Case Report

Pneumothorax, music and balloons: A case series

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Abstract:

We describe two cases of spontaneous pneumothorax in young healthy adults with no underlying structural lung disease. The onset of pneumothorax was following physical activity including playing musical instruments and blowing of balloons. There is sparse data evaluating the pathophysiology of primary spontaneous pneumothorax in relation to increased mouth pressures. These cases highlight the possible physical effect of valsalva manoeuvre on transpulmonary pressures, and the potential risk of developing pneumothorax in otherwise healthy individuals. This aspect of pneumothorax development is worthy of further exploration, to better elucidate the mechanism and enhance our understanding of this common respiratory presentation.

Key words:

Musical/wind instruments, spontaneous pneumothorax, valsalva

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The term 'pneumothorax' was first described by Itard and Laennec in 1803 and 1819 respectively. It is classified into two broad categories, primary and secondary. Primary spontaneous pneumothorax (PSP) occurs in patients with no underlying pulmonary disease. It is a significant global health problem with an estimated annual incidence of 24/100,000 for men and 6/100,000 for women.[1] The pathogenesis of PSP is not known to a great extent. A number of studies[2,3] have demonstrated presence of sub pleural blebs and bullae, which may play a role in the pathogenesis as a result of rupture. In addition, there is evidence suggesting that pleural porosities and the areas of pleural inflammation within visceral pleura may be responsible for PSP rather than blebs or bullae.[4] There is lack of evidence for a direct relationship between the onset of pneumothorax and increased physical activity as Bense *et al.*, have demonstrated that the onset of PSP is likely to occur during sedentary activity and it is unrelated to moderate or heavy exertion.[5]

We present two cases of PSP in otherwise healthy patients who developed pneumothorax during physical activity resulting in significantly high mouth pressures.

Case Reports

Case 1

A 16-years-old man presented to our emergency department (ED) with a sudden onset of severe right sided chest pain while playing musical instrument. The pain was sharp and pleuritic in nature and there was no associated shortness of breath. As part of his studies, he has been playing trumpet. This activity results is generation of very high mouth pressures and possibly increased intra-thoracic pressure. He had never smoked and denied the use of illicit drugs and was not on any regular medications.

On physical examination, he was haemodynamically stable with oxygen saturations of 99% breathing room air with a respiratory rate of 16 per minute. The systemic examination including cardio-respiratory system was unremarkable. A chest radiograph showed a small right apical pneumothorax [Figure 1]. After a period of observation for few hours, he was discharged to have a follow up with the respiratory team. The pneumothorax resolved on follow up chest radiograph taken a week later.

Case 2

A 26-years-old painter and decorator presented with acute onset of severe right side chest pain and dyspnoea shortly after he blew 26 birthday balloons. He was a smoker with 11-pack-year history of smoking. He had no other significant past medical history and was not on any regular medications.

On examination, he had oxygen saturations of 97% while breathing room air and was haemodynamically stable. Respiratory system examination revealed decreased air entry on the right side. His chest radiograph showed a moderate right pneumothorax [Figure 2]. It was treated with simple needle aspiration with full expansion of the affected lung. However, he re-presented to ED with worsening dyspnoea on the next day and chest radiograph suggested a recurrence of pneumothorax. Hence an inter-costal chest drain was inserted and he was admitted to the respiratory ward. There was no

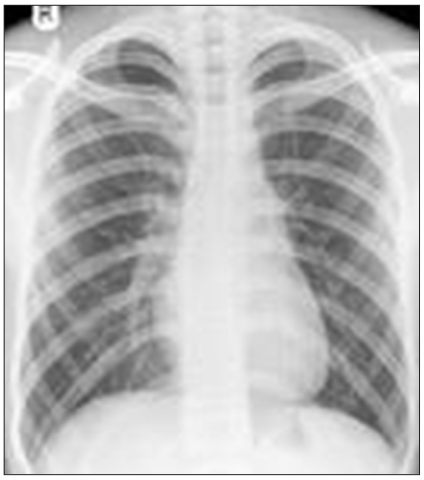

Figure 1: RT apical pneumothrax

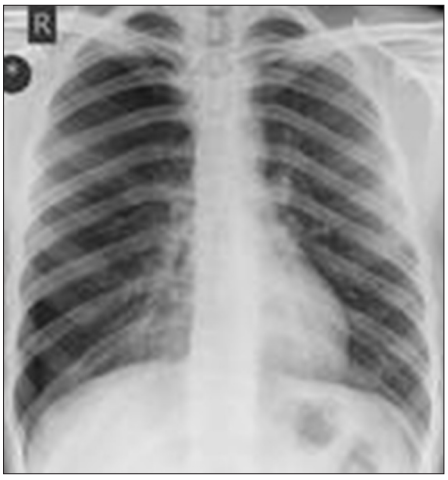

Figure 2: Large RT sided pneumothorax

resolution of his pneumothorax with a persistent air leak for the next 10 days. Therefore, a thoracic surgical intervention with video-assisted thoracoscopic surgery (VATs) was undertaken with a successful right apical bullectomy and pleurectomy.

Outcome and follow-up

Both patients were discharged from respiratory medicine as they were stable at two months and they have not had any further episodes of pneumothorax at six months following the initial presentation. Case 2 is being followed up by cardiothoracic surgeons.

Discussion

The pathophysiology of PSP is poorly understood. Most patients with this clinical entity have emphysema like changes (ELC) that comprise formation of subpleural blebs and bullae as demonstrated by high resolution CT scanning.[6] The causal relationship has yet to be determined for these ELC in the generation of PSP. There is evidence of a contentious relationship between PSP and exposure to loud music as Noppen *et al*.[7] reported five episodes of PSP in four patients exposed to sound energy. None of these patients were playing music at the time of symptom development. It is plausible that PSP results from the rupture of alveolar or ELC walls secondary of transmigration of high frequency sound or increased negative intra-thoracic pressure.

We believe that distension of the alveoli originating from frequent over inflation of the lungs and the high intra-thoracic pressure while playing wind instruments, especially when playing at high notes, increases the likelihood of development of PSP in musicians. Indeed we have reported a case of PSP in a professional music player and teacher who regularly played wind instruments such as clarinet and saxophone.[8] The music playing in higher notes simulates valsalva manoeuvre as demonstrated in Tuba players.[9] This may lead to very high intra-alveolar pressures and pneumothorax may results via "Macklin effect". Macklin *et al*.[10] first described the mechanism for spontaneous pneumomediastinum and subcutaneous emphysema secondary to alveolar rupture as a result of large pressure gradient being generated against a closed glottis. It is possible that professional music players are prone to develop pneumothorax due to rupture of subpleural blebs/bullae in association with repeated distension of alveoli by the mechanism described above and air leak through the wall of the bulla into the pleural cavity at a certain pressure.[11] A similar mechanism may operate in patients subjected to extremely high mouth pressure such as blowing large number of balloons over a short time period, as described in case 2. There are a number of therapeutic options that can be offered to musicians who had PSP. Most of the evidence available regarding therapeutic options comes from anecdotal information. In our second case the patient was originally treated with a simple aspiration. This was followed by insertion of inter-costal chest drain when the pneumothorax reoccurred. However, some may opt for surgical option of video-assisted thoracoscopic surgery, which provides the most definitive treatment resulting in reduction of recurrence to less than 5%.[12] Bullectomy together with pleurodesis carries better outcomes.[13] In some cases bilateral VATS may be more appropriate to avoid the risk not only of recurrence on the ipsilateral side but also contra-lateral pneumothorax. Invariably therefore patients preference will play important role in deciding on the type of treatment for PSP.

In conclusion, the cases described in this report illustrate an important and unrecognised risk factor for PSP. To our knowledge, there is only one case of PSP reported in literature in association with playing music.[8] Respiratory and general physicians should be aware of the risk of PSP with playing of wind instruments and physical activity resulting in valsalva manoeuvre.

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