Superior vena cava clamping for brachiocephalic vein cannulation during heart surgery

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Abstract

A new central venous catheterization during open heart surgery is seldom required. Clamping of superior vena cava (SVC) causes adequate brachiocephalic vein distension which facilitates vein puncture. In our experience, ~20 s is enough for adequate brachiocephalic vein distension. I usually prefer subclavian vein puncture by supraclavicular approach. By this approach, average superior vein clamping time is about 45 s.

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Keywords: Superior vena cava clamping; Central vein cannulation; Venipuncture

1. Introduction

A new central venous catheterization during open heart surgery is seldom required. The major causes of this requirement are removal of the previous central venous line accidentally, pinch-off phenomenon or additional line requirement for rapid fluid replacement. Insertion of a new central line in a draped patient during the operation without disturbing sterilization is not easy. Reverse Trendelenburg position is mostly used for promoting distension of brachiocephalic veins which facilitates vein cannulation. Herein, we describe a new technique for central venous cannulation during open heart surgery.

2. Surgical technique

Left or right supraclavicular area is prepared in patients whose jugular vein was cannulated previously during open heart surgery. Puncture needle and guide wire are also prepared. Superior vena cava (SVC) is clamped and vein puncture is done after 20 s (Fig. 1). In our experience, ~20 s is enough for adequate brachiocephalic vein distension. I have observed an increase of about two-fold after clamping in the diameter of brachiocephalic truncus and upper part of SVC. At the beginning, we performed digital compression instead of clamping but adequate SVC and brachiocephalic distension was not obtained. Although slight variations in technique of subclavian vein cannulation by supraclavicular approach may exist, the most common and simplest technique is to puncture the skin 1 cm cephalad and medial to the midpoint of clavicle. In most individuals, the described point for skin puncture is ~1 cm lateral to the lateral border of sternocleidomastoid muscle (SCM) and is quite close to the originally described point, ‘exactly at’ or ‘just behind’ the angle of the SCM and the clavicle. The needle course should bisect the angle of the

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SCM and the clavicle, and is directed 10–20° anterior to the coronal plane to avoid injury to the artery or pleura. The vein is encountered quite superficially, typically at 0.5–1.5 cm depth, with a characteristic appearance as the needle enters the lumen [1–4]. Guide-wire is placed through the needle after puncture of central vein and then SVC clamp is released. Average time period of SVC clamping is 45 s. Then vein cannulation is done. Supraclavicular approach is routinely used for subclavian vein cannulation in my department.

3. Discussion

Inadvertently removal of a central vein line is rarely experienced by the cardiac operation team. Pinch-off phenomenon may also develop in patients due to placing of a retractor after sternotomy. Rarely, a new central venous line may be required for inotropic administration or rapid fluid replacement. Reinsertion of a central line in alternative anatomic localizations is much more difficult during open heart surgery. Femoral veins may not be used due to inadequate draping or increased risk of infection. Brachiocephalic vein cannulation requires distension of subclavian veins. Surgeons use reverse Trendelenburg position for brachiocephalic vein distension. Hemodynamic derangement may develop during the reverse Trendelenburg position. I have clamped SVC for brachiocephalic vein distension. I have not experienced any hemodynamic derangement if a subclavian catheter is desired. The other issue that can be discussed is about the vein chosen for insertion of the catheter after clamping. Usually, only the head and neck regions of the body are left uncovered during cardiac surgery and the remaining body is covered with sterile dressings. Undressing the clavicular region may endanger the surgical field which is extremely dangerous when the mediastinum is exposed. Thus, extreme care should be taken to prevent contamination if a subclavian catheter is desired.

Once again, we congratulate the author about the proposed technique. We believe it would be more informative if the above issues are clarified.

References


eComment: Superior caval vein clamping

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We read with interest the article by Erkan Kuralay in which a practical catheter insertion technique has been described for the situations of accidental loss of central venous catheters during cardiac surgery procedures [1]. The technique seems effective and promising. However, we believe there are certain points to be discussed about the author’s method.

Central venous cannulation is an indispensable component of cardiac surgery. A multi-purpose catheter is inserted before initiation of the procedure and used during and after surgery. However, sometimes the catheter is lost due to various reasons (removal of the central venous line accidentally, pinch-off phenomenon, etc.) during operation or it may not be easy to puncture a central vein. The latter is more frequent for pediatric cases. Clamping of the superior caval vein may not be a big issue in terms of cardiac hemodynamics during adult cardiac surgery as it conveys 1/3 of the whole body venous return to the heart [2]. Literature includes reports of complete resection or reconstruction of the superior caval vein with the use of clamps especially during surgeries of intrathoracic malignancies [3, 4] that usually last longer than a few minutes. Clamping of the superior caval vein may be safely tolerated by older children or adults; however, since the superior caval vein transports at least half of the whole body volume to the heart during the neonatal period, clamping of the superior caval vein for the insertion of catheters during cardiac operations of pediatric cases may not be hemodynamically easily tolerated. Moreover, such maneuver may lead to cardiac failure and inotropic agents may be required [2, 5]. It would be very helpful if the author could provide his experience with the technique in pediatric patients undergoing cardiac surgery.

The other issue that can be discussed is about the vein chosen for insertion of the catheter after clamping. Usually, only the head and neck regions of the body are left uncovered during cardiac surgery and the remaining body is covered with sterile dressings. Undressing the clavicular region may endanger the surgical field which is extremely dangerous when the mediastinum is exposed. Thus, extreme care should be taken to prevent contamination if a subclavian catheter is desired.

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