



The Cardiac Surgery Training Using Pig Hearts and Small Pumps

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Keywords

Cardiac surgery training; Pig heart

Short Commentary

It is said that it takes 10000 hours to reach a certain level in cardiac surgery [1]. It is essential to repeat the same procedures multiple times regularly to achieve perfection in this surgery. However, there is a limit to the number of surgical cases you can experience, and it is not a good idea to practice in the operating room for the safety of patients. Surgical training using pig hearts and small pumps is useful to simulate surgical techniques.

Methods

A pig heart is available from a meat supplier and costs about \$3 to \$4, while a small pump (maximum flow 2L/min) costs \$220 and can be purchased online. After repairing the damaged parts of the heart to prevent any leaks, 3/8 cannula can be connected and secured to the aorta, pulmonary artery, superior vena cava, inferior vena cava, and one of the pulmonary veins (Figure 1A). Then, this cannula is connected to the circuit, and the circuit is filled with water through a water tap (Figure 1B). When the pump is started, the flow is established through the heart, which makes this system more realistic as it can bleed (Figure 1C and 2). Then, cannulation stitches can be placed, and cannulation can be performed. Training for coronary artery bypass grafting, aortic root procedure, and valve surgery can be undertaken. For coronary artery bypass grafting, harvested coronary sinus vein or circumflex artery can be used as bypass grafts (Figure 1D). After the procedure, the cannula should be removed and the suture line secured to obtain hemostasis. The water flow in the heart made by the pumps makes it possible to evaluate leaks or stenosis at the anastomosis after the procedure.

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Received Date: 27 May 2018

Accepted Date: 18 Jun 2018

Published Date: 26 Jun 2018

Citation:

Ikeda S. The Cardiac Surgery Training Using Pig Hearts and Small Pumps. *J Surg Tech Proced.* 2018; 2(1): 1015.

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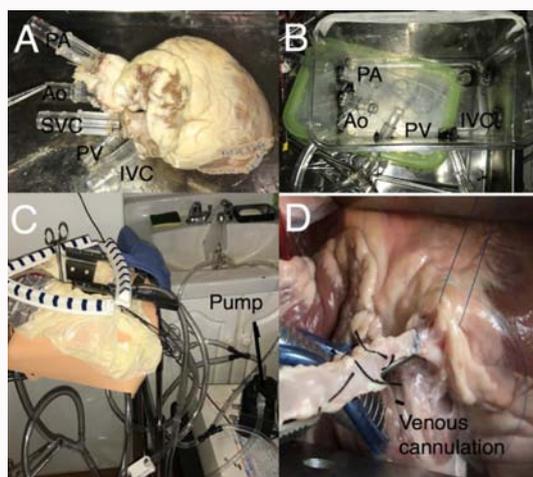


Figure 1: (A) 3/8 cannulas can be connected and secured to the aorta, pulmonary artery, superior vena cava, inferior vena cava, and one of the pulmonary veins. The original tear is repaired with felts and stitches. (B) The heart is paced into a plastic box and connected to the circuit through the wall. (C) The cannula is connected to the circuit, and the circuit is filled with water through a water tap. (D) Coronary artery bypasses grafting to the proximal right coronary artery using harvested coronary sinus vein. There is a venous cannula cannulated into the right atrium.

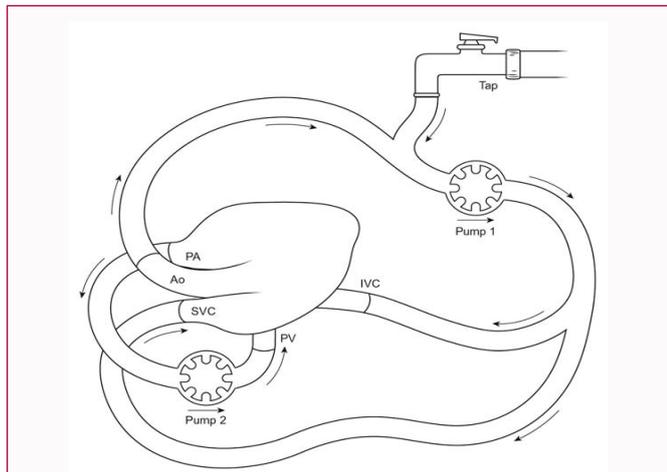


Figure 2: The cannula is connected to the circuit, and the circuit is filled with water through a water tap. Pump 1 circulates the flow from the aorta to superior vena cava and inferior vena cava. Pump 2 circulates the flow from pulmonary artery to pulmonary vein.

Conclusion

The whole process in cardiac surgery can be simulated with this system and the anatomy of the heart also can be learned. This training method does not require a special facility or huge funds; thus, frequent training is possible, which could reduce the length of the learning curve, especially for young surgeons; more importantly, it avoids the risk of harming patients.

References

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