Heart, Lung and Circulation (2014) **23,** e229–e230
1443-9506/04/$36.00
http://dx.doi.org/10.1016/j.hlc.2014.04.255

A New Use of Fogarty Catheter: Chest Tube Clearance

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Received 30 December 2013; received in revised form 4 March 2014; accepted 16 April 2014; online published-ahead-of-print 28 May 2014

Chest tubes are commonly used for patients who have undergone a cardiothoracic procedure to avoid the complications related to the accumulation of blood and serous fluid in the chest. Although the traditional methods such as milking, stripping or active chest tube clearence devices are used to establish patency of the chest tubes, they can become clogged at any time after their placement. Our technique may re-establish the tube patency with utilising Fogarty catheter and without any detriment to tissues.

Keywords Chest • Mediastinum • Pleural space • Surgery • Complications

Chest tubes (CTs) are commonly used for patients who have undergone a cardiothoracic procedure. The main objective of the drains is to drain the fluid / blood / air that is leaking in the chest cavity and drain it to the exterior so as to avoid collection in the chest with a possibility of tamponade. The CTs can be clogged by accumulation of residual blood and clots, debris or other fluids at any time after their replacement and can cause serious clinic consequences, such as cardiac tamponade and pericardial or pleural effusion [1]. Although controversial, the traditional methods such as milking, tapping, squeezing and stripping are utilised for maintaining the patency of tubing when it is likely to be blocked. We present a simple technique to clean the clogged CTs by a Fogarty catheter without any pain or generation of negative pressure.

Technique

The drainage tube was clamped proximally, close to chest wall, and was detached from distal tubing at connection site. Free end of drainage tube was prepared and draped. A 4F or 5F Fogarty catheter was passed through drainage tube during which the clamp is shortly released and the debris or clot is removed in the same manner as femoral embolectomy (Fig. 1). The balloon of the catheter is inflated with 0.6-0.7 cc isotonic solution resulting in a balloon diameter of 0.8 mm which is usually enough to remove clot and the debris from a 28 F chest tube. It is possible to overinflate the balloon to facilitate evacuation with the worst possible complication being the rupture of the balloon resulting in spillage of a few mililiters of sterile solution into the cavity. The tube is re-clamped immediately after the catheter is out of tube in order to prevent pneumothorax. Procedure could be repeated to ensure full removal of debris and thrombus. Extra care should be taken if the procedure is performed for a mediastinal tube in a patient with coronary artery bypass to avoid damage to grafts. A brand-new same size tube can be used to estimate the proper distance that catheter will be advanced. The catheter can be advanced safely if the procedure is performed for a thoracic tube.

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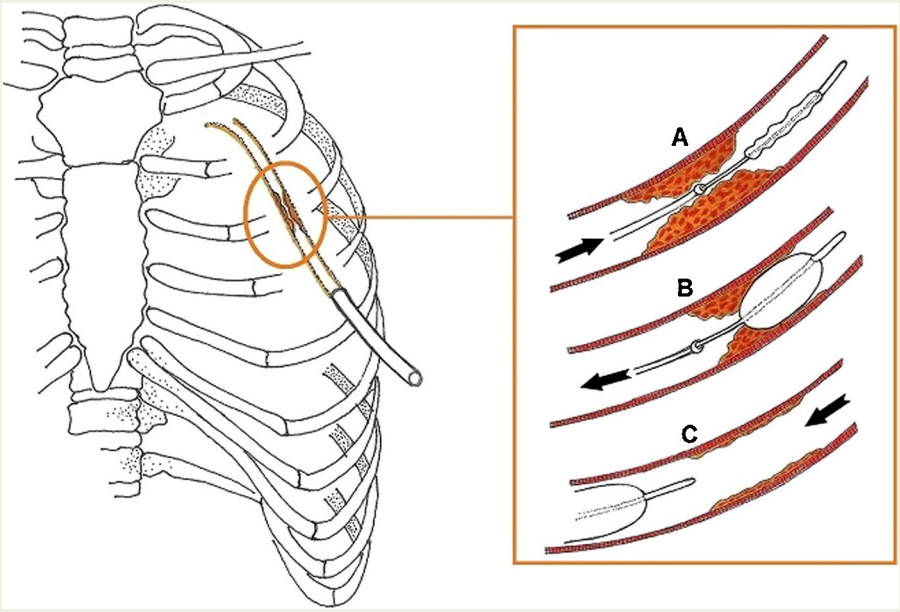

Figure 1 Fogarty catheter was passed through drainage tube and the balloon of the catheter is inflated. After that the catheter is pulled back slowly and debris or clot is removed from the tube.

Discussion

In cardiac surgical patients, to avoid the catastrophic complications of CT occlusion, the patency of tubes should be ensured until their removal [2]. A prospective study demonstrated that the incidence of the chest tube clogging was 36% [3]. Many makeshift methods such as milking, stripping, fanfolding, tapping, squeezing can be effective for establishing CTs patency. It was suggested that these techniques are not superior to each other [4] and moreover they can generate temporary, uncontrolled negative intrathoracic pressure and can be harmful to tissues [5]. Although the sophisticated active chest tube clearence devices were devoloped [6,7], these types of devices may not always be obtained. Despite all of the classical and novel techniques, the chest tubes can be clogged and our technique may be used to re-establish patency. We use this technique mainly in patients with longstanding thoracic tubes in whom the drainage amount decreases as fluid accumulates in the pleural cavity suggesting the clogging of the tube. In early postoperative period, the technique is used for early clotting of the tubes in patients with ongoing drainage. It is especially preferred in situations where re-exploration is less than desirable such as old patients with fragile sternum, and patients with chronic diseases and bleeding tendencies. Transthoracic echocardiography or chest X ray may show accumulation of mediastinal blood differentiating the clotting of the tubes from discontinuation of bleeding. The application of our technique is quite easy and can be used after all cardiac and thoracal procedures. It is also not detrimential to tissues because it does not create uncontrolled changes in intrathoracic pressure. We have not seen any complications related to this procedure so far. It is important to show extra care to prevent damage to saphenous vein grafts while cleaning the medistinal tube after coronary artery bypass surgery and we recommend that, the tip of the catheter should not be advanced further than the tip of mediastinal tube. After establishing chest tube patency, there is usually immediate evacuation of some amount of blood or fluid from the related cavity along with the material blocking the tube which may be blood clot or proteinaceous or gelous debris. Sometimes, an amount over 500 cc may be observed to drain from pleural cavity in patients with blockage of long standing chest tubes. The continuation of drainage confirms the ongoing patency of the tubes.

References

[1] Ashikhmina EA, Schaff HV, Sinak LJ, Li Z, Dearani JA, Suri RM, et al. Pericardial effusion after cardiac surgery: risk factors, patient profiles, and contemporary management. Ann Thorac Surg 2010;89:112–8.
[2] Smulders YM, Wiepking ME, Moulijn AC, Koolen JJ, van Wezel HB, Visser CA. How soon should drainage tubes be removed after cardiac operations? Ann Thorac Surg 1989;48:540–3.
[3] Karimov JH, Gillinov AM, Schenck L, Cook M, Kosty SD, Boyle EM, et al. Incidence of chest tube clogging after cardiac surgery: a single-centre prospective observational study. Eur J Cardiothorac Surg 2013;44(6 (Dec)): 1029–36.
[4] Wallen MA, Morrison AL, Gillies D, O'Riordan E, Bridge C, Stoddart F. Mediastinal chest drain clearance for cardiac surgery. Cochrane Database Syst Rev 2004;18. CD003042.
[5] Halm MA. To strip or not to strip? Physiological effects of chest tube manipulation. Am J Crit Care 2007;16:609–12.
[6] Shalli S, Boyle EM, Saeed D, Fukamachi K, Cohn WE, Gillinov AM. The active tube clearance system: a novel bedside chest-tube clearance device. Innovations (Phila) 2010;5:42–7.
[7] Perrault LP, Pellerin M, Carrier M, Cartier R, Bouchard D, Demers P, et al. The PleuraFlow Active Chest Tube Clearance System: initial clinical experience in adult cardiac surgery. Innovations (Phila) 2012;7(5 (Sep-Oct)): 354–8.