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An alternative technique for arterial pressure monitorization in pediatric cardiac surgery: internal mammary artery cannulation

Pediyatrik kalp cerrahisinde arteriyel basınç monitörizasyonu için alternatif teknik: İnternal mammaryan arter kanülasyonu

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Peripheral artery cannulation which allows continuous blood pressure monitoring is an easy way for blood sampling. Rarely, peripheral arteries can not be cannulated percutaneously or by cutdown technique. In this article, we describe a six-month-old female infant with a weight of six kilograms whom the left internal mammary artery was cannulated for monitoring arterial blood pressure due to unsuccessful catheterizations of other peripheral arteries. This line continued to function for 10 days postoperatively without any difficulty or complication. The internal mammary artery provides reliable access for blood pressure monitoring and arterial blood sampling in intra- and postoperative period in pediatric patients.

Keywords: Artery; internal mammary artery; blood pressure monitoring; catheterization; peripheral arterial; cut down.

Periferik arter kanülasyonu sürekli kan basıncı monitörizasyonuna olanak sağlamakla birlikte, kan örneği almak için kolay bir yoldur. Nadir olarak periferik arterler perkütan yolla ya da cutdown tekniği ile kanüle edilemeyebilir. Bu yazıda, diğer periferik arterlerin başarısız kanülasyonları nedeniyle arteriyel kan basıncı monitörizasyonu için sol internal mammaryan arter kanülasyonu yapılan altı kilogram ağırlığındaki Fallot tetralojili altı aylık kız bebek sunuldu. Bu hat ameliyattan sonraki 10 gün süresince herhangi bir zorluk ya da komplikasyon olmadan kullanıldı. İnternal mammaryan arter, pediyatrik hastalarda ameliyat sırası ve sonrası dönemde arteriyel kan basıncı monitörizasyonu ve arteriyel kan örneklenmesi için güvenilir bir yol sağlar.

Anahtar sözcükler: Arter; internal mammaryan arter; kan basıncı monitörizasyonu; kateterizasyon; periferik arter; cut down.

An indwelling arterial catheter is a must for monitoring of continuous systemic blood pressure and arterial blood gas analysis in congenital heart surgery.[1] Standard peripheral arterial cannulation sites are radial, femoral, dorsalis pedis, tibialis posterior and umbilical arteries.[1] Although very rare, these arteries cannot be cannulated percutaneously or by cut-down due to potential ischemic complications, usage for previous interventions or only time-use limitations. Herein, we describe a modified surgical technique for arterial blood pressure monitoring using the internal mammary artery (IMA) in an infant.

SURGICAL TECHNIQUE

After median sternotomy, a rake was used to retract the sternal edge superiorly. The left internal mammary artery (LIMA) was exposed and approximately a 3 cm segment in the mid-portion was dissected free from the surrounding tissue. A 20-gauge arterial cannula was brought out obliquely through an adjacent intercostal space and the arterial catheter was introduced by using the Seldinger technique. Then the new LIMA arterial line was connected to the monitor to trace the arterial blood pressure and to determine the ability to withdrawn blood for blood sampling (Figure 1).

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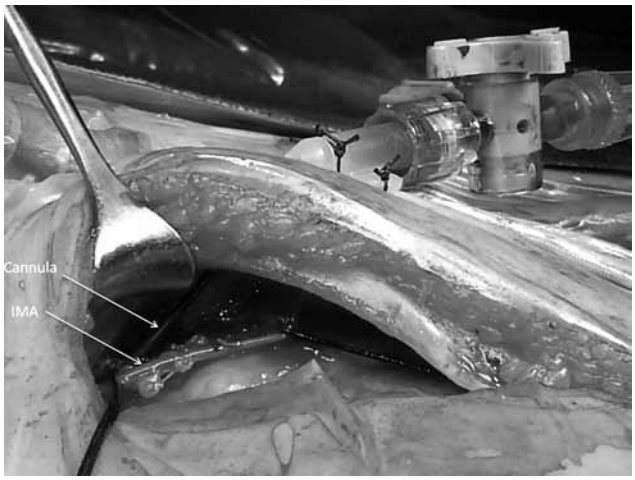

Figure 1. Intraoperative picture of the internal mammary artery (IMA) cannulation.

Next, a double-armed non-absorbable pull-out stitch was double looped around the LIMA proximal to the entry site of the cannula. Both arms were brought out through the chest wall. The free ends of the suture were tied around a rolled gauze pad. The LIMA was then ligated distally to the cannula entry site to prevent any back-bleeding when the cannula was removed (Figure 2).

This technique was used in a six-month-old, 6 kg female infant with tetralogy of Fallot who underwent corrective surgery under cardiopulmonary bypass. Her femoral arteries could not be cannulated due to previous cardiac catheterization, her radial arteries were too small in size and could not be cannulated despite cut-down. The LIMA line continued to function well for 10 days postoperatively without any difficulty or complication. The catheter was pulled out and the suture on the chest wall was tied compressing the LIMA against the anterior chest wall. Repeated echocardiography and chest X-ray after the removal of the catheter revealed no pericardial and no pleural effusion. The pull-out ligature was removed on the 20th postoperative day without any problem such as bleeding or tamponade.

DISCUSSION

Internal mammary artery cannulation offers a reliable access for arterial blood pressure monitoring and may be used for the monitoring of blood gases during operations and in the postoperative period. It is easy to perform under direct vision after median sternotomy.[1] In addition, it can be used during thoracotomy.[2] The size of IMA is usually large enough for cannulation even in neonates.[2] The

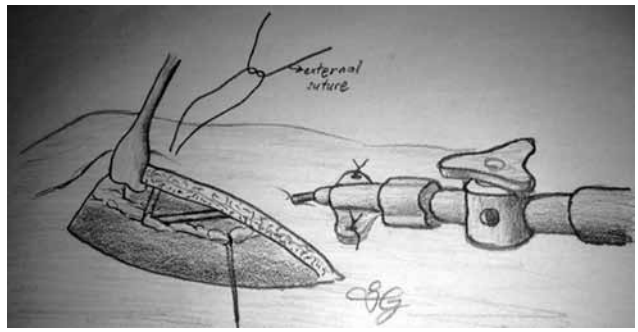

Figure 2. Drawing of internal mammary artery cannulation.

IMA line can be used effectively in the long-term, if required in the intensive care unit. Verghese et al.[3] reported a child with more than three weeks of LIMA monitoring. In our case, we used the catheter for 10 days without any complication. Although several techniques are available for the insertion of the catheter, our technique is a safe one during removal of the catheter.

Sacrificing of the LIMA may be a concern due to the possibility of future coronary revascularization procedures. The right IMA could be preferred, however, we chose the LIMA in our case thanks to its technical ease.

Internal mammary artery cannulation for arterial blood pressure monitoring is a neglected technique due to the improvement of percutaneous and cut-down techniques for peripheral arteries. In this report, we aimed to remind this technique to younger heart surgeons, particularly, and to reflect our technical modification.

In conclusion, cannulation of the IMA under direct vision is a suitable and safe method for intra-arterial monitoring and blood gas sampling in pediatric patients who undergo cardiac surgery. It could be also an alternative technique in a challenging situation and this technique should be in pediatric cardiac surgeons' armamentarium.

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