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Editorial

# Drying root canals with airway syringe causes emphysema — the dental alarm

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## 1. Introduction

The Root canal treatment (RCT) in permanent teeth and 'Pulpectomy' in deciduous teeth are not uncommon words amongst the general public. These are commonly performed endodontic techniques, which require experienced dental skills. Access opening, biomechanical preparation (BMP) and obturation are three imperative steps of a pulp therapy. Isolation of the tooth is also an invincible step in the protocol and is fundamental for the successful root canal treatment. Isolation can be done by various methods like rubber dam, cotton rolls, adsorbent pads, suction and gauze pieces. Although rubber dam is advisable and had been proved to be an efficacious method of isolation, still is not used by a large number of dental practitioners across the globe. Root canals need thorough irrigation during biomechanical preparation and a dry environment to work with strict drying while obturating the canals. Due to time constraint, the dental surgeons many a times use three way syringe to dry the root canals. This air syringe uses 'compressed air' which may cause subcutaneous emphysema and proves to be fatal sometimes.

## 2. What is a Compressed Air?

Air is a mixture of 78% nitrogen, 21% oxygen and 1% of remaining fourteen gases by volume. This composition remains unchanged with height but its mass with respect to volume varies. The air has gas molecules which interact or collide with each other with a force, and this force per unit area is called as air pressure or atmospheric pressure. The atmospheric pressure at sea level is 760 mm Hg. However, this pressure is not felt as our dynamic body has same internal pressure inside maintaining equilibrium. So, the air has pressure, density (weight/area) and volume because of gas molecules. Now, if the 100 $cu^3$ of air is filled into 50 $cu^3$ of chamber, it produces a high pressure, which is known as compressed air. In simple words, the air is compressed and is air with high pressure (pressure more than atmospheric pressure). Here, the free path for gas molecules is decreased and the rate of collision is increased producing more kinetic forces and as the area is less, so the output is more pressure (force/area). This principle is used in compressors where the air is drawn inside chambers through inlet valve and the air is compressed with different mechanisms like positive or dynamic displacement using an electric motor; after that compressed air is stored into a storage tank and is released through a narrow outlet valve. Now, this compressed air with high pressure is an excellent kinetic energy source and is used in pneumatic devices. One such example is compressors used in dental chairs, where compressed high pressure air is released via a narrow outlet in three airway syringes. [1–3]

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## 3. How Compressed Air causes Emphysema?

Subcutaneous emphysema is defined as the abnormal entrapment of air into subcutaneous spaces. The blast of air to dry the root canal through air way syringe in dental practice is not uncommon. And there is a plethora of literature to support the evidence that patients undergoing root canal treatment have reported with emphysema particularly if the drying of canal was performed with an airway syringe. The compressed air with pressure is forced into root canals or dento-alveolar membrane and then it enters facial and suborbital planes which consist of loose connective tissues and potential spaces between tissue and muscles. Once it enters the facial spaces, air follows the path of least resistance entering distant spaces. The maxillary teeth entrapped air can enter facial, suborbital, pterygomaxillary and other neck spaces; whereas mandibular teeth entrapped air can enter retropharyngeal, mediastinal, pericardial and thoracic spaces. The pressure in airway syringe is in the range of 20-25 PSI which may also result in air embolism and can be life threatening. The patient complains of diffuse swelling and crepitus when palpated, as the air is moved and patient complains of a crackling sound known as crepitus.[4–6]

## 4. Management Protocol

The swelling usually self-resolves within 2 weeks and does not require any specific treatment however the diagnosis is very important. The antibiotic coverage is prudent here and radiographs especially head, neck and chest CT scan are advised to locate the air in cervico-facial spaces. Preventive protocol includes application of rubber dam, drying of canals with small cotton pellets, strict avoiding of airway syringe in open pulp chambers essentially when canal apex is size 25 or large. Patient instructions must include avoidance of high pressure activities in oral cavity during and after dental procedure like smoking, blowing of nose, coughing, drinking fluids using straws and vomiting.[5,6]

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