

Clinical Case no. 14

25-year-old female

Personal physiological medical history

Nothing remarkable, apart from the possible relation of singing and the practice of sports, above all scuba diving, to the current clinical episode.

Past medical history

Nothing noteworthy.

Recent medical history

Onset of the current disease dated back to approximately three months before hospitalization. Following a particularly strenuous physical effort, the patient experienced severe pain in the right hemithorax, tachypnea, cyanosis of the face, intense asthenia, and prodromes of fainting. She was admitted to the emergency department, then transferred immediately to our division.

On physical examination, a tympanic percussion note in the right hemithorax was heard; absence of vesicular murmurs and breath sounds on auscultation.

A diagnosis of right spontaneous pneumothorax was thus made; this was confirmed by radiological examination, which showed total pneumothorax. Needle thoracentesis was performed immediately, which restored the lung nearly to its normal position. Radiography detected small hyper-diaphanous areas corresponding to the right pulmonary apex. As a result, the pneumothorax was deemed to be secondary to apical bullae from emphysema. Some hours following thoracentesis the disorder began to reappear, and at this point thoracic drainage with Bülow's (*Gotthard Bülow - 1835*) system of continuous aspiration was implemented. After approximately seven days aspiration was interrupted and, because in the subsequent days there was no recurrence of the pneumothorax, control radiography was performed: this confirmed the above-mentioned apical finding, and on the 10th day thoracic drainage was removed. The patient was discharged and scheduled for periodic follow-up visits.

Approximately three months later, the patient, who had been symptomatically silent for the whole period, presented again to the emergency department for the same clinical picture described above.

Physical examination

The same features as described above

Aspirating thoracic drainage is performed. Once lung reexpansion is achieved, radiological examination was carried out and confirmed the previous findings.

Given the type of apical pulmonary lesion found and the recurrence of the pneumothorax, and also in view of the patient's young age and her practice of sports, surgical intervention was decided.

Operation (see video)

Placement of the thoracic access at the 4th right intercostal space in the midaxillary line. A moderately collapsed lung was found. After introduction of physiological solution in the pleural cavity the source of the air supply was confirmed, as supposed, in the pulmonary apex. The thoracic drain applied during emergency care was removed. Two additional access sites were made at the 5th and 3rd posterior axillary spaces. The area of apical dystrophy, in which some small bullae were present, was now clearly visible. Extensive resection of the diseased apex with four Endo-Gia loads and final reinforcement with two endoclips. The lung was reexpanded and the hydrostatic seal was

checked. Abrasion of the parietal pleura with a metallic sponge. Toilet of the pleural cavity. Tube drainage reaching the pleural cupola. Suture of access sites.

Histopathology

The material examined showed features of interstitial fibrosis and cicatricial bands, with signs of emphysematosis and large lacunae of “*honeycomb*” lung and subpleural bullae.

The Postoperative course was regular and the patient was discharged after a few days.

Follow up and outcome were unremarkable (long-term medical and pneumological controls).

Remarks

The case described here regards a young woman in full prime, used to practicing sports and singing, who, after a particularly straining exercise, experienced spontaneous pneumothorax. This is a relatively rare event, which occurs at a rate of 1% in young people, usually males, between the age of 18 and 35: as a matter of fact, in the literature the disorder also takes the name of “*spontaneous pneumothorax of the healthy male*”. In our case, however, we are dealing with a female, and with these subjects the frequency becomes even rarer. Generally speaking, the disease is not dangerous if promptly and correctly treated; however, approximately 20% of cases recur within two years of the first treatment. Spontaneous pneumothorax is reported above all in individuals whose work or practice of sports entails the exertion of increased pressure in the airways. Indeed, our case presents both of these pathological elements (scuba diving and singing). The anatomopathological alteration that promotes the event is generally the presence of subpleural bullae, secondary to a dystrophic process occurring in the pulmonary parenchyma, generally and preferably localized in an apical area. These bullae, which are usually small in size, are generated by an infective process that generally goes unnoticed, but that induces fibrotic and scarring phenomena with the breaching of septa and the formation of lacunar areas, i.e., the bullae or blebs. These are subject to a progressive distension, which a sudden and violent increase of pressure in the airways will put them on the verge of rupturing. If it is a subpleural bullae that breaks, the induction mechanism underlying spontaneous pneumothorax becomes clear.

All of these elements - pathogenic, clinical and anatomopathological - are present in the case in question. It is clear that scuba diving and singing can be viewed as activities that yield the favorable conditions for moments of hyperpression - however transitory they may be - in the airways. Radiological and histopathological studies prove us right about the weak spot, the subpleural bulla, which, subjected to pressure, explodes; the negative pressure of the pleural cavity easily sucks in the gas that leaks from the resulting breach. If this latter is extensive the lung rapidly collapses, sagging around the hilum. Suddenly the patient is left with a respiratory volume equal to half of normal capacity: to compensate for the O₂ deficit, the breathing rate increases (tachypnea), which nonetheless fails to provide sufficient oxygenation, and hence cyanosis sets in. It goes without saying that these circumstances demand emergency care. To this end, however, a prompt and accurate diagnosis must be made. The semeiotic picture is extremely suggestive: the tympanism heard on percussion of the affected hemithorax and the disappearance of vesicular murmurs on auscultation, in addition, naturally, to the symptoms mentioned above. The first emergency measure to take is to insert a needle into the pleural cavity through the 2nd intercostal space on the midclavicular line: air will begin to flow out immediately. Inserting a needle with a syringe attached will enable a more controlled evacuation of air from the pleural space: indeed, the amount of air that needs to be removed in order to allow the lung to resume normal position, thereby restoring negative pressure in the pleural cavity, can be calculated. If the breach is small, this maneuver may resolve the problem, at least momentarily. If, however, the orifice caused by the rupture of the bulla is too large, it will remain dilated and aspiration of air with a syringe will prove insufficient to reexpand the lung because air will continue to enter into the pleural cavity. At this point it becomes

necessary to place a drainage tube in the pleural cavity connected to a controlled aspiration system. Equipment specific for this purpose exists, but in our experience the best and least expensive system is the “*underwater tube*” aspiration approach which is universally known by the name of its inventor: Bülow’s drainage.

Generally, seven to ten days after such treatment the breach will disappear and the lung will remain stably expanded. In approximately 2-5% of cases, however, this does not transpire, and in 20% of cases the pneumothorax recurs after a few months. In these cases surgical intervention is advisable. This is precisely what occurred in our patient, whose condition forced surgery following disease recurrence three months after conservative therapy.

The video attached depicts what is described in the surgery log reported above. Once the site of air entry into the pleural cavity (apical bulla) is confirmed, a mechanical “*cut-and-sew*” stapler (endo GIA) is used to suture the ruptures on the pleural surface of lung, or - as in our case - to resect the area riddled with bullae (some of which were still open), and thereby avert similar phenomena in the future. Reexpansion of the lung underwater, similarly to the technique used by cyclists to check for leaks in an inner tube, allowed us to ascertain the renewed pulmonary seal. Indeed, we could call this “*the cyclist’s maneuver*”. In all likelihood the sutures would remain stably tight; nevertheless, as a precautionary measure it is common practice to induce adhesion between the visceral pleura of the operated area and the parietal pleura through abrasion of the pleura with a metallic brush or pad. This procedure, which causes inflammation of the serosa, enhances coalescence between the lung and wall. This treatment approach has with time replaced pleurectomy, i.e., the resection of a patch of the parietal pleura corresponding to the surgical focus. This lesion would generate tenacious adhesions between the lung and wall (this procedure was considered appropriate when the suture of the pulmonary breach was achieved with a less reliable hand-sewn suture). With simple abrasion the induced adhesions will not cling as tightly and, as a result, differently from a pleurectomy, they will not impede future thoracic intervention should this become necessary.

Prior to the advent of video-assisted minimally invasive surgery, treatment entailed thoracotomy, with the resulting trauma being entirely excessive with respect to the entity of the actual operation on the lung. The video-assisted thoracoscopic access illustrated in the attached video ensures an easy, safe and rapid treatment approach, be it for the duration of the operation itself, be it for the length of the postoperative course and related hospital stay.

However, whoever is called on to aid a subject with pneumothorax - conceivably in adverse conditions (rural or mountainous areas) - will not always be in the position to recognize the event, which, if rapidly and in any case easily treated (see needle and syringe), can be (at least temporarily) resolved in lieu of more qualified care. This is just another reason for which I am pleased to take advantage of the case described herein to further and more broadly explore the topic.
