Management of bronchopleural fistula using Amplatzer duct occluder device

Sir,

A 60-year-old male with a past history of tuberculosis and left fibro-cavitary disease presented with complaints of moderate hemoptysis for past five days and significant weight loss in last eight weeks.

Chest radiograph revealed left upper lobe cavity and nodular infiltrates [Figure 1a]. Patient was initially managed with intravenous antibiotics and cough suppressants. Bronchoscopy and bronchoalveolar lavage were performed—BAL AFB smear and gene Xpert for Mycobacterium tuberculosis complex were negative. Patient had an episode of massive hemoptysis necessitating emergency pneumonectomy [Figure 1b]. On postop day five, air leak was noticed, and later (day12) pus was noticed through intercostal drainage (ICD) tube. Patient was febrile, and ICD drained around 300 ml of purulent discharge which on culture grew multidrug-resistant Pseudomonas aeruginosa. A CT thorax [Figure 1b] revealed a fistula involving the pneumonectomy stump [Figure 1b]. With appropriate antibiotic regimen, fever subsided, and pleural fluid drainage reduced to 50 cc/day. A flexible bronchoscopy revealed a smooth-walled bronchopleural fistula (~7 mm) involving the pneumonectomy stump [Figure 1c]. Patient was debilitated with poor nutritional status and having infected pleural space, so was considered a poor candidate for surgical repair and bronchoscopic options were explored. In view of large size of the fistula, we chose to place an Amplatzer duct occluder device [Figure 2a/b] that it being funnel shaped and appropriately sized and available at its earliest. Other possible options could be ASD closure device and a J-shaped stent, and both were not available in appropriate size. BPF was sized approximately using a Fogarty balloon inflated near the fistulous opening.

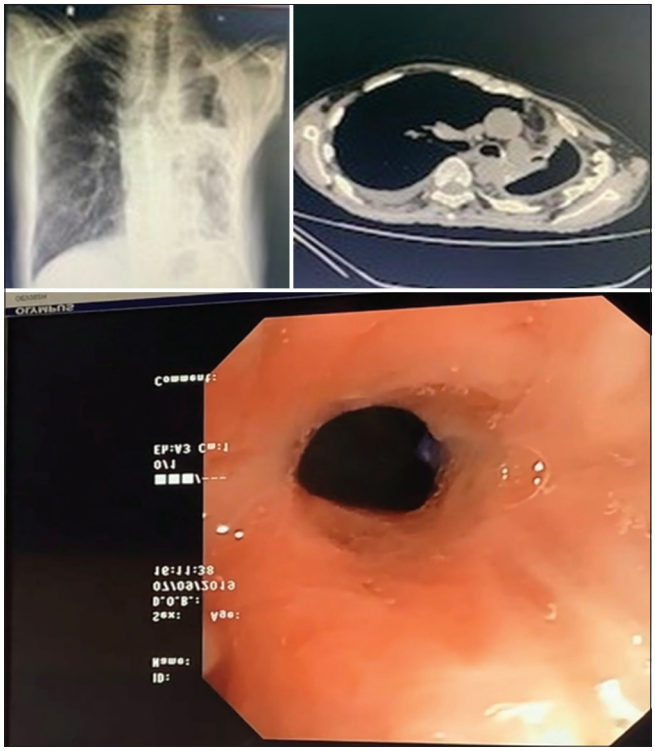

Figure 1: CT chest showing central bronchopleural fistula and its bronchoscopic view

A 7F guide wire positioned using a bronchoscope across the fistula and an Amplatzer duct occluder device (Abbott 12/10 size 12 mm (proximal waist), 10 mm (distal waist), 7 mm (length) and retention skirt of 2 mm on either side) was placed over the guide wire under bronchoscopic vision and under fluoroscopic guidance [Figure 2a and b]. Its margins were reinforced with the stump wall by using cyanoacrylate glue injected through a catheter passed through the bronchoscope. Transcutaneous approach through pleural space was not used due to less control in large pleural space. Wider end of the device was placed distally on the pleural side as there was a risk of device displacement. The device displacing in bronchial tree could be life threatening in the present scenario of single lung. Patient did well with cessation of air leak and significant reduction in the chest tube discharge. The ICD tube was removed after 20 days, but the device is not removed till date.

Bronchopleural fistula (BPF) is a communication between airways and pleural space. It is an alarming complication seen after lobectomy or pneumonectomy and causes morbidity and mortality with an incidence of 0.5% following a lobectomy, 2.2% following bilobectomy and 3% following pneumonectomy with a mortality between 16 and 25%.[1] Chances of developing BPF are correlated to the patient's general condition, the underlying pathology like tuberculosis, fungal disease or lung cancer, the resection technique, stump length, use of sutures vs. staplers, emergency versus planned surgery and the surgeons' experience. Surgery for post-tuberculosis patients is technically challenging because of adhesions and scarring making hilar dissection very difficult, as was in this case.[2]

Varoli *et al.*[3] classified fistulas according to the time of onset after the operation: early [1 to 7 days], intermediate [8

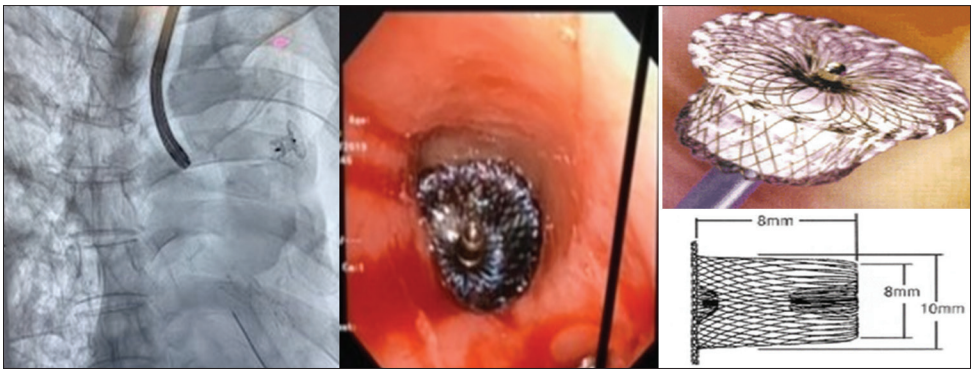

Figure 2: Duct occluding amplatzer device - fluoroscopic view and bronchoscopic view

to 30 days] and late >30 days]. BPF in our case developed on day 5 of the surgery, and preferred treatment was surgical but was not possible due to poor nutrition, active plural infection and risk of anaesthesia.

Bronchopleural fistulas may be peripheral or central, and bronchoscopy is the best diagnostic tool to size a central fistula.[4] Treatment is done by various surgical and nonsurgical techniques, but no standard of care exists. Surgical techniques include an open wound thoracostomy, skin flap, and antiseptic packing or debridement of the pleural space followed by bronchial stump suture and buttress with omentum or a muscular flap.[5] If BPF is not immediately taken care of, it can lead to empyema and prolonged hospitalization, making management challenging. Bronchoscopic techniques have used biological glue, gel foam, metallic coils, covered tracheobronchial self-expanding stents, spigots, endobronchial valves and various options depending upon size and site of fistula.[6,7] A study from Japan has used ethyl alcohol and trichloroacetic acid for small BPFs (1–3 mm) due to their irritative properties leading to granulation.[8,9]

The Amplatzer duct occluder devices are used for trans-catheter closure of PDAs by cardiologists. Fruchter *et al*. described a case series of 31 post-pneumonectomy patients in whom atrial septal occluder devices were used for the stump closure with 17.6-month follow-up. There are fewer reports of use of duct occluder device for closure of central air leaks, and one such case with transcutaneous route of delivery is published in this esteemed journal.[10,11]

Duct occluder device has a larger disc (12 mm) at one end and is mushroom-shaped which makes the device ideal to fit on each side of the defect, ensuring good occlusion and minimum chances of displacement. The device induced local granulation results in the total encapsulation of the occluder. Two such cases are reported in a review on BPF management by Marwah *et al*.,[12] and this projects duct occluder device as a potential tool in occluding large, central BPFs.

In cases of lung fibrosis and pleural adhesions, surgical technique should be modified with bronchial stump coverage (BSC) with muscle/omentum at the time of primary surgery itself, to get better results. Early BPFs can be handled surgically or endoscopically, as soon as possible, as any delay will increase the risk of pleural space infection.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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