

'Safe Triangle' as the Preferred Site for Drainage of a Spontaneous Pneumothorax: Is it the Right Option?

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The 'safe triangle' is an anatomical area which is bounded by the lateral border of the pectoralis major anteriorly, the lateral border of the latissimus dorsi laterally, the line of the 5th intercostal space inferiorly and the base of the axilla superiorly [1].

This 'safe triangle' is now a commonly preferred site for drainage of a spontaneous pneumothorax, as recommended by the British Thoracic Society (BTS). It is the preferred site for chest tube insertion, as it minimizes the risk of injury to internal organs, vascular structures such as the internal mammary artery, muscles and breast tissue [2]. However, complications associated with insertion of chest tube drainage in the 'safe triangle' are also known. These include puncture of major organs such as the lungs, liver, heart, spleen and also bleeding due to large vessel perforation.

We have observed in clinical practice that the 'safe triangle' is not exactly the best site for drainage of a spontaneous, free pneumothorax, as the tube placement is 'much too low'. Precisely, this is not the ideal site for drainage of a spontaneous, free pneumothorax, as the location goes against the basic premise of physics that, 'air always rises'.

When an intercostal chest tube is inserted in the 'safe triangle' for drainage of a spontaneous, free pneumothorax, the lung re-expands and invariably abuts on the drainage tube thereby blocking it. Further drainage is then obstructed and the tube again needs to be readjusted. Moreover, this also results in pain and in some cases lung contusion. Once the lung re-expands and blocks the drainage tube, the remainder air gets entrapped in the apical region of the pleural cavity and cannot be drained out. This, in many cases therefore defeats the very purpose of intercostal tube drainage in a patient with a pneumothorax, as the air trapped in the apical portion of the pleural cavity cannot be drained by the tube, as it is located at a 'lower level' than the air in the pleural cavity. Consequently, in an attempt to drain the air trapped at the apex, the treating physician then invariably tries to push the tube further upwards, thereby leading to severe pain, trauma and sometimes even a pleural reaction.

In order to avoid these complications, in case of a spontaneous, free pneumothorax (free air in the pleural cavity), it is best to insert the chest tube in the 2nd intercostal space (along the upper border of the 3rd rib), 1 - 2 cm lateral to the mid-clavicular line, (as it is a fact that free air always rises). Moreover, this site is quite safe from injury to any internal organs, breast tissue or large vessels. The chest tube can be inserted using the Seldinger technique or by an open surgical incision. Another advantage of this position is that a very small length of the tube needs to be inserted into the pleural cavity, which mitigates the chance of early tube blockage, pain, infection, lung injury or a pleural reaction secondary to the presence of a foreign body (chest tube) in the pleural space. Moreover, the tube invariably never needs to be readjusted which significantly reduces the duration of intercostal drainage, thereby reducing duration of hospitalization and consequent morbidity in the patient.

Hence, it is our clinical observation that in case of a spontaneous, free pneumothorax, chest tube insertion should be done in the 2nd intercostal space, 1 - 2 cm lateral to the mid-clavicular line, along the upper border of the 3rd rib, rather than the 'safe triangle,' as, besides being safe, this is also a more effective site for drainage and also significantly reduces morbidity and hospital stay for the patient.

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