Case Report

Iatrogenic subcutaneous emphysema and pneumomediastinum following a high-speed air drill dental treatment procedure

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Case: A patient was transported to our hospital with swelling in his right face and neck after restorative dental treatment. Subcutaneous emphysema and pneumomediastinum were discovered using computed tomography scans.

Outcome: The patient had no severe symptoms. We prescribed prophylactic antibiotics and he recovered uneventfully.

Conclusions: Clinicians must keep this pathology in mind because prompt diagnosis and treatment contribute to early improvement. Otherwise, patients may face life-threatening complications.

Key words: Dental air drill, pneumomediastinum, subcutaneous emphysema

INTRODUCTION

SUBCUTANEOUS AND MEDIASTINAL EMPHYSEMA IS a well-recognized problem after trauma or any surgical procedure of the respiratory and alimentary tracts, anesthetic measures, or infections from gas-forming bacteria; it also occurs spontaneously. However, the occurrence of pneumomediastinum and massive s.c. emphysema due to a dental procedure is quite rare. Here, we present a case of pneumomediastinum and massive s.c. emphysema that occurred during dental treatment with an air turbine handpiece. Mediastinal emphysema caused by the introduction of air from the use of a high-speed air turbine drill is usually harmless, but complications including infection, pneumothorax, pneumopericardium, and orbital emphysema with optic nerve damage have been reported.^{1–5} This report may help healthcare experts working in emergency departments to realize that s.c. and mediastinal emphysema occasionally occur after various dental and oral procedures such as endodontic therapy and dental extraction. Early recognition of

this unique problem is essential in preventing life-threatening complications such as airway obstruction, mediastinitis, deep neck infection, and cardiac failure. Diagnostic and therapeutic recommendations are included.

CASE

A 68-YEAR-OLD MAN was referred to our emergency department with swelling on the right side of his face and neck. The day before he arrived, he had undergone restorative dental treatment in which the dentist used a high-speed air turbine dental drill. Physical examination revealed major facial and neck s.c. emphysema. There was no evidence of airway, esophageal, or abdominal injury. He said that swelling had begun during the prolonged dental treatment. Oral examination revealed no significant wounds or lacerations. He had no known allergies. The patient did not have any pre-existing lung disease or chest problems. The patient's vital signs were: heart rate, 83 b.p.m.; blood pressure, 147/79 mmHg; respiratory rate, 10 breaths per min; body temperature, 36.6°C; and oxygen saturation, 98% in room air. His white blood cell count, hematocrit, and blood chemistry were normal, as well as his electrocardiogram. Chest radiograph showed extensive s.c. emphysema in both the cervical and facial areas. Thoracic and cervical computed tomography revealed air in the s.c. and cervical spaces expanding to the mediastinum (Figs. 1, 2).

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Fig. 1. Cervical computed tomography in a 68-year-old man with swelling in his right face and neck after restorative dental treatment. Arrows, s.c. emphysema of right cheek. Arrow head, s.c. emphysema in the posterior pharynx.

OUTCOME

PROPHYLACTIC I.V. ANTIBIOTICS were prescribed. The patient recovered uneventfully.

DISCUSSION

SUBCUTANEOUS EMPHYSEMA OF THE HEAD, neck, and mediastinum occurs with a variety of disease processes. Most cases involve the passive escape of air from the digestive tract into the S.C. tissues. The many causes include head and neck surgical procedures, tracheal and esophageal trauma, intraoral trauma, foreign bodies and neoplasms of the digestive tract, and pulmonary barotrauma from mechanical ventilation or in patients with pulmonary disorders.⁶ Subcutaneous emphysema and pneumomediastinum following a dental procedure, as in our case, is extremely rare. However, the incidence of emphysema has increased because of the introduction of the air turbine dental drill.

The high-speed air turbine drill was designed to cut teeth and is most commonly used in dental restorative treatments.

The use of these drills, which are driven by compressed air at 3.5–4.0 kgf/cm² and rotate at 450,000 rpm, is now widespread. Water sprayers attached to the tip of the air turbine cool friction-induced heat caused by cutting and wash away debris. Although most cases of emphysema occur incidentally with the use of a high-speed air turbine handpiece, there have been some reports over the past decade of cases caused by the air cooling spray of dental lasers.⁷

Air may be introduced into the mediastinum through the fascial spaces of the neck when high-speed air turbine drills are used. Communication between the fascial spaces allows air introduced from the mandibular region to spread to the retropharynx and mediastinum. Air dissection is caused by compressed air through a disrupted oral barrier such as a dentoalveolar membrane or root canal. As the roots of the first, second, and third molars are directly connected to the sublingual and submandibular space, these are common sites where emphysema and pneumomediastinum develop. The retropharyngeal space, which is located posterior to the pharynx, extends from the skull base into the mediastinum; this potential space is the most common cause of the spread of infection to the mediastinum. Compressed air leading to

Fig. 2. Thoracic computed tomography in a 68-year-old man with swelling in his right face and neck after restorative dental treatment. Arrow, s.c. emphysema of right neck. Arrow head, pneumomediastinum in the anterior trachea.

pneumomediastinum mostly follows the same paths.⁸ The prevertebral space, found in the anterior part of the vertebral column, extends from the base of the skull to the coccyx. The space between the retropharyngeal space (anteriorly) and the prevertebral space (posteriorly) is a “danger zone” for these complications. This space extends from the skull base to the diaphragm and causes potential spread of oral infections to the mediastinum.⁹

The differential diagnosis for patients presenting with a combination of face and neck swelling after dental procedures includes pneumothorax, expanding hematoma, infection in the facial planes of the neck, anaphylaxis, local allergic reaction, and angioneurotic edema. A patient coughing, forcefully blowing, smoking, or vomiting after a dental procedure can also lead to s.c. emphysema and pneumomediastinum. During procedures with anesthesia, the tracheal mucosa may tear during intubation or excessive ventilation pressure can cause increased pressure in the alveoli, leading to the introduction of air into the pleural and mediastinal spaces.¹

Although s.c. emphysema rarely causes long-term morbidity, early recognition and proper management is critical to prevent progression. As pneumomediastinum is frequently associated with s.c. emphysema, examination

should include the thoracic cavity even when s.c. emphysema is limited to the cervicofacial region. Computed tomography showed that the emphysema extended into the parapharyngeal space, retropharyngeal space, s.c. neck, and mediastinum. Almost 10% of cases of surgical emphysema are misdiagnosed as “allergic reactions,” which may lead to treatment errors.¹⁰

Although the condition is not usually life-threatening, antibiotic prophylaxis is recommended and patients should be admitted for observation. The rationale for antibiotics is that air introduced from an intraoral site is likely to carry with it bacteria that could potentially lead to rapidly spreading cellulitis or necrotizing fasciitis. Cardiovascular collapse associated with the development of venous air embolism is a life-threatening complication that has also been reported to be associated with high-speed air turbine dental drills.¹¹ Urgent surgical decompression may be required if cardiovascular collapse or airway obstruction occurs.

CONCLUSION

IN CONCLUSION, this case report of a patient who developed pneumomediastinum while receiving a dental procedure documents the potential sequelae associated with air entrainment from use of a high-speed air turbine dental drill in general dentistry. Prompt recognition of this phenomenon is essential because of potential airway obstruction and additional complications, as the infused air dissects through the fascial planes. Computed tomography might be an important strategy to investigate the extent of emphysema in order to prevent unexpected complications.

CONFLICT OF INTEREST

NONE.

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