Traumatic occult pneumothorax: the optimal management for the ventilated patient

Occult pneumothorax is defined as the pneumothorax not visible on a chest radiograph but found on a computed tomography scan. The incidence of occult pneumothorax has increased with the use of whole body computed tomography scans for trauma patients and is found in up to 15% of patients suffering blunt trauma. Controversy exists regarding the optimal management of these patients especially when they require positive pressure ventilation. Should a thoracostomy tube be inserted or not?

For insertion of a thoracostomy tube

Traditional teaching has been to insert a thoracostomy tube for patients with an occult pneumothorax, especially if they require positive pressure ventilation, a sentiment echoed by the Advanced Trauma Life Support guidelines. The worry is that without it these patients may suffer from progression of their pneumothorax and at worst this may develop into a life-threatening tension pneumothorax.

Enderson et al decided to challenge this theory in 1993 by prospectively randomizing patients with an occult pneumothorax to either have a thoracostomy tube inserted or be observed. Of the 21 patients observed 15 required positive pressure ventilation. Of these 15, three developed a tension pneumothorax and five had progression of their pneumothorax requiring insertion of a thoracostomy tube. They concluded that traditional teaching was correct and that all patients with an occult pneumothorax requiring positive pressure ventilation should have a thoracostomy tube inserted.

Against initial insertion of a thoracostomy tube

Insertion of a thoracostomy tube is not without its complications, with some studies quoting up to 21% suffering associated morbidity. These problems include pain, inadvertent removal, post-removal complications, empyema, pneumonia and longer hospital stays. Perhaps more worryingly improper placement can lead to vascular and cardiac injury, which can result in death, as observed by Ball et al (2003).

'Insertion of a thoracostomy tube is not without its complications... [which] include pain, inadvertent removal, post-removal complications, empyema, pneumonia and longer hospital stays.'

Given these potentially serious consequences surely due consideration should be given before proceeding with insertion of a thoracostomy tube.

Two reviews of the literature up to 2009 found seven different studies considering this question (Ball et al, 2003; Yadav et al, 2010). Overall 256 patients were included with approximately half being observed and, of these, although 35 had progression of their pneumothorax requiring thoracostomy tube insertion, only four developed a tension pneumothorax, three of these being in the study by Enderson et al (1993) mentioned above. However, it is unclear how many received positive pressure ventilation although many patients did.

Subsequently two further studies have been carried out. One was a retrospective review that found 68 patients with a occult pneumothorax (Wilson et al, 2009). Of these 33 were observed and even though 16 of these required positive pressure ventilation none of them progressed to require a thoracostomy tube. The second study was a prospective multicentre study that collected 568 patients, of which 448 were observed (Moore et al, 2011). Of these 73 received positive pressure ventilation and only 27 in total required a thoracostomy tube to be subsequently inserted, none of whom suffered a tension pneumothorax.

Conclusions

Although studies vary in their recommendations of how best to treat an occult pneumothorax, more recent studies appear to favour observation. The rationale behind the reduced rates of progression of the pneumothorax has been attributed to the reduction in the pressures used for positive pressure ventilation by today's clinicians. Although progression to tension pneumothorax can never be fully excluded, observation with heightened awareness does negate the need for a thoracostomy tube and the complications associated with them. **BJHM**

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