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CORRESPONDENCE

Subcutaneous emphysema potentially caused by tracheostomy tubes with subglottic suction devices

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To the Editor,

Recently in the *Journal*, Sibley *et al*. reported a series of airway injuries associated with endotracheal tubes (ETTs) with subglottic suction devices (SSDs), mainly presenting as erythema, edema, granulation tissue, and ulceration.[1]

The concerns about ETTs with SSDs increasing tracheal injury initially stemmed from an animal study by Berra *et al*., which showed a specific pattern of tracheal injury at the suction port site in 14 sheep with suction device.[2] Because of this safety concern, *intermittent* subglottic aspiration (SA) is advocated rather than *continuous* SA.

Spapen *et al*. used an automated intermittent SA device in six male patients, and bronchoscopy revealed a diversity of tracheal mucosal lesions (maceration, erythema, linear erosions, ulceration) in the area adjacent to the suction port of the ETT, suggesting that the intermittent SA could also cause injury to the tracheal mucosa.[3]

Here, we report subcutaneous emphysema in two patients potentially associated with an automated intermittent SA device. Written informed consent to report the cases was obtained from the patients' next of kin. We used an automated intermittent SA device in three male patients with tracheostomy tubes (TTs). We performed percutaneous tracheostomy as guided by the standard procedures in our ward.[4] Ultrasound positioning was used preoperatively. The procedure was performed under endoscopic guidance and went smoothly for all patients. After the procedure, the TT SSD (Awakzon™ AG100s, Weishengkang Medical Technology Co. Ltd., Kunshan, Jiangsu, China) was connected to the patients. This TT SSD performs a suction every two hours, with each suction lasting 120 sec. The negative pressure starts from 80 mm Hg, rises to 100 mm Hg and 120 mm Hg, and decreases back to 80 mm Hg. These pressure levels change cyclically, each for 20 sec. One hour later, in all three patients, there were no manifestations of pneumothorax or subcutaneous emphysema. All patients passed a spontaneous breathing trial and were weaned from mechanical ventilation. Nevertheless, about four to six hours after SSD use, a 44-yr-old (Figure) and a 52-yr-old patient developed subcutaneous emphysema. Subglottic suction was stopped immediately. Subcutaneous emphysema did not worsen further and resolved spontaneously over the next four to six days. Given that few patients at our centre developed subcutaneous emphysema or pneumothorax after the use of ultrasound localization combined with fibreoptic bronchoscope-guided percutaneous tracheostomy prior to the use of SSDs, we strongly suspect that the subcutaneous emphysema observed was associated with SSD use (despite the lack of direct evidence).

Previous studies have investigated airway injury related to SSD use in patients with endotracheal intubation.[1,3,5] Nevertheless, no studies have reported SSD-related airway injuries in patients with tracheostomy.

We do not know the mechanism by which subcutaneous emphysema may have occurred. In the study of Spapen *et al*., high-resolution computerized tomography imaging showed entrapment of the posterior tracheal mucosa into

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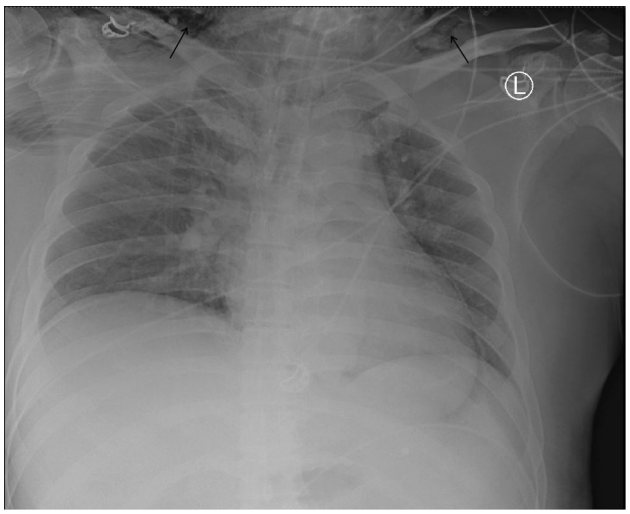

Figure Chest *x-ray* on the first day after tracheostomy of a 44-yr-old male patient with subcutaneous emphysema after the use of a subglottic suction device

the suction port office of the ETT.[3] Although the presentation of injury in our patients differed from that in previous studies, we speculated that the mechanisms might be similar. As the TT SSD could cause negative pressure under the glottis, the tracheal mucosa might be entrapped into the suction port of the TT, resulting in negative pressure in the loose connective tissue between the skin and the trachea. The air might enter the loose connective tissue through the incision in the trachea because of the pressure difference, resulting in subcutaneous emphysema.

Complications associated with TT SSD use have rarely been reported. Here, we report two cases of a typical form of airway injury accompanied by tracheostomy tubes with TT SSDs. Although the relationship between TT SSD use and subcutaneous emphysema was uncertain and the mechanism of subcutaneous emphysema was unclear, we propose that TT SSDs be used cautiously for patients undergoing tracheostomy until the sinus tract forms. The relationship between TT SSD use and airway injury should be further investigated.

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