

Dorsalis pedis cannulation: An overlooked option—A case report

SAGE Open Medical Case Reports
Volume 12: 1–3
© The Author(s) 2024
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/2050313X241255014
journals.sagepub.com/home/sco



Ali Asghar, Bushra Salim  and Muhammad Hassan Khan

Abstract

Radial artery is mostly used for arterial cannulation because of its location, collateral circulation, and less complications. Dorsalis pedis artery can be an alternative for arterial cannulation in difficult radial or brachial arteries cannulation situations as it is mostly overlooked. We present a case of a 45-year-old female planned for supratentorial craniotomy for excision of meningioma. After induction of anesthesia, the invasive access couldn't be attained after multiple attempts under ultrasound guidance by five senior anesthesiologists. The surgery was abandoned, and the patient awakened. The case was rescheduled after 2 days. The new anesthesia team attained the arterial access in the right dorsalis pedis artery and the central venous access in the right internal jugular vein in the first attempt. No complications were noted post-operatively. The dorsalis pedis artery can be safely used for arterial cannulation when radial artery cannulation is not possible.

Keywords

Blood pressure, vascular access devices, peripheral arterial catheterization, dorsalis pedis, craniotomy, vascular catheters, ultrasound

Date received: 1 December 2023; accepted: 26 April 2024

Introduction

The direct measurement of arterial blood pressure by an intraarterial catheter is commonly used in anesthesiology. Invasive arterial monitoring gives accurate blood pressures, ability to measure cardiac output, and frequent blood gas measurement. Hence, it can guide in fluid resuscitation.¹

The common sites for arterial cannula placement are the radial, brachial, and femoral arteries.²

The most favored artery for cannulation is the radial artery. The most important reason for radial artery selection is its location, the collateral circulation, and a low complication rate.³ A case of difficult invasive cannulation in an elective surgical procedure is being reported here.

Case report

A 45-year-old female with no known comorbidities was planned for supratentorial craniotomy secondary to meningioma. After applying standard American Society of Anaesthesiology (ASA) monitoring, the patient was induced and intubated successfully. Invasive central venous pressure and intraarterial pressure monitoring were planned. Despite multiple ultrasound-guided attempts on radial, ulnar, brachial, and femoral arteries by five different consultant

anesthesiologists, no one was able to get arterial access. Femoral vein was attempted for central venous access but was also not successful. After a discussion with the neurosurgeon, surgery was abandoned, and the patient awakened. This surgery was replanned after 2 days with a new anesthesia team, who attempted the dorsalis pedis artery for arterial cannulation and the internal jugular vein for central venous access. Both cannulations were done successfully on the first attempt, and surgery proceeded without any complications.

Discussion

The significance of intraarterial blood pressure measurement, especially in the setting of neurosurgical procedures cannot be over-emphasized. The continuous monitoring of blood pressure results in timely intervention as the sudden changes in patient's condition can be easily picked up.

Department of Anaesthesiology, Aga Khan University, Karachi, Pakistan

Corresponding Author:

Bushra Salim, Department of Anaesthesiology, Aga Khan University, P.O. Box 3500, Stadium Road, Karachi 74800, Pakistan.
Email: bushra.salim@aku.edu



The radial artery is easily accessible as it is superficially located and has a low complication rate.⁴ Despite these advantages, sometimes it is difficult to cannulate radial arteries due to anatomical deformities, upper extremity burns, and trauma.

The foot is mainly supplied by the posterior tibial and dorsalis pedis arteries.⁵ These arteries can be considered alternatives to radial arteries for cannulation. The dorsalis pedis artery is the direct continuation of anterior tibial artery in front of the ankle joint. It passes midway between the medial and lateral malleoli till the proximal end of the first dorsal intermetatarsal space from where it continues inferiorly as deep plantar artery.⁶

The dorsalis pedis artery is congenitally absent in around 3% of the population.⁷ In the other 97% of individuals, the flow of the dorsalis pedis artery is excellent. It can be easily cannulated with the same risk of complications as that of posterior tibial artery.^{8,9} However, it should be noted that the systolic pressure readings are 5–20 mmHg higher than those taken at the radial artery.¹⁰

In a few cases, foot gangrene has been reported due to dorsalis pedis artery cannulation.¹¹ The risk can be minimized by simulated training, knowing the anatomy, and adopting strict aseptic measures. It is imperative to monitor the site regularly for any bleeding and inflammation to minimize complications and remove the lines as soon as possible. There may be significant risks involved with repeated arterial cannulations, including vessel thrombosis, limb ischemia and, rarely, loss of the limb.¹² Our patient was followed daily for a week, and there were no complications noted.

Distal radial artery cannulation is another evolving alternative site for blood pressure monitoring because it is relatively superficial at the anatomical snuffbox and receives collateral circulation from the superficial palmar branch and the ulnar artery. Due to its anatomy, it is considered to maintain the integrity of the forearm radial artery.¹³

In our case, multiple attempts were made in the radial, brachial, femoral, and ulnar arteries, while the dorsal pedis approach was not considered. As anesthetists, we must be familiar with the dorsal pedis and new evolving approaches like distal radial arterial cannulation approach because it may be a reasonable, practical, and safe approach.

Conclusion

In summary, dorsalis pedis artery can be an option for arterial cannulation when radial artery cannulation is not possible. However, it must be kept in mind that the systolic pressures measured at dorsalis pedis are higher than at the radial artery whereas the mean arterial pressures are not clinically significant.

Acknowledgements

The authors would like to acknowledge Asma Faraz, Research Associate, for the proofreading and submission of the manuscript.

Author contributions

A.A. was responsible for the concept, design, and the intellectual content of the manuscript. B.S. contributed by drafting, editing, and reviewing the manuscript. M.H.K. also contributed to the concept and literature of the manuscript. All authors approved the final version to be published.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Presentation at a meeting

Nil.

Ethics approval

Our institution does not require ethical approval for reporting individual case.

Informed consent

The written consent was obtained from the patient's Legally Authorized Representative (patient's son), as the patient is suffering from a certain degree of cognitive impairment and therefore does not have the decisional capacity to give consent.

ORCID iD

Bushra Salim  <https://orcid.org/0000-0002-6857-6474>

References

1. Saugel B, Kouz K, Meidert AS, et al. How to measure blood pressure using an arterial catheter: a systematic 5-step approach. *Crit Care* 2020; 24: 172.
2. Gutte S, Azim A, Poddar B, et al. Arterial cannulation in adult critical care patients: a comparative study between ultrasound guidance and palpation technique. *Med Intensiva (Engl Ed)* 2023; 47(7): 391–401.
3. Maitra S, Ray BR, Bhattacharjee S, et al. Distal radial arterial cannulation in adult patients: a retrospective cohort study. *Saudi J Anaesth* 2019; 13(1): 60–62.
4. Schmidt GA, Blaivas M, Conrad SA, et al. Ultrasound-guided vascular access in critical illness. *Intensive Care Med* 2019; 45(4): 434–446.
5. Qazi E, Wilting J, Patel NR, et al. Arteries of the lower limb-embryology, variations, and clinical significance. *Can Assoc Radiol J* 2022; 73: 259–270.
6. Hemamalini and Manjunatha HN. Variations in the origin, course, and branching pattern of dorsalis pedis artery with clinical significance. *Sci Rep* 2021; 11: 1448.
7. Robertson GS, Ristic CD and Bullen BR. The incidence of congenitally absent foot pulses. *Ann R Coll Surg Engl* 1990; 72(2): 99–100.

8. Haldar R, Kumar Singh T, Saikia P, et al. Evaluation of success of arterial cannulation employing the dorsalis pedis artery versus posterior tibial artery: a clinical comparative study. *Turk J Anaesthesiol Reanim* 2023; 51(1): 55–61.
9. Chakraborty S, Ghosh S, Banerjee A, et al. Painless dorsalis pedis arterial cannulation in a patient undergoing awake craniotomy. *Int J Contemp Med Res* 2021; 8(8): H6–H7.
10. Lam S, Liu H, Jian Z, et al. Intraoperative invasive blood pressure monitoring and the potential pitfalls of invasively measured systolic blood pressure. *Cureus* 2021; 13(8): e17610.
11. Panda R and Mohanty CR. Foot gangrene following dorsalis pedis artery cannulation: risk versus benefit of arterial cannulation in polytrauma patient. *Indian J Community Fam Med* 2018; 4: 72–73.
12. McKeivitt H and Milan Z. A case of difficult arterial cannulation: is intra-arterial blood pressure monitoring an absolute requirement for paediatric liver transplantation? *J Clin Med* 2023; 12(13): 4387.
13. Xiong J, Hui K, Xu M, et al. Distal radial artery as an alternative approach to forearm radial artery for perioperative blood pressure monitoring: a randomized, controlled, noninferiority trial. *BMC Anesthesiol* 2022; 22(1): 1–9.