Forearm compartment syndrome after a trans-ulnar coronary intervention in a patient with ST segment elevation myocardial infarction

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Abstract

Compartment syndrome is a very rare but possibly devastating complication of coronary angiography when a trans-radial approach is used. The trans-ulnar approach is an attractive option in cases with anatomic variations of the radial artery or weak radial pulses. Even though it is expected that the trans-ulnar approach has a similar risk of developing compartment syndrome like trans-radial approach, the literature does not have many case reports describing this complication. Here we report a case of a woman who developed forearm compartment syndrome after trans-ulnar coronary intervention in the setting of ST-segment elevation myocardial infarction.

Keywords: Compartment syndrome, trans-ulnar access, coronary intervention

Introduction

The trans-ulnar approach (TUA) for cardiac catheterization is an attractive option for experienced operators who are skilled in this technique, especially in cases of anatomic variations of the radial artery or weak radial pulses[1–3] and has been associated with fewer bleeding complications.[4] Compartment syndrome is a rare but hand-threatening complication of trans-radial approach (TRA). Because TRA is preferred over TUA for coronary interventions, little is known about possible risks for compartment syndrome. Based on our literature review, there has been just one case published of TUA coronary intervention complicated by compartment syndrome.[5] Here we report a case of a woman who developed forearm compartment syndrome after TUA coronary intervention in the setting of ST-segment elevation myocardial infarction.

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Case

A 54-year-old woman with a past medical history of diabetes mellitus, hypertension, and hyperlipidemia was diagnosed with ST-segment elevation myocardial infarction after arriving to the emergency department with complaints of substernal chest pain at rest. The patient underwent emergent coronary angiography using ultrasound-guided right ulnar arterial access. Ulnar access was used due to diminished radial pulse and poor visibility by ultrasound. Aspiration thrombectomy of the left anterior descending artery thrombus was performed, accompanied by placement of a drug eluting stent. One to two hours after the procedure, she developed pain and swelling of the right forearm with mild subjective paresthesia. The orthopedic surgery service was consulted to evaluate her potential compartment syndrome. On physical examination, the right forearm appeared swollen and slightly hyperemic and was minimally tender to palpation. Forearm compartments were firm but compressible. The fingers were slightly cool to the touch. The wrist and hand were not tender to palpation. Motor control of her fingers was intact, as was sensation to light touch in all distal nerve

distributions. She had 2+ right radial and ulnar pulses and brisk capillary refill. Following initial evaluation, the swelling increased with complete loss of sensation to fingers. She was brought to the operating room for forearm compartment release, and a right volar forearm fasciotomy incision was done. After the procedure, compartments were firm but compressible with minimal tenderness to palpation. Motor function was intact in the fingers without pain. Sensation was intact in the radial and ulnar distribution with paresthesia in the median distribution was reversed.

Discussion

Compartment syndrome is defined as an increase in the tissue pressure (normal up to 9 mmHg) in a non-extensible space. It is a clinical diagnosis, and measurement of tissue pressures is not required. Pain, pallor, paralysis, paresthesia, and pulselessness (5 Ps) are traditionally considered to be the symptoms that indicate compartment syndrome. However, in clinical practice, the diagnosis of compartment syndrome should be made before all 5 Ps appear. Most cases of compartment syndrome after interventional procedures are caused by extravasation of blood into the tissues due to guidewire or catheter-induced damage to small arterial branches that are proximal to the puncture site.[6] Cases of arterial spasm induced by the radial sheath or catheter resulting in ischemia of the forearm muscles have been described as possible causes.[7]

Compartment syndrome after TRA is very rare, with incidence rates ranging from 0.01%–0.125% after any radial procedure, to 0.14%–0.22% after any radial percutaneous intervention.[8,9] Based on our literature review, there has been just one case reported of compartment syndrome after TUA. The lack of data regarding compartment syndrome after TUA can be due to multiple causes. First, TUA is less frequently used compared with the TRA, and hence, the amount of observational data from TUA is less compared with that from TRA. Second, studies have shown that the ulnar artery has a slightly larger diameter, fewer loops, and less spasm compared to the radial artery, which should make damage to the artery less likely.[10]

The key for management is early detection. Education of the staff involved in post-procedural care is essential for its timely diagnosis and treatment, with early recognition/response often being sufficient to avoid progression to major complications. Early involvement of an experienced hand surgeon is recommended if compartment syndrome is suspected or documented.

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References

1. Li YZ, Zhou YJ, Zhao YX, et al. Safety and efficacy of transulnar approach for coronary angiography and intervention. Chin Med J (Engl) 2010;123(13):1774–9.
2. Duarte PVF, Cortes LA, de Almeida Sampaio FB, et al. Feasibility and safety of ipsilateral ulnar access in cases of impossibility or failure of radial access for coronary angiography or percutaneous coronary intervention. J Invasive Cardiol 2022;34(2):E92–E7.
3. Gralak-Lachowska D, Lewandowski PJ, Maciejewski P, et al. TransRadial versus transUlnar artery approach for elective invasive percutaneous coronary interventions: a randomized trial on the feasibility and safety with ultrasonographic outcome-RAUL study. Postepy Kardiol Interwencyjnej 2020; 16(4):376–83.
4. Sedhom R, Megaly M, Abraham B, et al. Transulnar versus transradial access for coronary angiography and percutaneous coronary intervention: a meta-analysis of randomized controlled trials. Cardiovasc Revasc Med 2021;26:39–45.
5. Smits MWL, van der Schaaf RJ, Herrman JP, et al. Transulnar coronary intervention complicated by compartment syndrome. BMJ Case Rep 2021;14(2):e237339.
6. Bazemore E, Mann JT. Problems and complications of the transradial approach for coronary interventions: a review. J Invasive Cardiol. 2005;17(3):156–9.

7. Araki T, Itaya H, Yamamoto M. Acute compartment syndrome of the forearm that occurred after transradial intervention and was not caused by bleeding or hematoma formation. Catheter Cardiovasc Interv 2010;75(3):362–5.

8. Harvey JA, Kim S, Ireson ME, et al. Acute upper-limb complications following radial artery catheterization for coronary angiography. J Hand Surg Am 2020;45(7):655. e1–e5.

9. Zwaan EM, Koopman AG, Holtzer CA, et al. Revealing the impact of local access-site complications and upper extremity dysfunction post transradial percutaneous coronary procedures. Neth Heart J 2015;23(11):514–24.

10. Kong N, Rasberry K, Gold D, et al. The Transulnar approach to coronary angiography and intervention: assessing the anatomy of the ulnar artery using angiography. J Invasive Cardiol 2022;34(3):E164–E70.