Case Reports

The Use of Subcutaneous Drains to Manage Subcutaneous Emphysema

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Subcutaneous emphysema is a frequent complication of thoracic and cardiac surgical procedures, and emergency tracheostomy is often advocated as the treatment for this complication. However, we report the case of a patient in whom massive subcutaneous emphysema, which had developed after emergent replacement of the aortic root, was relieved using subcutaneous drains and suction, instead of a tracheostomy. We found that the subcutaneous drains provided effective decompression of the head and neck areas, and markedly reduced airway pressure and subcutaneous air. We recommend subcutaneous drains for safe, effective, and inexpensive management of massive subcutaneous emphysema. ***(Tex Heart Inst J 1999;26:129-31)***

Subcutaneous emphysema is a frequent complication of thoracic and cardiovascular surgical procedures. Subcutaneous emphysema can be minimal, requiring no specific treatment; or it can be massive, rapidly increasing, severely disfiguring, and even life threatening. The main risk of subcutaneous emphysema is rapid, massive accumulation of air in the deeper tissue planes at the level of the thoracic inlet. This accumulation can substantially compress the trachea and the great vessels, which can severely compromise the airway, venous return, and blood flow to the head and neck.[1] Emergency tracheostomy is often advocated to alleviate the compression. However, we report the case of a patient in whom we used a much simpler technique—a variation of a subcutaneous drain—to alleviate acute, massive subcutaneous emphysema that was causing severe compression of the head and neck.

Case Report

In July of 199-, a -0-year-old man was admitted to our institution with an acute type I dissection of the thoracic aorta. He had undergone aortic valve replacement several years earlier.

He underwent an emergency surgical procedure to replace the aortic root with a valved conduit; the coronary arteries were reimplanted into the graft. Severe adhesions were present in the chest, and dissection in the surgical field resulted in some air leakage from the lung parenchyma. Three chest tubes were inserted: in both pleural cavities and the mediastinum.

During the 1st 12 hours after the operation, the patient developed gradually accumulating subcutaneous emphysema. At 16 hours after the operation, the subcutaneous emphysema had massively expanded to involve the entire torso, neck, head, abdomen, groin, scrotum, and thighs. The patient remained intubated. Serial chest radiography showed the lungs to be fully inflated with no evidence of pneumothorax or pneumomediastinum. By this time, however, the air pressure in the subcutaneous plane had greatly increased, so that the neck was tense and the eyelids were swollen tightly shut. We decided to decompress the subcutaneous plane at the patient's bedside by inserting subcutaneous drains.

Using local anesthesia (0.5% lidocaine HCl), we made a small (1.5 cm) transverse incision on each side of the midclavicular line, midway between the clavicle and the nipple. Using careful blunt dissection in the subcutaneous plane, we created an 8- to 10-cm vertically oriented track just superficial to the pectoral fascia on both sides. Creation of the track was facilitated by the air itself, which had lifted the subcutaneous tissue away from the deeper planes. Medium-sized Jack-

Key words: *Drainage/subcutaneous; mediastinal emphysema/therapy; pneumothorax; subcutaneous emphysema/therapy*

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son-Pratt drains were gently placed in the tracks and were fixed to the skin with a 2-0 silk suture (Fig. 1). Suction was applied to the drains by using the connected bladder. Chest radiography was used to check the drain position and to rule out pneumothorax.

Effective decompression of the head and neck was achieved within 3 hours, reducing the pressure on the airway and markedly reducing subcutaneous air. The patient continued to improve over the next few days, and he was extubated after 48 hours. The drains were removed by the end of the 1st postoperative week. Resolution of the subcutaneous emphysema was nearly complete by the time the patient was discharged from the hospital.

Discussion

The objective in treating subcutaneous emphysema is to decompress the thoracic inlet and the neck. Emergency tracheostomy[2] is often advocated for this purpose because it effectively and rapidly establishes an adequate airway; keeps the deeper tissue planes in the thoracic inlet and the neck (especially the subfascial space of Stiles) decompressed; and maintains positive intrathoracic pressure, which enables the lungs to fully expand. However, subcutaneous drains provide a simpler and more cost-efficient method of relieving the pressure caused by subcutaneous emphysema.

Most of the air leaks responsible for the development of subcutaneous emphysema occur below the level of the thoracic inlet and result from injury to the parenchyma of the lung.[2] The leaking air then moves cephalad in the tissue planes to the root of the neck. Therefore, the optimal site for draining the collecting air is at the level of the thoracic inlet, so that the air escapes to the outside before it finds its way into the deep tissue spaces. Subcutaneous drains of adequate diameter can be inserted into the subcutaneous plane so that they lie in an infraclavicular position. Leaking air is then drained, either in a passive fashion or with the use of continuous or intermittent suction. Several types of semirigid tubing have been used, including Hemovac® drains,[3] regular 20-F chest tubes, and even intravenous tubing with side holes. It should be noted that the insertion of a trocar-type chest tube into the subcutaneous plane carries some risk of pneumothorax.[4] We found that the semirigid Jackson-Pratt drain worked extremely well, and it was easily and atraumatically inserted into the subcutaneous tissues. Like other drains, the Jackson-Pratt has multiple side holes to provide adequate drainage.

In the 1st few hours after insertion of the drains, the application of some sort of suction is beneficial for rapid decompression of the tissue planes. We found that the air under pressure follows the path of least resistance—in this case the drain—away from the tissue planes. Suction also ensures the patency of the drain.

Other techniques have been used to manage subcutaneous emphysema with varying success. The

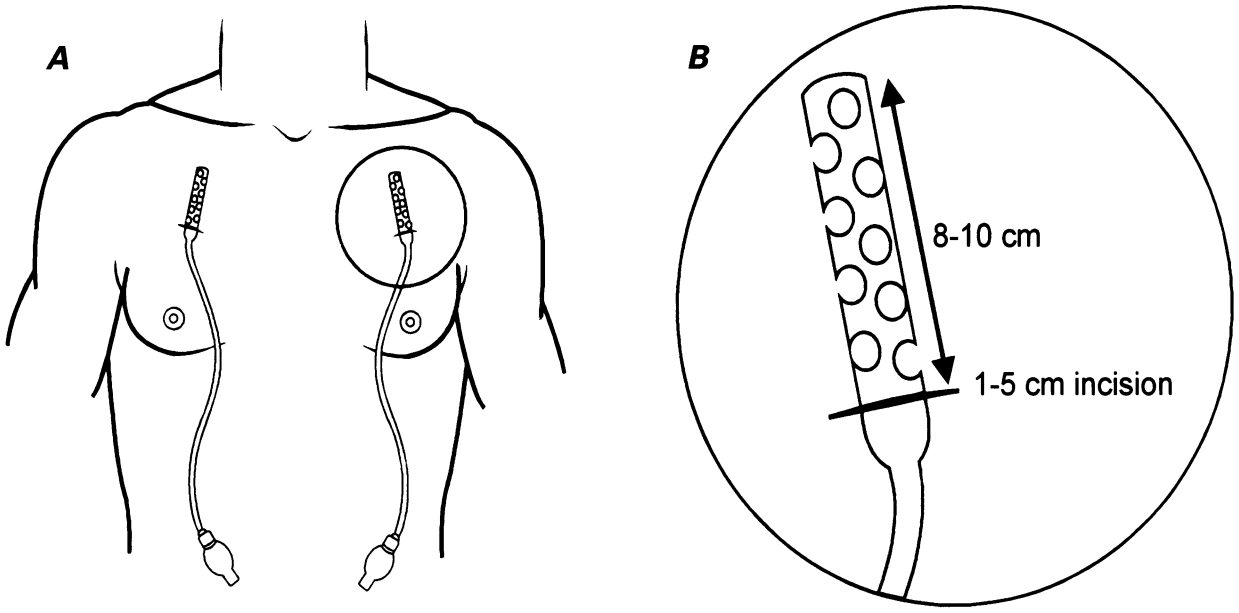

Fig. 1 ***A)*** *A 1.5-cm transverse incision was made on each side of the midclavicular line, midway between the clavicle and the nipple.* ***B)*** *By careful blunt dissection in the subcutaneous plane, an 8- to 10-cm vertically oriented track was created just superficial to the pectoral fascia on both sides. Medium-sized Jackson-Pratt drains were gently placed in the tracks.*

Illustration by C.J. Latta after H.M. Sherif.

least effective of these techniques is the insertion of medium- or large-bore intravenous catheters or needles into the subcutaneous plane. The drainage achieved with this method is, at best, very limited because the lumens of the needles are too narrow; the attempt can be likened to trying to drain a boggy hematoma by using a needle and syringe. Another technique involves the use of multiple incisions or "blow holes."[5] In this technique, a number of small (2 cm) incisions are made in the skin of the anterior chest wall, and blunt dissection is used to create short tracks down to the level of the pectoral fascia. The tracks work for a short time, but factors such as tissue recoil and plasma clot can cause them to collapse and close.

In summary, the use of subcutaneous drains to manage acute massive subcutaneous emphysema is effective, simple, and safe. We found that the Jackson-Pratt drain worked well. Treatment via this method is inexpensive and can be carried out at the bedside without any added risk to the patient. We recommend that this often overlooked technique be used more frequently.

References

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