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Commentary: The choice of arterial pressure monitoring in adult cardiac surgery should be individualized. The devil is in the details

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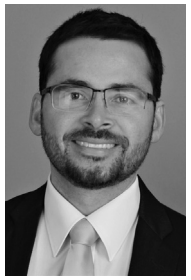

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CENTRAL MESSAGE

High radial to femoral arterial pressure gradient is common and has clinical implications of overtreatment. The site of arterial monitoring in cardiac surgery should be individualized.

Intra-arterial or invasive blood pressure monitoring is the standard of care in cardiothoracic surgery and is common in the intensive care unit. Usually, a radial artery is chosen in adults. This artery is frequently used due to ease of access, safety profile, and dual circulation of the hand. Nonetheless, it is also common to experience inaccuracies, specifically under-reading, leading to overtreatment of false hypotension. Possible factors leading to a radial-to-central arterial pressure gradient include length of bypass, cross-clamp time, hypothermia, vasopressor use, and small patient size.[1] This phenomenon is common in clinical practice and has been described in many reports.

Some approaches to quantify radial pressure under-reading include insertion of a needle in the aorta while the chest is open, placement of a femoral arterial line for comparative transduction of pressures, or using the measurement of mitral valve regurgitation velocity to estimate systolic arterial pressure. This usually unmasks a pressure difference or pressure gradient that can be significant enough to completely disregard the radial arterial pressure readings until the gradient dissipates, usually with time.

The prevalence and significance of this arterial pressure gradient in adult patients undergoing cardiac surgery was explored by Bouchard-Dechêne and colleagues[2] in this issue of the *Journal*. The authors examined the reliability of radial artery monitoring during cardiac surgery in a prospective study of 129 patients; measured the duration of a significant gradient as well as the impact of simultaneous radial and femoral artery monitoring; and analyzed them in 2 groups: radial artery monitoring (37 patients) versus simultaneous radial artery and femoral artery monitoring (92 patients).

They defined the radial-to-femoral artery pressure gradient (RFPG) as significant if >25 mm Hg in systolic and >10 in mean arterial pressure for at least 5 minutes and correlated this incidence with radial artery diameter measured with ultrasound the day before surgery. The clinical team was blinded to the measurements. The authors found an overall incidence of significant RFPG of 34.8% with an average duration of 54 ± 48 minutes. This incidence correlated to previous reports on radial to central arterial pressure gradient in cardiac surgery. Interestingly, but not surprising, the incidence was greater when the radial artery diameter was smaller. Almost one half (48%) of the patients with radial artery diameter of <1.8 mm on ultrasound evaluation had significant RFPG. Not only was the frequency of significant RFPG greater, but these patients required more vasoactive support in the operating room and intensive care unit despite less-complex procedures and shorter bypass runs.

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Despite the limitations of this study, it provides important insight on this phenomenon that prompts caution when caring for cardiac surgical patients, specifically if the hypotension seems out of proportion to other variables that monitor tissue perfusion and when using arterial pressure–derived algorithms to manage hemodynamics, such as pulse contour analysis and continuous cardiac output monitors.

It is important to emphasize that brachial arterial lines were not analyzed and that there were no complications in the femoral arterial line group. Moreover, all patients with femoral arterial lines were mobilized and extubated without distinction to the radial artery group.

The study, albeit observational, small, and single-center, highlights important information that has practical and clinical implications. Although it seems excessive to stop using radial arterial lines all together, we need to be aware of this phenomenon and consider the risk factors for significant RFPG when we formulate a hemodynamic monitoring plan for our patients. The choice for invasive arterial pressure monitoring should therefore be individualized to patient and procedure, and body mass index, radial artery diameter, and possible long bypass run should weigh in the decision.

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