Radial artery variations in interventional cardiology

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The increased interest in radial artery anatomy stems from its preferred use as approach in interventional cardiology (1). The radial approach is an excellent alternative to the standard femoral approach for cardiac catheterization (2). Campeau (3) performed the first transradial (TR) percutaneous diagnostic coronary angiography in 1989. Later, in 1993, Kiemeneij (4) reported the first TR percutaneous coronary intervention. Nowadays, diagnostic and treatment procedures which utilise the TR approach are extremely frequent due to the high incidence of coronary artery disease. Studies on experimental models have proven the connection between coronary artery disease, hypertension and impaired myocardial function owing to alterations in the normal anatomy and physiology of the myocardium (5-7).

Compared to the transfemoral (TF) approach, the TR approach is easily accessible, has fewer vascular complications (haematoma, thrombosis, pseudoaneurysm and arteriovenous fistula), ensures earlier mobilization, improves patient satisfaction and reduces hospital stay and hospital costs (8). Moreover, the TR approach has high efficacy, with success rates over 90% and failure of the procedure varies between 1–5% of cases (9). The advantages of TR approach are due to the fact that the radial artery is located just beneath the skin and provides easy access for haemostasis. Furthermore, if the above complications occur, they are usually treated nonoperatively. Another advantage of TR approach is the double blood irrigation of the hand, which prevents hand ischemia after radial artery thrombosis or spasm. Although the TR approach has the advantage of reduced local complications, it is associated with specific technical challenges and has relatively high incidence of catheterization failure. TR catheterization has different limitations: longer learning curve, failure to puncture the artery, limitations on catheter size, radial artery spasm and radial anatomical variations and others (9-18).

The arterial variations of the upper limb are not uncommon and some of them could have definite clinical significance, especially radial artery variations. These variations include high bifurcating origin of the radial artery (high take-off radial artery), radial artery loop, tortuosity, hypoplasia and stenosis (19). Jelev and Surchev (20) divided radial artery variations into two types. The first one, termed "high-arm", included variations of the radial artery in its origin and/or course with a normal diameter and "usual" access site at the wrist. These variations do not impede the initial transradial catheter insertion. Jelev and Surchev (20) reported the following anatomical variations that could impede cardiac catheterization: tortuosities of the artery, a radial artery loop, a radio-ulnar loop or a course behind the biceps brachii tendon. The second type of variations, termed "low-arm" variations, includes variations of the radial artery with possible hypoplasia and/or presenting with an atypical wrist access. The radial artery variations in this group may result in impossible (in cases of aplasia) or extremely difficult (in cases of hypoplastic arterial segments) wrist access to the radial artery. In this group, the variations of the radial artery could have a single arterial stem or exist as two vessels. In the latter case, the radial artery divides into two large arteries or gives off a branch of significant size, which results in a radial artery at the wrist with a smaller diameter than the normal one (20).

In conclusion, anatomical variations are the second most common factor impeding transradial cathetherizations. Precise knowledge of these variations is essential to interventional cardiologists when performing transradial coronary procedures during left heart catheterization.

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