

# APSR RESPIRATORY UPDATES



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For members of the Asian Pacific Society of Respiriology, indications for referring a patient with pneumothorax for surgery should be very familiar. The American College of Chest Physicians (ACCP) in 2001 and the British Thoracic Society (BTS) in 1993, 2003 and 2010 published guidelines for the treatment of pneumothorax, and these remain the most widely recognized algorithms today. Nonetheless, with increasing clinical experience gained in the years since, trends have emerged which may influence how we select patients for surgery. In particular, 3 trends are worthy of special attention: the use of radiological findings as indicators for surgery; the influence of age; and special considerations in female patients.

In this edition of the APSR Update, a number of the most recently published papers have been selected to reflect and illustrate the above trends.

First of all, however, one must be reminded of the need for timely referral for surgery:

### **Treatment of pneumothoraces at a tertiary centre: are we following the current guidelines?**

**Authors:** Elsayed H, *et al.*

**Reference:** Interactive Cardiovascular & Thoracic Surgery. 12(3):430-3, 2011 Mar.

**URL:** <http://icvts.oxfordjournals.org/content/12/3/430.full>

**Comments:** In a major Cardiothoracic Surgery unit in the UK, 120 patients transferred in for management of pneumothorax were analyzed. It was found that the *median* time of referral for patients was an appalling 12 days [interquartile range (IQR) 9-12], which was far above the recommendations in any guideline. Even the introduction of the 2003 guidelines, which would have been expected to prompt more expedient referrals, failed to make any difference. The problem is not only unnecessarily prolonged hospitalization for patients, but a risk of causing harm. In this series, intrapleural infection was significantly more likely if the time to surgery was delayed >14 days (P=0.03). In an eComment attached to this paper, it was confirmed that this phenomenon of delayed referral for surgery was not only seen in Europe, but in Asia as well. Evidently, there is a pressing need to now re-evaluate indications for surgical referral and actively avoid delays.

## **1. Radiological Findings as indicators for surgical referral**

### **Size of pneumothorax can be a new indication for surgical treatment in primary spontaneous pneumothorax: a prospective study**

**Authors:** Sayar A, *et al.*

**Reference:** Annals of Thoracic & Cardiovascular Surgery. 20(3):192-7, 2014.

**URL:** [https://www.jstage.jst.go.jp/article/atcs/20/3/20\\_0a.12.02212/article](https://www.jstage.jst.go.jp/article/atcs/20/3/20_0a.12.02212/article)

**Comments:** Studying an original idea, the authors assessed 181 patients hospitalized with the diagnosis of primary pneumothorax, and determined the size of pneumothorax in all patients using the method defined by Kircher and Swartzel. Patients were divided into two groups, according to pneumothorax size: Group A (large pneumothorax, >50%), and Group B (small or moderate pneumothorax, <50%). The rate of patients requiring surgical operation (for prolonged air leak or recurrent episodes) was significantly higher in Group A (51.9%) than in Group B (19.7%; p <0.001). This is one of the first studies to suggest that size of a pneumothorax on CXR *per se* (>50% by volume) can be used as an indication for surgical referral.

**Management of pneumothoraces detected on chest computed tomography: can anatomical location identify patients who can be managed expectantly?**

**Authors:** Agbo C, et al.

**Reference:** Journal of Emergency Medicine. 46(5):605-11, 2014 May.

**URL:** [http://www.jem-journal.com/article/S0736-4679\(13\)01405-4/fulltext](http://www.jem-journal.com/article/S0736-4679(13)01405-4/fulltext)

**Comments:** This study looked at CT scans performed for 183 traumatic pneumothoraces, and attempted to identify if the location of pre-treatment pneumothorax as seen on CT could be associated with subsequently required management. The authors failed to find any positive correlation. Nonetheless, the idea is potentially intriguing. Future studies looking at whether location of pathology on CT in cases of primary and secondary spontaneous pneumothoraces have any bearing on management (including surgical referral) may be worth conducting.

**Treatment outcomes of pneumothorax with chronic obstructive pulmonary disease**

**Authors:** Ota H, et al.

**Reference:** Asian Cardiovascular & Thoracic Annals. 22(4):448-54, 2014 May.

**URL:** <http://aan.sagepub.com/content/22/4/448.full>

**Comments:** The authors looked at 58 patients with emphysema-dominant chronic obstructive pulmonary disease who were admitted with secondary spontaneous pneumothorax. CT scans were performed on all patients, and the presence or absence of pulmonary fibrosis in addition to the emphysema was noted. There was no significant difference in the recurrence rate after nonsurgical treatment, but the presence of pulmonary fibrosis on CT was associated with possibly higher mortality risk after surgery, and a significantly higher mortality rate from respiratory failure during follow-up. CT scanning was therefore suggested to be useful in identifying pulmonary fibrosis as a contra-indication for surgery in these emphysematous patients.

**Surgery for secondary spontaneous pneumothorax: risk factors for recurrence and morbidity**

**Authors:** Isaka M, et al.

**Reference:** Interactive Cardiovascular & Thoracic Surgery. 17(2):247-52, 2013 Aug.

**URL:** <http://icvts.oxfordjournals.org/content/17/2/247.long>

**Comments:** The authors retrospectively studied 97 consecutive surgical treatments (VATS bullectomy) on 94 patients with SSP who had emphysematous changes of lung. Emphysematous changes on preoperative computed tomography image were evaluated by the Goddard score, which is a visual scoring system. They found that a Goddard score >7 was a significant risk factor for peri-operative morbidity, while pulmonary fibrosis tended to increase the risk of recurrence (hazard ratio: 4.21, P=0.051), and a Goddard score >7 (hazard ratio: 7.79, P=0.023) was a significant risk factor for recurrence. Taken in conjunction with the above paper from Ota et al, this further suggests a potential role for CT in selecting emphysema patients who may or may not be good candidates for surgery.

### **A new method to detect air leakage in a patient with pneumothorax using saline solution and multidetector-row spiral CT scan**

**Authors:** Nakanishi K, et al.

**Reference:** Chest. 144(3):940-6, 2013 Sep.

**URL:** <http://journal.publications.chestnet.org/article.aspx?articleid=1674760>

**Comments:** The authors describe an interesting technique whereby sterile 0.9% saline was injected into the pleural cavity via a chest tube already placed for spontaneous pneumothorax. While each patient vocalized continuously, multiple bubbles formed foam or wave shadows that could sensitively identify and localize sites of air leaks were noted in over 80% of patients. In all cases, patients underwent video-assisted thoracoscopic surgery and their points of leakage suggested on CT could be confirmed intra-operatively. This is a simple and apparently safe technique that could further allow CT to identify patients that would benefit from early surgical referral.

## **2. Age as a consideration in surgical referral**

### **Management of the pediatric spontaneous pneumothorax: is primary surgery the treatment of choice?**

**Authors:** Lopez ME, et al.

**Reference:** American Journal of Surgery. 208(4):571-6, 2014 Oct.

**URL:** [http://www.americanjournalofsurgery.com/article/S0002-9610\(14\)00319-5/fulltext](http://www.americanjournalofsurgery.com/article/S0002-9610(14)00319-5/fulltext)

**Comments:** The authors identified 96 pediatric patients with 108 pneumothoraces. Outcomes of initial non-operative treatment versus VATS blebectomy and mechanical pleurodesis were compared. Of 98 pneumothoraces with initial nonoperative management, 37% had surgery during their initial hospitalization for persistent air leak. Of those discharged home without video-assisted thoracoscopic surgery, 40% recurred. Initial nonoperative management resulted in more total hospital days (median: 11 vs 5 days,  $P < .001$ ). Ultimately, 63% of all patients required surgery. These striking results from a major surgical unit in the USA provide a very compelling argument in favor of offering surgery to children even on the first episode of spontaneous pneumothorax.

### **Video-assisted thoracoscopic surgery for primary spontaneous pneumothorax in children**

**Authors:** Choi SY, et al.

**Reference:** Pediatric Surgery International. 29(5):505-9, 2013 May.

**URL:** <http://link.springer.com/article/10.1007%2Fs00383-013-3273-0>

**Comments:** The authors performed 281 VATS procedures in 257 patients with PSP. Although they found that the recurrence rate was significantly higher in the children's group than in the young adult group (10.6 vs. 3.9 %,  $P = 0.032$ ), the operative outcomes did not differ significantly. The authors conclude that VATS is a safe and effective procedure for PSP in children. The increased risk of recurrence in children may be related to the formation of

new bullae, and this may be a target for further operative improvements in future. In light of the poor outcomes of non-surgical treatment as suggested by the above paper from Lopez et al, the increased risk of post-operative recurrence in children compared to adults is certainly not large enough to preclude offering of surgery to children.

**Surgical results of video-assisted thoracic surgery and risk factors for prolonged hospitalization for secondary pneumothorax in elderly patients**

**Authors:** Matsuoka K, et al.

**Reference:** Annals of Thoracic & Cardiovascular Surgery. 19(1):18-23, 2013 Feb 20.

**URL:** [https://www.istage.jst.go.jp/article/atcs/19/1/19\\_oa.12.01909/article](https://www.istage.jst.go.jp/article/atcs/19/1/19_oa.12.01909/article)

**Comments:** The authors looked at patients at the other end of the age spectrum: 73 patients aged 70 years or over receiving VATS for secondary pneumothorax. They note a postoperative mortality rate of 2.7% and a complication rate of 9.6%, which is not unexpected for this patient population. The median postoperative drainage and hospital stay periods were 2 days (1-40 days) and 5 days (2-51 days). More importantly, patients with interstitial pneumonitis, pulmonary infection and low total protein or sodium levels were the risk factors for hospital stay longer than 7 days. Studies such as this demonstrate that it is possible to offer surgery to elderly patients with secondary pneumothorax with reasonably good outcomes, and risk factors are identifiable to help select patients according to surgical risk.

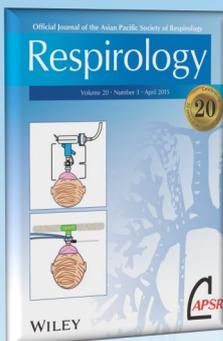
**Intraoperative mechanical and chemical pleurodesis with 50 % glucose solution for secondary spontaneous pneumothorax in patients with pulmonary emphysema**

**Authors:** Tsukioka T, et al.

**Reference:** Surgery Today. 43(8):889-93, 2013 Aug.

**URL:** <http://link.springer.com/article/10.1007%2Fs00595-013-0497-5>

**Comments:** The authors looked at relatively elderly patients (mean age 68 years) with pulmonary emphysema-related pneumothorax. Patients received bullectomy, 500 mL of a 50 % glucose solution instilled into the pleural cavity, and then mechanical pleurodesis. One patient died of pneumonia on POD 24. All other patients survived without pneumothorax recurrence after a mean postoperative follow-up period of 521 days. This is another example of surgical series emerging in recent years showing reasonably good results even when operating on patients traditionally regarded as having prohibitively high risk.



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### 3. Special situations in female patients

#### **Pneumothorax in women of child-bearing age: an update classification based on clinical and pathologic findings**

**Authors:** Legras A, et al.

**Reference:** Chest. 145(2):354-60, 2014 Feb.

**URL:** <http://journal.publications.chestnet.org/article.aspx?articleid=1746171>

**Comments:** This paper reports a series of 229 women (mean age, 33 years) who underwent surgery for spontaneous pneumothorax. At pathology, thoracic endometriosis was diagnosed in 54 cases (24%), and all of these cases were positive for progesterone and/or estrogen receptors. Catamenial pneumothoraces (n = 80, 34.9%) were endometriosis related in 50% of cases (n = 40, 17% of the whole population). Multivariate analysis showed that right side, presence of diaphragmatic abnormalities, relapse after unilateral surgery, and presence of hemosiderin-laden macrophages were independent variables associated with thoracic endometriosis (all,  $P < .02$ ). Apical emphysema-like changes were found in 184 of the 213 patients (86%) with apical resection and were significantly associated with the absence of thoracic endometriosis ( $P < .001$ ). This paper brings to light the fact that catamenial and endometriosis related pneumothoraces are perhaps much more important amongst female pneumothorax patients of child-bearing age than previously realized. Failure to recognize this may lead to delay or omission of referral for appropriate management (including surgery).

#### **Videothoroscopic repair of diaphragm and pleurectomy/abrasion in patients with catamenial pneumothorax: a 9-year experience**

**Authors:** Attaran S, et al.

**Reference:** Chest. 143(4):1066-9, 2013 Apr.

**URL:** <http://journal.publications.chestnet.org/article.aspx?articleid=1388069>

**Comments:** This is a case series in which 12 patients with proven catamenial pneumothorax operated on using a videothoroscopic approach, diaphragmatic repair, and pleurectomy/pleural abrasion. All patients received hormone therapy for 6 to 12 months postoperatively. All cases except one underwent a primary operation. One patient had previously had videothoroscopic pleurodesis without diaphragm repair at another center. In all cases, findings typical of catamenial pneumothorax were identified within the pleural cavity, mainly on the diaphragm. There were no postoperative complications and no mortality. After a median follow-up of 45.8 months, only one patient suffered a single episode of recurrence before starting hormonal therapy. This is but one example of surgical studies now showing excellent results for aggressive surgical management of catamenial pneumothorax. The key, however, remains early identification of patients with this condition and consequently expeditious referral for multi-modality treatment.

### Should pregnant patients with a recurrent or persistent pneumothorax undergo surgery?

**Authors:** Nwaejike N, et al.

**Reference:** Interactive Cardiovascular & Thoracic Surgery. 17(6):988-90, 2013 Dec.

**URL:** <http://icvts.oxfordjournals.org/content/17/6/988.long>

**Comments:** This is a timely systematic review that addresses a challenging clinical scenario: in pregnant patients with a recurrent or persistent pneumothorax, is surgery safer compared with conservative treatment for the wellbeing of the patient and the foetus? The authors' findings suggest that there is no difference in outcome to the mother or foetus if a conservative approach (observation or tube thoracostomy) is used compared with surgery prior to the delivery of the baby. However, an initial conservative approach could lead to surgery after delivery for a persistent pneumothorax in as much as 40% of patients. This in turn delays discharge home and compromises the normal interaction between the mother and new-born child, which might be distressing. Although the authors do not recommend one approach over the other, they do advise that patients should be warned of this probability if surgery is not chosen.

### Awake video-thoroscopic surgery for intractable pneumothorax in pregnancy by using a single portal plus puncture

**Authors:** Onodera K, et al.

**Reference:** Interactive Cardiovascular & Thoracic Surgery. 17(2):438-40, 2013 Aug.

**URL:** <http://icvts.oxfordjournals.org/content/17/2/438.long>

**Comments:** The authors report a 31-year old female patient in the ninth week of pregnancy who developed a pneumothorax on the right side. The patient previously had a contralateral pneumothorax 11 years earlier, and now there was a continuous air leakage. The authors performed VATS under local and epidural anaesthesia only, with the patient awake during the surgical intervention. Similar reports have emerged repeatedly in recent years, documenting safe surgery for pregnant patients. There is insufficient evidence to suggest that this should become a mainstream approach at this time, but reports like this should encourage a multi-disciplinary assessment involving surgeons and anaesthetists should such a situation arise.

## 4. Asia

### Needlescopic video-assisted thoracic surgery pleurodesis for primary pneumothorax

**Authors:** Sihoe AD, et al.

**Reference:** Multi-Media Manual of Cardio-Thoracic Surgery 2014: mmu012 doi:10.1093/mmcts/mmu012.

**URL:** <http://mmcts.oxfordjournals.org/content/2014/mmu012.full>

**Comments:** Asia has traditionally been a pioneer in advanced operative techniques for pneumothorax surgery. In this study, the authors present a needlescopic VATS approach that uses the patient's existing chest drain wound as a working port and adds only two 3-mm ports to provide equally effective bullectomy and pleurodesis

as conventional VATS. By potentially reducing morbidity for the individual patient, the nVATS approach may lower thresholds for surgical candidacy in Asia - even for first episodes of primary pneumothorax.

### Surgery for primary pneumothorax: new ideas, new paradigms

**Authors:** Sihoe AD & Cheng LC.

**Reference:** Hong Kong Medical Association CME Bulletin. June 2014: 4-10

**URL:** <http://www.hkma.org/english/cme/onlinecme/cme201406main.htm>

**Comments:** This review highlights two very pertinent facts that many clinicians do not realize. First, the recurrence rate of a first episode of primary pneumothorax is considerably higher than most clinicians think if treated conservatively. In fact, more than half of all young patients will have a recurrence unless intervention is given. Second, such intervention is considerably less traumatic than most clinicians and patients fear. Modern surgery - available in Asia - has allowed effective pneumothorax prevention to be effected with minimal discomfort and very rapid recovery. When these two facts are put together, it means that thresholds for pneumothorax surgery in Asia now need to be significantly lowered for the sake of the patients.

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