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Correlating Radiology with Thoracoscopic Findings in a Case of Primary Spontaneous Pneumothorax in a Child

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ABSTRACT

Background: Spontaneous pneumothorax hardly occurs in healthy children. Diagnosing its etiology can be difficult. Chest X ray and Computerized Tomographic scan (CT) are useful investigations but have limitations. CT scan in combination with video assisted thoracoscopic surgery (VATS) improves diagnostic accuracy and facilitates appropriate management of non-resolving spontaneous pneumothorax. Showcased are images demonstrating how effectively CT complements video assisted thoracoscopic surgery (VATS) in managing a recalcitrant case of spontaneous pneumothorax caused by a solitary bulla.

Objectives: A 15 year old boy presented to the referring hospital with a right sided spontaneous pneumothorax which occurred whilst playing football

Case report: A 15 year old boy presented to the referring hospital with a right sided spontaneous pneumothorax which occurred whilst playing football. His symptoms were shortness of breath and right pleurisy chest pain. His oxygen saturations were more than 95% on air. A needle aspiration was performed yielding 2300mls of air, however the pneumothorax persisted.

Conclusions: In cases of pontaneous pneumothorax, Chest X ray and Computerised Tomographic scan have limitations. CT scan in combination with video assisted thoracoscopic surgery improves diagnostic accuracy and facilitates appropriate management of non-resolving spontaneous pneumothorax.

Keywords: Pneumothorax; Spontaneous; Blebs; Vat Protein

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Implication for health policy/practice/research/medical education:
In cases of spontaneous pneumothorax Chest X ray and Computerized Tomographic scan have limitations. CT scan in combination with video assisted thoracoscopic surgery improves diagnostic accuracy and facilitates appropriate management of non-resolving spontaneous pneumothorax.

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1. Background

Spontaneous pneumothorax hardly occurs in healthy children. Diagnosing its etiology can be difficult. Chest X ray and Computerized Tomographic scan (CT) are useful investigations but have limitations. CT scan in combination with video assisted thoracoscopic surgery (VATS) improves diagnostic accuracy and facilitates appropriate management of non-resolving spontaneous pneumothorax. Showcased are images demonstrating how effectively CT complements video assisted thoracoscopic surgery (VATS) in managing a recalcitrant case of spontaneous pneumothorax caused by a solitary bulla.

2. Case Report

A 15 year old boy presented to the referring hospital with a right sided spontaneous pneumothorax which occurred whilst playing football. His symptoms were shortness of breath and right pleurisy chest pain. His oxygen saturations were more than95% on air. A needle aspiration was performed yielding 2300mls of air, however the pneumothorax persisted (Figure 1). An intercostal drain was inserted next day. He was subsequently (4 days later) transferred to our tertiary pediatric surgical center for a non-resolving pneumothorax (Figure 2). On arrival, the drain was noted to be bubbling on coughing and was placed under negative suction of 5cm H20. Following a further 4 days without resolution, a CT scan was requested and demonstrated a right-sided uncomplicated pneumothorax and a collapsed right lung with an associated bulla in the apical segment of the upper lobe (Figure 3). The patient was taken to the operating theatre, placed in a left lateral position and subjected to a right thoracoscopy utilizing two 5mm working and a 10mm camera port in the 3rd, 5th and 7th interspaces in the anterior axillary line. The collapsed right lung was essentially normal apart from a solitary small bulla in the apex of the upper lobe (Figure 4). The bulla was managed by simple excision utilizing an end stapler introduced via the 10 mm working port (Figure 5).The lung was then re-inflated by positive pressure and the integrity of the pulmonary suture line confirmed by submersion of the apex of the lung in saline. A large drain was placed through one of the 5mm port sites and secured. Follow up chest X-ray confirmed complete re-inflation of the lung (Figure 6). The chest drain was removed 48 hours later. The patient was followed up as an outpatient and remained asymptomatic a year later.

3. Discussion

In 1932 Kjaergard, provided a modern description of primary spontaneous pneumothorax which is defined as a condition arising from a normal lung, commonly from apical blebs or bullae (1). Occasionally, it may be attributable to pleural porosity. No study has been able to clearly explain the relationship between pleural porosity, blebs/bullae and pneumothorax (2, 3). Secondary spontaneous pneumothorax (SSP) is a pneumothorax arising from abnormal pulmonary parenchymal disease as in cystic fibrosis and in connective tissue disorders (Marfan's syndrome, Ehlers-Danlos syndrome, etc) whereas recurrent spontaneous pneumothorax is defined as a metachronous pneumothorax which may be ipsilateral or contralateral. Spontaneous pneumothorax occurs in 24 per 100,000 men and 9.8 per 100,000 women in UK (4). Males are more commonly affected whereas there is no preponderance below 9 years of age (3). The typical patient is a tall, slim boy with a low body mass index (BMI) presenting with cough, breathlessness and chest pain (5, 6). Paediatric spontaneous pneumothorax (PSP) is commonly left sided 54-67 % (7). There is a dearth of literature pertaining purely to paediatric age group; requiring extrapolation of adult management guidelines in managing paediatric patients (7-9). Conservative management of spontaneous pneumothorax (SP) is less successful in children and its recurrence rate is estimated between 37% - 61% (7, 8). Recurrence rates after surgery are probably higher in pediatric patients compared to that in adults however the data is not so clear (7, 9). Spontaneous pneumothorax occurs within first 6 months (9). In addition, bilateral diseases break out in children more than adults (3, 9). Detection of blebs and bullae are important since their presence is thought to be the cause of spontaneous pneumothorax and recurrences (10, 11). By means of improved CT imaging, 75 -100% of patients with PSP will have blebs/bullae demonstrated (10-12). The prevalence of bleb is 0-15% in public (5, 7). Air leaks at the site of the blebs have been seen in up to 76% of cases undergoing thoracotomy. Pulmonary pathomorphologic may be present in some normal looking cases and is sometimes the cause of pneumothorax .In this condition, the lung looks grossly normal with a normal CT scan. The diagnosis in these cases is usually done at histopathology (12, 13). An X-ray chest is the primary investigation for detection of pneumothorax but fails to identify underlying blebs or bullae in almost half of the cases demonstrated by CT (3, 10). The majority of blebs/bullae is present in the apical region and is usually fewer than 5 in number (8, 10). Management decisions are mainly based on X rays and CT scans are not performed routinely (10). As there is limited published information on the reliability of CT's in pediatric practice any firm conclusion regarding false negative and false positive rates is difficult. False negatives might arise when some areas of the lung are not scanned due to the spacing of imaging sections. The sensitivity of CT scanning is improved by using lung windows, decreasing thickness of image sections, image reconstructions and evaluations by experienced radiologists (8, 10). CT, itself, has limitations but this may improve when complemented by video assisted thoracoscopic surgery (VATS) which also offers a therapeutic option. The sensitivity of VATS in detecting small blebs is estimated 95% (93-100%) and according to several studies,

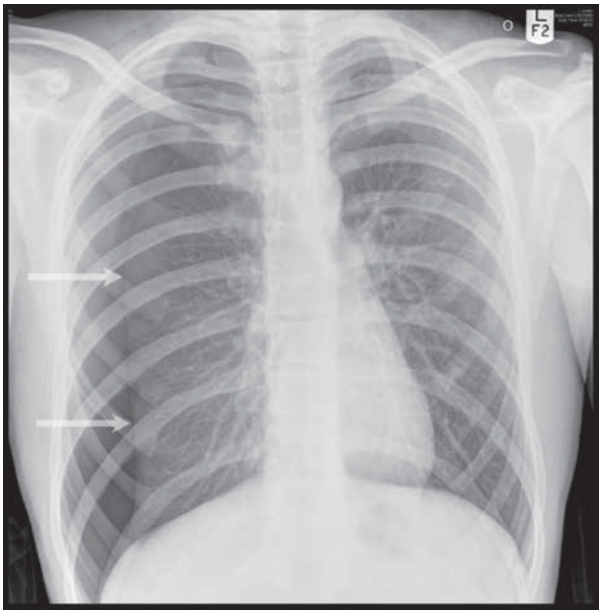

Figure 1. Initial Chest X Ray in a Fifteen Year Old Demonstrating a Spontaneous Pneumothorax on Right Hand Side (Marked By Arrows). X-Ray 70kv, 3mas and Dose 0.5msv

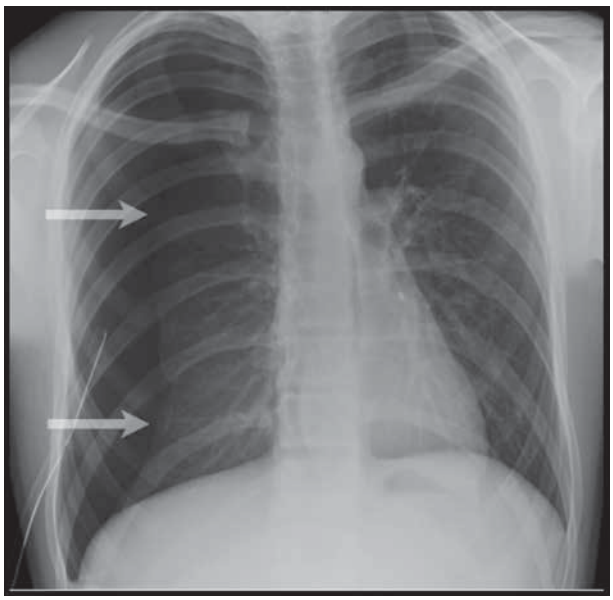

Figure 2. Chest X Ray on Day 2 Post Admission Demonstrating Persistence of Pneumothorax on the Right (Marked By Arrow)

it is higher than CT scan (7, 13). However visualization by VATS is limited to the surface, intra parenchymal lung pathology may be missed. The pickup rate is also operator dependent (10). As the majority of blebs are in the apical region, the impact of this disadvantage decreased. VATS is both diagnostic and therapeutic and has largely replaced poster lateral thoracotomy for a significant number of lung problems. Closure of leaks, via this approach, with a ligature, laser sealing, wedge resection, pleural abrasion and pleurectomy have been described to deal with the pulmonary pathology (7, 9). The other advantages of VATS are diminished postoperative pain, better cosmoses, less physiologic trauma, and improved postoperative pulmonary function (6, 7, 9, 13) VATS is also recommended as the initial treatment because of its higher success rate in the pediatric population. Success in the presented case is further testament to the versatility of VATS.

This is despite aspiration of air followed by insertion of intercostal drain and application of negative suction to the intercostal drain. X-Ray 70KV, 3mAs and dose 0.5mSv

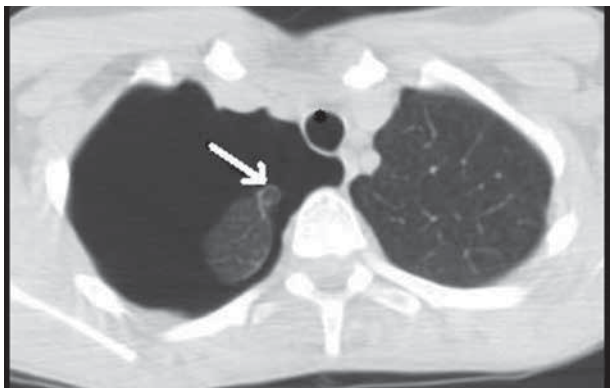

Figure 3. Lung view of CT performed on day 4 following non resolution of pneumothorax

CT showed a small bulla (arrowed) in apex of collapsed right lung. CT Machine - GE light speed ultra 8 slice scanner, kVp -120, slice thickness 5mm, contrast used Niopam 300, dose 90mls @ 3ml/sec

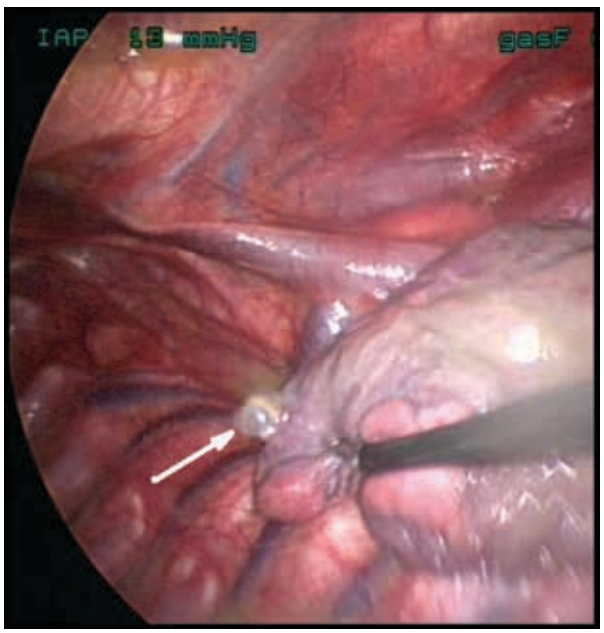

Figure 4. Collapsed Right Lung at Thoracoscopy with Bulla (Arrowed) in the Apex, the rest of the lung appears grossly normal

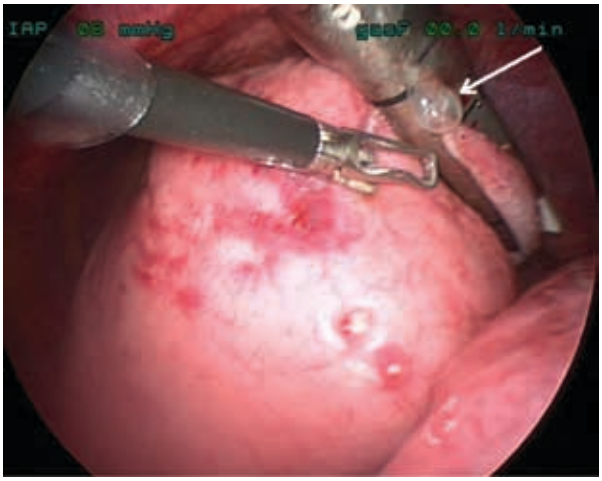

Figure 5 Bulla (Arrowed), With Margin of Surrounding Normal Lung Undergoing Resection with Endostapler

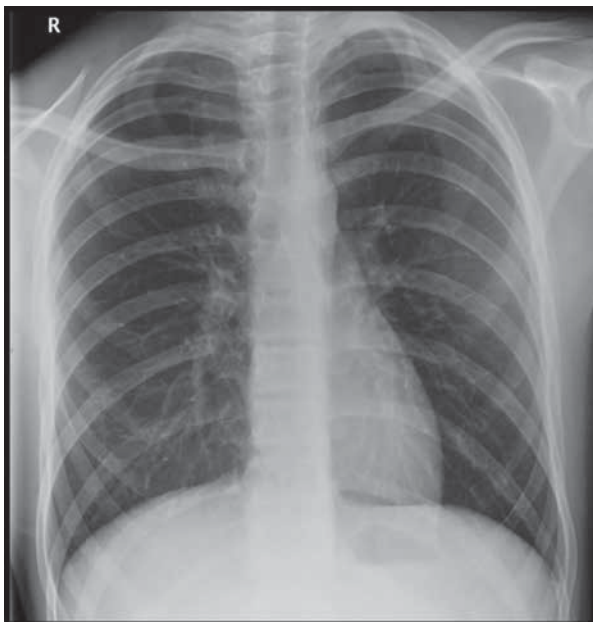

Figure 6. Chest XRay Taken 48 Hours Post Resection Of Bulla And Following Drain Removal Demonstrating A Fully Expanded Right Lung. X-Ray 70KV, 3mAs and dose 0.5mSv

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None declared

Authors' Contributions

Mr Mahomed was the surgeon and clinical lead, Mr Thakur was case researcher and the main author.

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References

1. Kjærgaard H. Spontaneous pneumothorax in the apparently healthy. *Acta Med Scand.* 1932;**77**(S43):1-159
2. Henry M, Arnold T, Harvey J. BTS guidelines for the management of spontaneous pneumothorax. *Thorax.* 2003;**58 Suppl 2**:ii39-52
3. Poenaru D, Yazbeck S, Murphy S. Primary spontaneous pneumothorax in children. *J Pediatr Surg.* 1994;**29**(9):1183-5
4. Gupta D, Hansell A, Nichols T, Duong T, Ayres JG, Strachan D. Epidemiology of pneumothorax in England. *Thorax.* 2000;**55**(8):666-71
5. Amjadi K, Alvarez GG, Vanderhelst E, Velkeniers B, Lam M, Noppen M. The prevalence of blebs or bullae among young healthy adults: a thoracoscopic investigation. *Chest.* 2007;**132**(4):1140-5
6. Stringel G, Amin NS, Dozor AJ. Video-assisted thoracoscopy in the management of recurrent spontaneous pneumothorax in the pediatric population. *JSLS.* 1999;**3**(2):113-6
7. Robinson PD, Cooper P, Ranganathan SC. Evidence-based management of paediatric primary spontaneous pneumothorax. *Paediatr Respir Rev.* 2009;**10**(3):110-7
8. Guimaraes CV, Donnelly LF, Warner BW. CT findings for blebs and bullae in children with spontaneous pneumothorax and comparison with findings in normal age-matched controls. *Pediatr Radiol.* 2007;**37**(9):879-84
9. Shaw KS, Prasil P, Nguyen LT, Laberge JM. Pediatric spontaneous pneumothorax. *Semin Pediatr Surg.* 2003;**12**(1):55-61
10. Mitlehner W, Friedrich M, Dissmann W. Value of computer tomography in the detection of bullae and blebs in patients with primary spontaneous pneumothorax. *Respiration.* 1992;**59**(4):221-7
11. Warner BW, Bailey WW, Shipley RT. Value of computed tomography of the lung in the management of primary spontaneous pneumothorax. *Am J Surg.* 1991;**162**(1):39-42
12. Ayed AK, Chandrasekaran C, Sukumar M. Video-assisted thoracoscopic surgery for primary spontaneous pneumothorax: clinicopathological correlation. *Eur J Cardiothorac Surg.* 2006;**29**(2):221-5
13. Inderbitzi RG, Leiser A, Furrer M, Althaus U. Three years' experience in video-assisted thoracic surgery (VATS) for spontaneous pneumothorax. *J Thorac Cardiovasc Surg.* 1994;**107**(6):1410-5