Avoiding a Very Preventable Surgical Complication

by Jay B. Reznick, DMD, MD

As we go through our practice years, one of the things we all strive for is to make our lives less stressful. For those of us doing surgery many times per day, this is essential in order to maintain our sanity. Doing surgery is stressful enough as it is. Having to deal with surgical complications is something I like to avoid. As I have taught in my courses and on the message boards of Dentaltown.com, one of the best ways to deal with complications is to prevent them from occurring in the first place. This involves very simple strategies that can make a big difference. Why look for trouble?

One of the most dramatic complications we see in dentistry is the development of subcutaneous air emphysema.* A relatively unusual phenomenon, subcutaneous air emphysema has been reported in both medical and dental literature for such varied procedures as rectal biopsy, nasogastric intubation, radical neck dissection, tonsillectomy, adenoidectomy, root canal treatment, dental restorations and extraction of maxillary and mandibular teeth. The most common cause involves the surgical extraction of mandibular third molars. It is a result of air under pressure being driven into the subcutaneous tissues in the head and neck. It is generally associated with the use of a high-speed, air-driven dental handpiece, which allows air to be vented toward the bur. This air under pressure can get into the subcutaneous tissues when either a flap is reflected or the gingival attachment to the alveolus is compromised. Air is forced beneath the dermis, and subcutaneous air emphysema results.

More commonly, air is also forced into the fascial planes, causing tissue space emphysema. Due to many of the fascial spaces of the head and neck being contiguous, retropharyngeal and mediastinal emphysema are possible sequels of air getting into the soft tissues surrounding the oral cavity. The severity of this disease is variable. In some cases, the swelling is minor and localized, necessitating only reassurance to the patient that the condition is benign, self-limiting and temporary. In more severe cases, antibiotics, close observation, hospital admission and surgical intervention might be indicated. It is important for the clinician to be able to recognize subcutaneous air emphysema when it occurs, so that inappropriate therapies can be avoided. A sudden facial swelling occurring during a dental procedure involving pressurized air or air turbine instruments is characteristic. Pain on palpation and a sensation of being able to move air within the tissues and crepitance, not associated with an underlying bony defect, are important features in the diagnosis of subcutaneous emphysema. Definitive evidence of this condition is obtained by radiographs of the soft tissue, which show masses of free air within the layers of soft tissue.

To prevent air emphysema you should be using a surgical rear-venting handpiece whenever you do any type of surgical procedure. I have been told by a number of non-oral surgeons that since this happening is so rare, it is not worth worrying about. But, for anyone who does surgical extractions or bony surgery at all, the minimal investment will give you significant

*Over the years I have heard number of terms used erroneously to describe this condition. So, I want to reemphasize for everyone that the correct term for this condition is subcutaneous air emphysema. This is defined as any abnormal distention of an organ or part of the body with air or gas. The origin of the word is from the Greek meaning “to blow as a result of action.” This condition is not termed an air embolism. An embolism is an obstruction of the circulatory system caused by a loose blood clot or thrombus or an air bubble. It is also not an empyema. An empyema is a collection of pus that is confined in an anatomical space by normal epithelial boundaries. And finally, it is not an empanada, which is a Spanish or Latin American turnover with a flaky crust, and spicy or sweet filling.
peace of mind, and essentially eliminate the occurrence of this stress-inducing complication. This is a fairly rare phenomenon, but it does occur. In my 20+ years of private practice experience, I have seen a total of four cases, as well as one during my oral surgery residency. You, most likely, will see a case or two in your career. When it develops, it is quite rapid and quite dramatic. It is very stressful for both patient and dentist alike, but is completely preventable by simply changing which handpiece is used when you are doing surgical extractions.

The most common etiology is from using a standard high-speed dental handpiece to perform a surgical extraction or periodontal surgery. This type of instrument, which is normally used for restorative procedures is designed to deliver a stream of water and compressed air to the operative field to prevent excessive heat generation of the tooth being treated. It also vents a portion of the air used to drive the turbine forward along the shaft of the bur. This design is hazardous when used where soft tissue flaps are raised to surgically extract a tooth. Subcutaneous air emphysema is associated with the use of an air turbine-driven dental handpiece when used for surgical procedures and when there is compromise of the gingival attachment. Clinicians should be cautioned against use of these instruments for surgical extraction of teeth and for other surgical procedures where a flap is raised, as they are not designed for this purpose. Surgical handpieces, which vent air toward the back of the handpiece, should be used for this purpose. An electric handpiece can be used as long as the chip blower is turned off, so that no air blows into the surgical site.

Although surgical extraction of an impacted mandibular third molar tooth is the most commonly reported cause of subcutaneous air emphysema, the phenomenon has also been reported after procedures that did not include a soft tissue flap. It has also been reported to occur in association with post and core preparation of a maxillary anterior tooth, crown preparation of a mandibular third molar, and during endodontic therapy of a mandibular premolar. It has also been observed with the use of an air-water jet polishing device for periodontal therapy, an ultrasonic scaler, and with a standard dental air-water syringe.

The most common sequelae of subcutaneous air emphysema are facial swelling and severe pain. However, the spread of air forced into the fascial spaces can result in more severe consequences. Respiratory distress can result from retropharyngeal air which causes restriction of the upper airway. Clinicians should be able to recognize soft tissue emphysema in a patient by sudden onset of swelling during a dental procedure and crepitus within the soft tissues. To avoid this clinical condition, most oral surgeons use a straight surgical handpiece, which is either electric, or driven by nitrogen gas which exhausts to the rear. The reason they run off of nitrogen is that the handpiece is a completely sealed unit, and the oxygen content in compressed air would oxidize the metal on the inside of the handpiece. Nitrogen does not do this. These handpieces run at about 100,000 RPM and put out a high amount of torque. Such instruments run about $3,000 to $5,000, and unless you do a lot of surgery, they are not really cost effective.

A much better solution for most general dentists and occasional surgeons is to use a surgical handpiece that has been designed to attach to a standard dental unit. My favorite handpieces in this category are the Sabra 45 and 105-degree models with fiberoptics. The ImpactAir is also a good choice. These resemble a standard air-driven dental handpiece, but exhaust to the rear, away from the surgical field. They run at 400,000 to 500,000 RPM and deliver a higher torque than a standard dental handpiece, so are extremely capable of removing bone and sectioning teeth as necessary for surgical extractions. They are nearly the same price as a standard operative handpiece, about $500 to $700. Unless you are doing multiple surgical extractions per day, my recommendation is to go with this type of handpiece. It is not worth taking the risk of a patient developing subcutaneous air emphysema; using a standard dental handpiece is just asking for trouble.

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The treatment of subcutaneous and tissue space emphysema varies with the severity of the condition and the experience of the clinician. Prophylactic antibiotic coverage is indicated in all cases, as secondary infection is always a possibility, and finding purulent matter with the swelling has been reported. Penicillin is a logical choice, as any bacteria involved in a secondary infection will most likely be of the oral flora. Some clinicians advocate the use of broad-spectrum antibiotic coverage on the assumption that air which penetrates the subcutaneous layers is contaminated. Application of moist heat to the area may also be helpful. In very mild cases, clinical observation is the only treatment necessary. It is important to explain to the patient the nature of the swelling and the expected clinical course, and to notify the doctor immediately in case of any increased swelling or respiratory difficulty. In cases of more severe swelling, lateral and anteroposterior soft tissue radiographs of the neck should be taken to evaluate the airway and the extent of the emphysema. Chest radiographs should also be taken to rule out mediastinal involvement. Admission to the hospital for observation is warranted, especially if the patient complains of any airway or throat tightness. Because of the extreme discomfort that may be associated with swelling in the neck, the patient’s oral intake of fluids might diminish. Therefore intravenous fluids might be needed to prevent dehydration. Surgical drainage of infected tissue should be done if indicated by clinical examination and by the patient’s progress. Most cases of subcutaneous and tissue space emphysema will begin to resolve after two to three days of supportive therapy. Residual swelling is usually minimally evident after about a week to 10 days.

Author’s Bio

Dr. Jay B. Reznick is a Diplomate of the American Board of Oral and Maxillofacial Surgery. He received his Dental degree from Tufts University, and his M.D. degree from the University of Southern California, and trained in Oral and Maxillofacial Surgery at L.A. County-USC Medical Center. His special clinical interests are in the areas of facial trauma, jaw and oral pathology, dental implantology, sleep disorders medicine, laser surgery, and jaw deformities. He also has expertise in the integration of digital photography and 3-D imaging in clinical practice. Dr. Reznick is one of the founders of the Web site OnlineOralSurgery.com, which educates practicing dentists in basic and advanced oral surgery techniques. He is the Director of the Southern California Center for Oral and Facial Surgery in Tarzana, California. He can be reached at jreznick@sccofs.com.