A New Left Atrial Catheter

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Abstract

A new catheter was designed which permits easy insertion of a polyurethane catheter into the left atrium utilizing a "breakaway" needle system. The advantages of such a system include a needle size hole into the pulmonary vein and the security of a luer lock connector at the distal catheter end.

Introduction

During procedures involving cardiopulmonary bypass, it is quite helpful to have direct readings of left arterial pressures. These measurements are the most reliable guide to volume replacement both intraoperatively and postoperatively.[1] The risks of a left atrial line include cerebral embolization from thrombus, air embolism, and hemorrhage following its removal. However, these complications are extremely rare and hence the widespread use of left atrial monitoring is justified.[2]

There are several commonly used catheters in practice. Most of these are threaded directly into the left atrium, and most of the catheters used for this purpose are polyethylene catheters. Insertion usually requires a stab hole in the pulmonary vein after a purse-string suture has been placed within its adventitial wall. For ease of insertion, a needle is sometimes placed directly into the superior pulmonary view and a plastic catheter inserted through this into the left atrium. This permits minimal bleeding and good exposure while the catheter is being inserted. A difficulty with this technique, however, is that the proximal portion of the catheter must be exteriorized from the pericardial cavity through the skin and then attached to some type of connector. A variety of such sealant connectors have been used, but each of these potentially results in the risk of detachment during manipulation, as well as the risk of introducing air within the system while the line is aspirated. Often tiny air bubbles accumulate within such a line even following strict assurance of air evacuation after placement of the device in the operating room.

Materials and Methods

To obviate the above problem a new catheter[a] was designed. The catheter consists of 38 centimeters of radiopaque polyurethane tubing which is factory connected to a luer lock end with a flanged plastic base with holes to secure it onto the skin (Figure 1). The catheter must, therefore, be introduced from outside the skin to within the pericardial cavity and then into the superior pulmonary vein. To accomplish this with ease, a new type of needle was devised through which the catheter is passed, instead of making a stab wound within the vein. This "breakaway" 18 gauge, 65 milli-

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a PCP (Pressure Placement Set), Catalog code 50010, DLP, Inc., Walker, MI 49504.

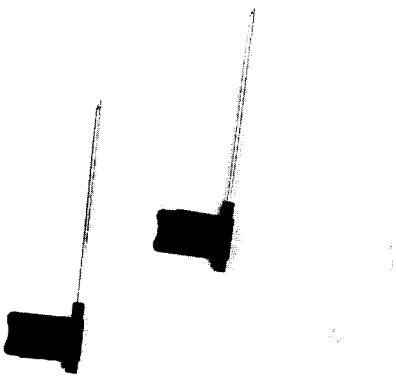

Figure 1: A catheter and two 18 gauge "breakaway" needles.

meter needle has attached flanges which are split into two pieces. Two such needles are supplied, the first needle is passed from outside the body cavity to within the pericardium. The catheter is passed through it, and the needle is then withdrawn, split and discarded. After a purse-string is inserted into the superior pulmonary vein, the second breakaway needle is inserted directly into the vein, and the catheter tip, which is now within the pericardial cavity, is passed through this needle into the left atrium. The needle is withdrawn over the catheter, broken away and discarded, and the purse-string suture in the superior pulmonary vein is ligated (Figure 2). The catheter is aspirated to assure that there is no air within the line. A three-way stopcock is then connected to it, which joins the catheter to the plastic tubing of a strain gauge manometer.

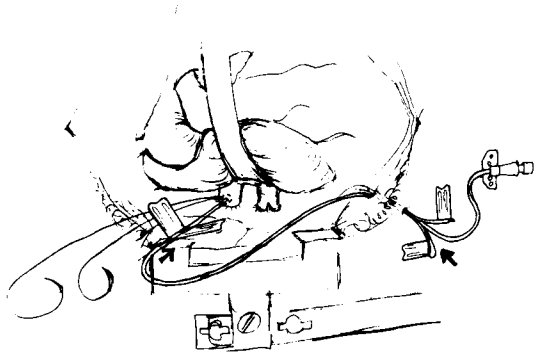

Figure 2: Surgeon's view of insertion of catheter directly into pulmonary vein through "breakaway" needle. Atrium is retracted toward assistant.

Results

Such a "breakaway" needle system has been utilized in our hospital in 450 consecutive open heart and coronary bypass procedures. To date, there has been no difficulty with removal of the device, which usually occurs a day or two postoperatively. There has been no instance of re-entry for bleeding around the catheter. There have been no instances of tamponade attributable to bleeding from the left atrial catheter insertion site. In addition, none of these catheters have broken upon forceful pulling. In one instance, the catheter stretched and was, presumably, held in place within the pericardial cavity by either a sternal wire or by a fascial stitch. Gentle traction pulled the catheter out without undue complication.

Discussion

The advantages of this simple breakaway needle-radiopaque atrial catheter system are summarized. It assures a factory sealed luer lock catheter connection at the proximal portion to eliminate or reduce the incidence of air aspiration or leakage with subsequent false pressure readings. The experience with this catheter has been uniformly favorable. The ease of insertion of this device is made possible because of the unique breakaway needles. It is a safe reliable monitoring aid in cases requiring cardiopulmonary bypass.

References

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