Anesthesiology
51:80–81, 1979

Iatrogenic Subcutaneous Emphysema during Dental Anesthesia

MORTON B. ROSENBERG, D.M.D.,* BEBE K. WUNDERLICH, M.D.,† ROBERT N. REYNOLDS, M.D.‡

Subcutaneous emphysema of facial and cervical connective tissues can occur following injury to the larynx, trachea and pulmonary alveoli, and from facial fractures, tonsillectomy, intraoral injections, and dental extraction.[1] The advent of air-driven ultrahigh-speed dental instruments has resulted in many reports of this complication.[2–4] We present the case of a pediatric patient in whom subcutaneous emphysema developed as a result of dental procedures during anesthesia.

REPORT OF A CASE

A 3-year-old 16.3-kg white boy was brought to the operating room for restorative dentistry. The history was unremarkable, and laboratory data were within normal limits. The patient was premedicated with pentobarbital, 35 mg, and scopolamine, .25 mg, im. Anesthesia was induced with halothane, oxygen, and nitrous oxide by mask. Succinylcholine, 10 mg, iv, was injected and the trachea intubated atraumatically with a 5.0-mm uncuffed nasotracheal tube. Anesthesia was maintained with spontaneous respiration. Four crown preparations were prepared with an ultrahigh-speed handpiece in the left mandibular quadrant. The operation proceeded uneventfully for four hours. Prior to tracheal extubation, left-sided facial swelling was observed. The swelling extended from the upper and lower eyelids to the clavicle and sternal notch. The tongue was raised slightly anteriorly, and on palpation crepitus was found.

Roentgenograms of the head, neck, and chest revealed air in the deep fascial spaces of the neck with direct access to the mediastinum, although air in that region was not visible on the roentgenogram of the chest. Vital signs and arterial blood gases were normal, and submucous emphysema was not present. Since no respiratory impairment was evident, the patient's trachea was extubated and he was placed in a mist tent. He was discharged two days later with the swelling greatly reduced.

* Assistant Professor of Anesthesia, Tufts University School of Medicine; Assistant Professor of Oral and Maxillofacial Surgery, Tufts University School of Dental Medicine; Assistant Anesthetist, Tufts–New England Medical Center Hospital.

† Assistant Professor of Anesthesia, Tufts University School of Medicine; Anesthetist, Tufts–New England Medical Center Hospital.

‡ Professor of Anesthesia, Tufts University School of Medicine; Senior Anesthetist, Tufts–New England Medical Center Hospital.

Received from the Tufts University School of Medicine, Boston, Massachusetts. Accepted for publication November 25, 1978.

Address reprint requests to Dr. Rosenberg: Department of Anesthesiology, Tufts University School of Medicine, New England Medical Center Hospital, 171 Harrison Avenue, Boston, Massachusetts 02111.

DISCUSSION

The increased air pressure used with the ultrahigh-speed instruments would seem to increase the possibility of emphysema during dental procedures with general anesthesia. Differentiation of this entity due to damage to tracheal and pharyngeal mucosa during endotracheal intubation, alveolar rupture, or iatrogenic causes from nonemphysematous swelling arising from hematoma, angioneurotic edema or abscess is essential for appropriate treatment.

The modern high-speed dental handpiece is operated by compressed air pressure of approximately 30 psi, which drives a turbine faster than 200,000 rpm. Most of the air in the turbine comes back along the handpiece, but in order to cool the burr, a water spray diverts some air toward the drill point. Another potential source for subcutaneous emphysema is the air syringe used to dry the operative site in dental surgery. These syringes operate at 20–25 psi.

In this case, air dissected beneath the periosteum of the mandible, along the sternocleidomastoid muscle, and beneath the superficial and middle layers of the deep cervical fascia. It then passed along the middle of the pretracheal layer, which arises from the deep surface of the sternocleidomastoid muscle and passes in front of the trachea. A roentgenogram showed that air had passed along the length of the cervical trachea. Air had also dissected above the mandible to the zygomatic processes. Air was not seen in the mediastinum. Mediastinal emphysema, with its potential, sometimes lethal, complications of tension pneumothorax, pneumopericardium, pneumoretroperitoneum, impaired cardiac function and infection, has been reported to occur following iatrogenic subcutaneous emphysema caused by air-driven turbine dental drills.[5,6]

Air embolism and subcutaneous emphysema can result from the use of compressed air in root canal procedures.[7,8] Richles and Joshi showed experimentally that death can result from air forced into the root canals of dogs and presented this evidence to support a suggested etiology of a cardiac arrest during endodontic therapy. Periorbital swelling and tenderness with emphysema around the eye, otologic com-

0003-3022/79/0700/0080 $00.50 © The American Society of Anesthesiologists, Inc.

Downloaded from http://pubs.asahq.org/anesthesiology/article-pdf/51/1/80/623573/0000542-197907000-00018.pdf by guest on 16 August 2022

plications,[3] and dysphagia, dysphonia, and dyspnea[9] have been found following subcutaneous emphysema caused by high-speed air-driven turbine handpieces.

The treatment of iatrogenic subcutaneous emphysema varies from close observation to emergency airway management. When this complication can be detected intraoperatively, administration of nitrous oxide should be discontinued to avoid enlargement of the air mass. Roentgenograms of the chest should be obtained to determine the extent of the emphysema. The use of clear plastic drapes is helpful in permitting observation of the patient intraoperatively. Prophylactic antibiotic therapy, although controversial, is probably justified, because the oral flora are potentially pathogenic, and the possibility of cellulitis from organisms carried interstitially with the air is always present.[10,11]

We report this case to stress that the use of ultrahigh-speed instruments with increased air pressures and the use of compressed-air syringes can cause subcutaneous emphysema, mediastinal emphysema, and possibly air embolism during dental procedures with anesthesia.

References

1. Thawley SE: Air in the neck. Laryngoscope 84:1445–1453, 1974
2. Cardo VA, Mooney JW, Stratigos GT: Iatrogenic dental-air emphysema: Report of a case. J Am Dent Assoc 85:144–146, 1972
3. Quisling RW, Kangen TT, Jahrsdoefer RA: Otologic complications following use of a high-speed air-turbine handpiece. J Am Dent Assoc 94:895–897, 1977
4. Duncan JM, Ferrillo PJ: Interstitial emphysema after a restoration. J Am Dent Assoc 74:407–409, 1967
5. Trummer MJ, Fasburg RG: Mediastinal emphysema following the use of a high-speed air-turbine dental drill. Ann Thorac Surg 9:378–381, 1970
6. Hunt RB, Sahler OD: Mediastinal emphysema produced by an air-turbine dental drill. JAMA 205:241–242, 1968
7. Rickles NH, Joshi BA: Death from air embolism during root canal therapy: A possible case in a human and an investigation in dogs. J Am Dent Assoc 67:397–404, 1963
8. Lloyd RE: Surgical emphysema is a complication in endodontics. Br Dent J 138:393–397, 1975
9. McGrannahan WW: Tissue space emphysema from an air-turbine handpiece. J Am Dent Assoc 71:884–886, 1965
10. Rhymes R: Postextraction subcutaneous emphysema. Oral Surg 17:271–273, 1964
11. Kleinman HZ: Subcutaneous and mediastinal emphysema after oral surgery: Report of a case. J. Oral Surg 19:527–529, 1961

Anesthesiology
51:81–84, 1979

Age, Height, and Speed of Injection as Factors Determining Caudal Anesthetic Level, and Occurrence of Severe Hypertension

Woo Young Park, M.D.,* Minda Massengale, M.D.,† Thomas E. Macnamara, M.B., Ch,B.‡

Bromage documented that the level of anesthesia achieved with lumbar epidural block was influenced by age and height.[1] However, factors influencing the level of caudal epidural block have not been well investigated in adult patients. Therefore, we decided to study the effects of age, height, and speed of injection on the level of caudal anesthesia in adult patients. During this study unexpected severe hypertension developed in several patients with caudal injection of local anesthetic.

Methods

Subjects of the study were 135 consenting adult male patients given caudal anesthesia for various operations. Premedication consisted of diazepam, 5–10 mg, and morphine sulfate, 5–10 mg im, given approximately an hour prior to operation. Patients were placed in the jackknife position and conventional caudal blocks performed by use of a #20, caudal needle 3.75 cm long. A 30-ml volume 1.5 per cent lidocaine with epinephrine (1:200,000) was injected over 1 min in Group I (85 patients) and over 2 min in Group II (50 patients). On completion of the injection, patients were either turned to the supine position or kept in the jackknife position maintaining the spine horizontal.

* Chief of Anesthesiology, VA Medical Center, and Associate Professor in Anesthesiology, Georgetown University Medical School.

† Staff Anesthesiologist, VA Medical Center.

‡ Professor and Chairman, Department of Anesthesiology, Georgetown University Medical School.

Received from the Veterans Administration Medical Center, Washington, D. C. Accepted for publication November 25, 1978. Presented in part at the Annual Meeting of the American Society of Anesthesiologists, New Orleans, Louisiana, October 15–19, 1977.

Address reprint requests to Dr. Park: Section of Anesthesiology, Veterans Administration Hospital, 50 Irving Street NW, Washington, D. C. 20422.

Downloaded from http://pubs.asahq.org/anesthesiology/article-pdf/51/1/80/623573/0000542-197907000-00018.pdf by guest on 16 August 2022