Cervicofacial and mediastinal emphysema after dental extraction

Odma szyjno-twarzowa oraz śródpiersia po usunięciu zęba

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Abstract

Subcutaneous emphysema (SE) is a rare but potentially life-threatening complication in dental procedures. The development of SE and pneumomediastinum (P) during tooth extraction is an uncommon complication. The roots of the second and third lower molars (and, rarely, of the premolar and first molar) communicate directly with the sublingual and submandibular spaces. Occasionally, after a dental operation, the pressurized air from the drill is forcefully injected into the surrounding subcutaneous tissues proximal to the extraction site in the facial planes. The air might pass through the sublingual and submandibular spaces to the pterygomandibular, parapharyngeal and retropharyngeal spaces, and to the mediastinum. Molar extraction is a common procedure in dental surgery.

We report a rare case of extensive cervicofacial SE as well as P, following mandibular second molar extraction with the use of a high-speed dental handpiece, which is specifically designed for restorative treatment. Careful observations of the symptoms and clinical course, and an early initiation of pharmacologic therapy are recommended.

Key words: pneumomediastinum, subcutaneous emphysema, dental extraction

Słowa kluczowe: odma śródpiersia, odma podskórna, usunięcie zęba

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Introduction

Mediastinal emphysema or pneumomediastinum (P) is defined as the presence of air or another gas within the mediastinum. This is a rare and generally benign self-limited condition that can be categorized as spontaneous or traumatic.[1] Spontaneous P is determined by the appearance of free air in the mediastinum that is not preceded by trauma, surgery or other medical procedures, i.e., vigorous Valsalva maneuver, childbirth or injury during intubation.[2] Pneumomediastinum is often associated with subcutaneous cervical and supraclavicular emphysema.

Molar extraction is a common procedure in dental surgery. Common complications that may occur post-procedure include pain, trismus, infection, bleeding, maxillary sinus perforation, injuries to the lower alveolar nerve, and maxillary tuberosity fracture.[3] Subcutaneous facial, cervical and supraclavicular emphysema, pneumothorax and P are rare complications.[4]

A rare case of extensive cervicofacial subcutaneous emphysema (SE) and P, following second lower molar extraction with the use of a high-speed dental handpiece, which is specifically designed for restorative treatment, is reported here. Issues relating to the diagnosis, etiology and management of these complications are discussed. Occasionally, after a dental operation, the pressurized air from the drill is forcefully injected into the surrounding subcutaneous tissues proximal to the extraction site in the facial planes. The air may cause SE, airway compromise (due to the accumulation of air in the retropharyngeal, prevertebral and danger spaces), gas embolism, infections of the soft tissues, pneumothorax, P, and pneumopericardium.[5,6]

We present a case of extensive SE, which was probably caused by the use of an air-water-cooled high-speed dental handpiece when extracting a mandibular second molar.

Case report

A 30-year-old Caucasian woman came to the Department of Emergency Medicine at the Civic Hospital of Palermo, Italy, complaining of fever, left periorbital edema, and swelling in the neck, face and chest, accompanied by audible and palpable crepitus, which is typical of SE. The symptoms appeared after dental surgery performed with a high-speed dental handpiece, normally used to dissect the tooth and to remove it from the alveolar bone tissue.

The patient had a strong sensation of pressure-aspiration in the retrosternal site during extraction, and did not suffer from lung or thoracic diseases.

When she arrived at our hospital, her vital signs were: temperature – 37.1°C; heart rate – 70 beats/min; respiratory rate – 18 breaths/min; blood pressure – 125/80 mm Hg, and oxygenation – 98%. The blood test and electrocardiogram were within normal limits. Intraoral examination revealed good oral hygiene and absence of bacterial infection. There was an enlargement of the cervicofacial soft tissues and crepitation on palpation of that region.

Computed tomography (CT) showed significant left SE in the periorbital, submandibular, sublingual, and mediastinal spaces (Fig. 1–6). Pneumothorax, parenchymal and/or pleural abnormalities were excluded.

Conservative medical treatment consisted of intravenous administration of corticosteroids (betamethasone: 4 mg / 2 mL / 8 h / 7 days) and antibiotic therapy (Tazocin®: 4 g – Cubicin®: 250 mg / 8 h / 7 days) and complete bed rest. Cough suppressants and laxatives can be used to prevent gas embolism.

Fig. 1. Subcutaneous emphysema in the submandibular space

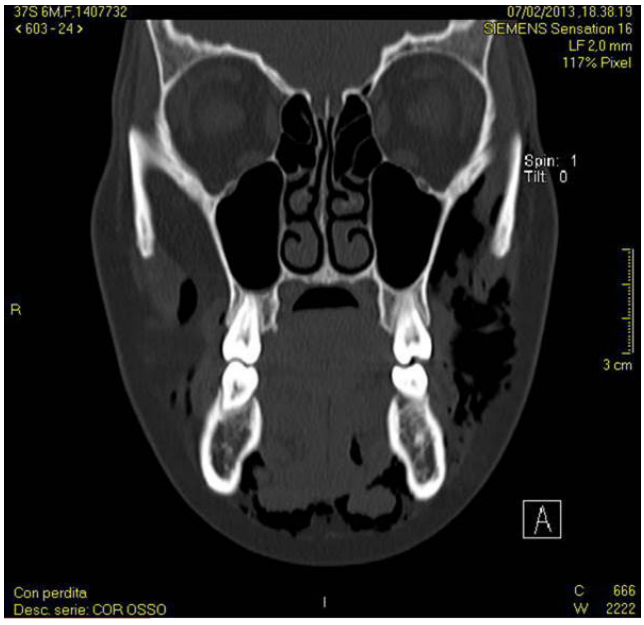

Fig. 2. Presence of air in the spaces of the left periorbital soft tissues

Fig. 3. Presence of air in the left subcutaneous tissues of the neck

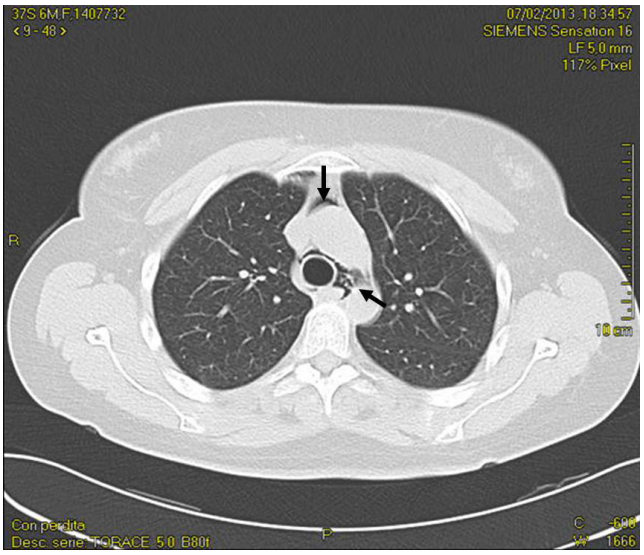

Fig. 4. Computed tomography (CT) scan of the chest revealing pneumomediastinum

Fig. 5. Subcutaneous emphysema in the area of the pterygoid medial muscle

Fig. 6. Subcutaneous emphysema in the area of the masseter muscles

The CT scan taken 1 week after the medical treatment showed air reduction in the left periorbital region (Fig. 7).

The discharge prescription contained 3rd generation cephalosporins (Ceftibuten®: 400 mg / 24 h / 5 days) to prevent low respiratory tract infections in a patient who stayed in a subintensive care unit.

Another CT scan taken after 3 weeks showed air reduction in the left masseter and pterygoid muscles, and in the perimandibular space as well as the resolution of P (Fig. 8–10).

After 1 month, the patient had a complete clinical and radiological recovery without a recurrence of the disease (Fig. 11).

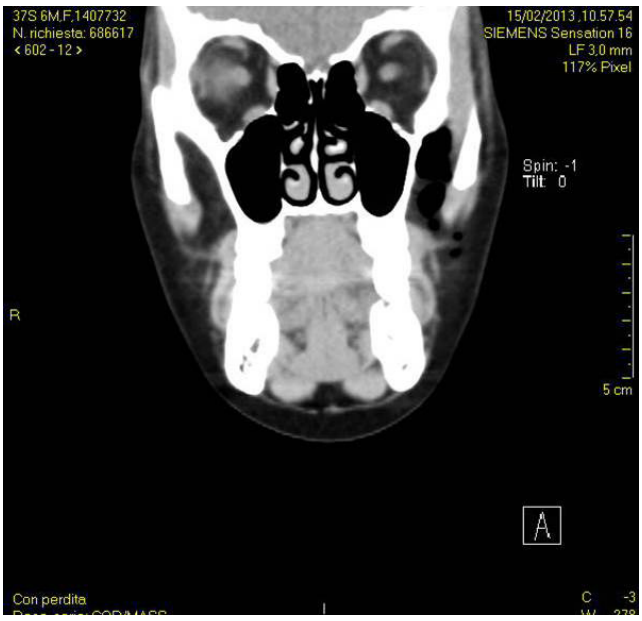

Fig. 7. Periorbital soft tissue air is partially reabsorbed after 1 week

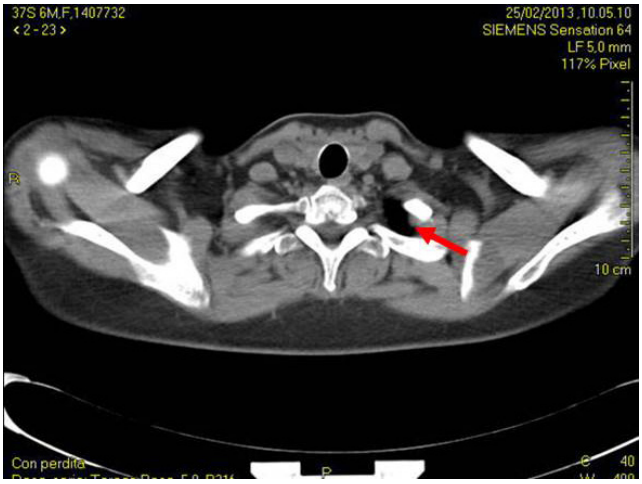

Fig. 8. CT scan showing reduced air in the subcutaneous tissues of the base of the neck after 3 weeks

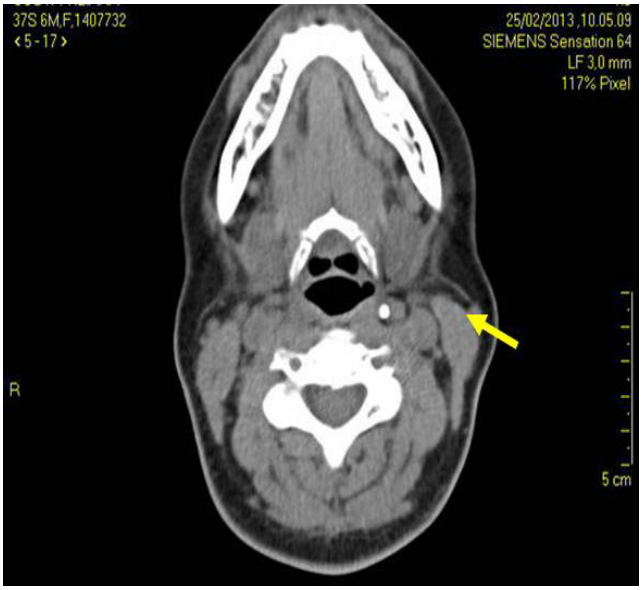

Fig. 9. Subcutaneous emphysema in the left pterygoid medial muscle regresses after 3 weeks

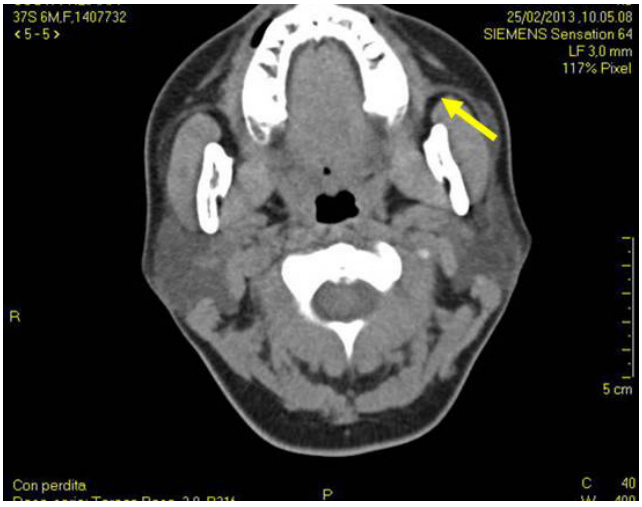

Fig. 10. Subcutaneous emphysema in the left masseter muscle regresses after 3 weeks

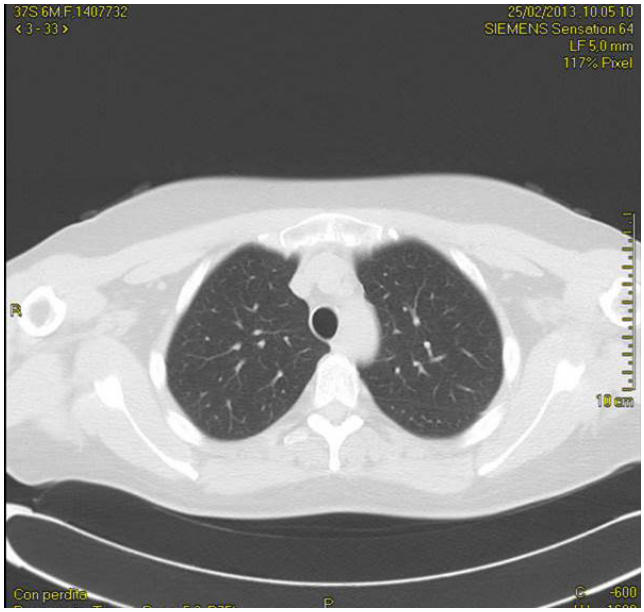

Fig. 11. CT scan showing resorption of air after 1 month

Discussion

Subcutaneous emphysema is a complication in dental procedures (principally dental extractions and restorative procedures). The mechanism leading to SE and P after molar extraction has been identified. There may be 2 explanations for this mechanism: the compressed air procedure (high-speed dental handpiece, air-water syringe), and the communication between the oral cavity and deeper tissue.[7] Understanding the anatomy and the mechanics of injury will help to anticipate the onset of SE and P.

The roots of the second and third molars (and, rarely, of the premolar and first molar) communicate directly with the sublingual and submandibular spaces. These spaces are separated by mylohyoid muscle fibers. Only the loose connective tissue rather than true fascia actually separates one side of the floor of the mouth from the other; it is an anatomic situation that permits air to spread bilaterally with ease in the soft tissues. The sublingual space communicates anteriorly with the submental space and posteriorly with the lateral pharyngeal spaces in the neighborhood of the posterior edge of the mylohyoid muscle. This space is bounded laterally by the submandibular skin, superficial fascia, platysma muscle, the superficial layer of the deep cervical fascia, and the lower border of the mandible. These neck spaces communicate with the parapharyngeal, pterygomandibular and retropharyngeal spaces.

The retropharyngeal space (RS) extends from the skull base (clivus) to the upper mediastinum (from T1 to T6 vertebrae), lies posterior to the pharynx and esophagus, and is anterior to the prevertebral musculature. It is bounded by the buccopharyngeal fascia anteriorly, the prevertebral fascia posteriorly and the carotid space laterally. The normal contents of RS include fat, small vessels and lymph nodes.[8,9]

The alar fascia, a part of the deep cervical fascia, originates as a well-defined midline structure at the level of C1 vertebra and can be identified down to C6 vertebra, and does not reach the base of the skull.[10]

This thin fascia divides RS into 2 components: the anteriorly positioned, true or proper RS, and the posteriorly situated, danger space of Grodinsky and Holyoke. The alar fascia fuses with the visceral fascia obliterating the true RS. The danger space extends further inferiorly into the posterior mediastinum to the level of the thoracic diaphragm and is named as such, because it provides a conduit for infections to spread from the pharynx to the mediastinum.

Since the alar fascia is very thin, the danger space and the true RS cannot be distinguished by imaging in a healthy patient.[10] The symptoms depend on the amount of air, its location and the presence of infection, caused by the diffusion of microorganisms of the oral microbial flora in the submandibular space.

Patients have otalgia, Eustachian tube dysfunction with temporary hearing loss, dysphagia, dysphonia, compression of the venous trunks (congestive heart failure), compression of the trachea (asphyxia), compression of the sympathetic trunk, P, pneumopericardium, Ludwig's angina as well as mediastinal and pleural space infections.[11]

Air in the mediastinum can cause venous vasodilation and hypotension, hypercapnia, acidosis, and gaseous embolism. Death can occur due to a large gas bubble that prevents the ventricle from pumping blood into the pulmonary artery and to the lung.

The differential diagnosis of P includes Quincke's edema, allergic reactions caused by the local anesthetic, hematomas (in patients taking both anticoagulant and platelet aggregation inhibitors), and soft tissue infections.[12]

Palpable crepitus of the face and neck, crackling sounds in the lungs, the presence of Hamman's sign (crunching, rasping sound, synchronous with the heartbeat as a result of the heart beating against air-filled tissues), radiography, and cervical and thoracic CT facilitate making an accurate diagnosis.

Conclusions

Sometimes patient can have breathing problems during or after dental and oral surgical procedures. This dyspnea can be caused by an allergic reaction to local anesthetic, but also by barotrauma and pneumothorax. Subcutaneous emphysema is a rare complication of dental procedures. The medical community should be aware of this complication. The appearance of sudden swelling and soft tissue palpable crepitus should give rise to a strong suspicion of SE. Careful observation of the symptoms and clinical course, and an early initiation of pharmacologic therapy (broad-spectrum antibiotics and 100% oxygen inhalation) are recommended. The high-speed dental handpiece and air/water syringe that exhaust air into the surgical field should not be used, even in the absence of a mucoperiosteal flap.

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