extraction, pneumothorax, pneumoperitoneum, pneumoretroperitonium

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Introduction

Pneumoperitoneum is an abnormal state characterized by gas (as air) in the peritoneal cavity [1]. The term *pneumoretroperitoneum* indicates the presence of gas within the retroperitoneal space[2]. Pneumoperitoneum is usually a manifestation of a perforated viscus which demands immediate laparotomy. However, that air may enter the peritoneal cavity through routes other than the gastrointestinal tract, and therefore a more conservative approach may be considered [3]. A nonsurgical etiology may cause pneumoperitoneum in up to 10 percent of patients [4].

Wisdom tooth extraction complicated by subcutaneous emphysema and pneumomediastinum is rare but was documented in several case reports. However, it can be complicated by a pneumothorax, pneumoperitoneum, and pneumoretroperitoneum, which is extremely rare but described in our case.

We are reporting a case of a 50-year-old male patient who presented one-week status post wisdom tooth extraction, with significant subcutaneous emphysema involving the face, neck, and upper chest; further workup and assessment showed that the patient has considerable pneumoperitoneum, pneumomediastinum, mild pneumothorax bilaterally, and extensive subcutaneous emphysema on computerized tomography. The patient was managed conservatively, with no need for any surgical intervention, and he was discharged home in a good general condition.

Narrative

A fifty-year-old male patient presented to our ER complaining of anterior neck swelling followed by epigastric pain for a few hours after several episodes of hiccup. He had a history of uneventful right lower wisdom tooth extraction one week prior to his presentation to the emergency room. There

was no history of fever, vomiting, or shortness of breath, and the patient has free past medical and surgical histories.

The patient looked well on arrival to the emergency room, not dyspneic or cyanosed. His vital signs were: temperature, 36.8◦C, heart rate, 88 beats/min, respiratory rate, 18/min, and blood pressure 125/77 mmHg.The oxygenation (SpO2) was 99% on room air. Physical examination showed palpable subcutaneous emphysema involving the submandibular region, anterior and lateral aspect of the neck, the bilateral supraclavicular regions, and the upper part of the anterior chest wall. On heart and chest auscultation, he had regular S1 and S2 sounds, no murmur, and had a clear chest with a minimal decrease in air entry at both apical lungs. On abdominal exam, he had an epigastric tenderness on deep palpation. The peritoneal signs were negative.

Fig 1 Axial (A) and Sagittal (B) CT scan for the neck, showed: Extensive emphysema tracks along the superficial and deep layers of neck soft tissues (white arrow)

He underwent a CT scan imaging that revealed extensive subcutaneous and intramuscular air locules that represent surgical emphysema, extending from the face through the neck to the chest (Fig 1). In addition, chest CT revealed mild bilateral pneumothorax and extensive pneumomediastinum (Fig 2). Furthermore, the abdomen CT scan showed pneumoperitoneum and pneumoretroperitoneum (Fig 2). The laboratory tests showed slightly elevated white counts 13.36/uL with shift-to-left. C-reactive protein was 355 mg/L.

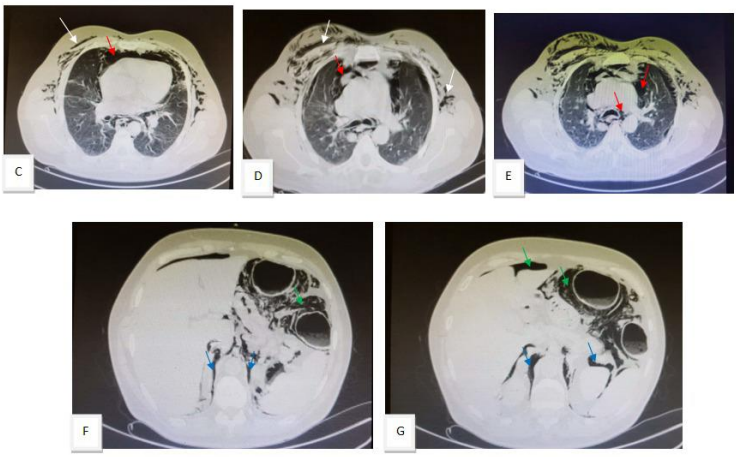

Fig 2 Axial plane CT scan for chest (C,D, and E) and abdomen (F and G) in lung window, showed: Extensive subcutaneous emphysema tracks along the superior aspect of the anterior thoracic wall(white arrow). Extensive pneumomediastinum (red arrow) that extends into the retroperitoneum (blue arrow). Pneumomediastinum is also partially imaged (green arrow)

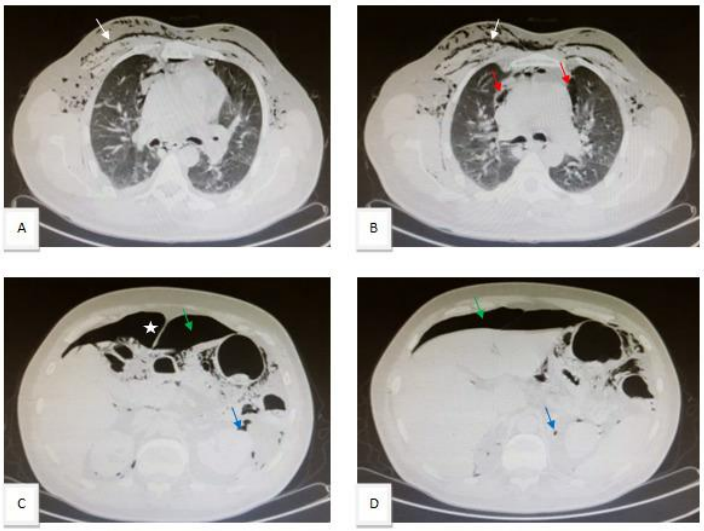

Fig 3 Follow up images after 3 days, showed same findings with the increase in the amount of the pneumomediastinum (green arrow) with typical falciform ligament sign (star); otherwise, the pneumomediastinum (red arrow), retroperitoneum (blue arrow) and subcutaneous emphysema (white arrow) appear to be decreased in volume.

The patient was admitted from the emergency room for further management and assessment. We proceeded with an upper GI endoscopy to properly evaluate the upper GI tract and exclude other causes of pneumoperitoneum; the study was free. In addition, we did a bronchoscopy for proper assessment of the airway and to exclude any lesion in the bronchial tree; the study was

negative for

any abnormalities. Furthermore, a colonoscopy was performed as well, and it was free.

Maxillofacial surgery consultation was obtained, and they decided to do an advanced flap repair to the gum at the area of the removed wisdom. The surgical repair was done with an uneventful course.

The patient was admitted to the ICU, kept NPO, and was kept under close monitoring and observation, three days later, follow up CT scan was performed and showed a decrease in subcutaneous emphysema, and the pneumothorax resolved (Fig 3), but pneumoperitoneum was still found and increased in volume (Fig 3).

On the other hand, the patient was doing well clinical-wise, and his symptoms subsided. Therefore, he was discharged home three days after admission in good general condition and without complaint. He was instructed to return to the hospital immediately in case of any worsening abdominal pain, shortness of breath, vomiting, or fever.

Discussion

A dental extraction is a general procedure. However, it may result in several serious complications; one of them is when the air is introduced into the soft tissue spaces through the dentoalveolar membrane or the root canal by the use of high-speed air-turbine drills, causing subcutaneous emphysema, pneumome-diastinum, and even pneumothorax and pneumoperitoneum. Afterward, it reaches the mediastinum by dissection through the visceral space. Besides tooth extraction, trauma, dental treatments, infections, and maxillofacial operations when applying hydrogen peroxide solution may cause subcutaneous emphysema. In addition, the extension of the air into the retropharyngeal, mediastinal, and peritoneal spaces can cause secondary infections and even death from sepsis or air embolism [5].

A brief review of the anatomy of the neck contributes to an understanding of this unusual complication. The cervical fascia is divided into superficial and deep layers. The deep layer, in turn, divides into the anterior, middle, and visceral layers. These fascial layers form the boundaries of potential spaces known as the fascial spaces of the neck. The submandibular space is located

beneath the body of the mandible and is divided into three parts: the sublingual, submaxillary, and submental compartments. The sublingual space is in direct communication with the roots of the

first, second, and sometimes the third mandibular molar teeth. The submaxillary compartment communicates posteromedially with the retropharyngeal space and thus into the mediastinum. When air enters the fascial planes of the neck, it may produce subcutaneous emphysema. In dental surgical procedures, the soft tissues are opened to extract the impacted teeth. When the wound is created, potential surgical dissection planes appear. For ease of observation and operation, continuous compressed air of high flow may be required, but the air can penetrate the soft tissues and cause damage. The potential dissection planes include wounds of the gingiva, hypopharynx, cervical fascia, pre-tracheal and para-tracheal fascia of the anterior mediastinum. When the pressure of emphysema has increased to a certain extent, the mediastinal pleura may rupture, and then the air will accumulate in the pleural space, namely a pneumothorax. Then the air passed from the mediastinum along with the perivascular spaces and the esophagus into the retroperitoneal space. From the retroperitoneum, air may then rupture into the peritoneal cavity. This same route has been postulated as the mechanism responsible for idiopathic pneumoperitoneum in a child with hyaline membrane disease[3,6].

Spontaneous pneumothorax is a relatively common condition accounting for up to 0.2% of all hospital admissions, although very few of these are ever associated with a pneumoperitoneum. This is primarily because intra-abdominal pressure usually exceeds

intrathoracic pressure by 20-30 cmH2O during inspiration and expiration. However, the association of increased intrathoracic pressure reverses this gradient, and at pressures over 40 cmH2O interstitial emphysema results, over 50 cmH2O results in pneumoperitoneum, and over 60 cmH2O creates both pneumoperitoneum and surgical emphysema. The perivascular space is not the sole communication pathway between the chest and abdomen since pneumothorax and pneumomediastinum have been described as complications of pneumoperitoneum. Air may traverse the aortic and oesophageal hiatus or enter via congenital defects that may exist between the peritoneal and thoracic cavity or from a pleuroperitoneal fistula [7].

Most cases from the literature were due to lower third molar extraction. Patients were almost always of young age and without underlying pulmonary disease. The most common symptoms were facial and neck swelling, dyspnea, chest pain, and odynophagia. The symptoms usually occurred soon after the dental procedures, and patients usually sought help within hours. However, in some cases, the patients only sought help two days later, and in our case, the patient sought medical advice one week after wisdom tooth extraction [8]. Associated pneumopericardium and pneumoperitoneum were reported in one case [3]. in addition, one case report described a simultaneous presentation of pneumothorax, pneumopericardium, and pneumomediastinum after tooth extraction [6].

In the mentioned case report above [3], their patient was treated conservatively and improved without surgical intervention. Similarly, our case was managed conservatively, and his abdominal pain resolved spontaneously over three days without surgical intervention. Particularly, we observed the patient's vital signs, did laboratory tests, and gave him I.V antibiotics and NSAID.

Conclusion

Pneumoperitoneum could result from nonsurgical causes of 10% of cases; we are reporting a case of pneumoperitoneum and pneumoretroperitoneum post wisdom tooth extraction; such cases can be managed conservatively, providing that the patient will be under good monitoring and serial assessments. However, a multidisciplinary approach should be followed with these patients in case of any worsening condition.

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