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Crossover from radial access to the ipsilateral ulnar artery after sheath insertion into the radial artery

Running title: Ipsilateral ulnar crossover after radial artery sheath insertion

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Introduction

The radial artery has been the preferred access site for percutaneous coronary procedures for quite some time since it has some proven clinical benefits [1-3]. However, in some studies, the failure of trans radial access (TRA) is reported between 1% to 7%, mainly due to inability of puncture, radial artery spasm or dissection, hypoplastic or small radial artery and failure of catheter passage to the subclavian artery and ascending aorta [1, 4]. In these situations, the ipsilateral trans ulnar access (TUA) has shown to be a safe and feasible alternative to contralateral TRA for coronary interventions [5, 6]. In this report, we describe 11 cases of successful cross over performed from radial to ipsilateral ulnar artery after sheath insertion into radial artery.

Methods

This is a prospective, descriptive, observational study on 11 patients who candidate for elective coronary angiography due to stable ischemic heart diseases with unsuccessful TRA catheterization in two distinctive hospitals (Shahid Chamran (7 patients) and Khorshid (4 patients) hospitals, Isfahan, Iran) from January 2012 to September 2018. Our alternative planned approach was to perform cross over from radial to ipsilateral ulnar artery after sheath insertion into radial artery. Cross over from radial to femoral arteries was not possible due to severe obesity and/or peripheral vascular disease. All patients agreed to participate in the study. All procedures were performed by two expert interventional cardiologist in trans radial and ulnar approaches.

The right radial access was obtained for all of the patients. After sheath insertion in radial artery (RA) the advancement of catheter was unsuccessful due to some complications therefore, the procedure was incomplete. In 6 patients Tiger catheter (Terumo, Japan) could not be advanced due to tortuosity/loop of radial artery which led to patient's discomfort after several attempt to
repeat the procedure. In 2 patients severe spasm of radial artery, in 2 other patients' dissection of radial artery and in 1 patient advancement of catheter failed since he had a highly take off radial artery (Fig. 1). Therefore, due to limitation of femoral access we performed crossover from radial artery into ipsilateral ulnar artery access. Local anesthesia (2 ml lidocaine 2%) was infiltrated about 1 inch proximal to the flexor crease where the most powerful pulsation of the ulnar artery (UA) was sensed. Then the UA was accessed and the hydrophilic 5F or 6F sheath was introduced over the guide wire (Fig. 2). Intravenous unfractionated heparin was administered (50–70 U/kg, up to 5,000 units) [7] and to reduce ulnar artery spasm 2.5 mg diluted verapamil was injected intra-arterial. The coronary angiography/angioplasty was successfully performed in all patients without any further hindrance and complication.

Statistical analysis

There were just 11 cases that continuous and categorical variables were reported as mean (SD) and frequency respectively.

Results and discussion

The mean age of the patients was 57.8 (5.7) years old and seven of them were men. Their mean BMI was 32.5 kg/m². Atherosclerosis risk factors including diabetes, hypertension, dyslipidemia and current smoking were seen in seven, eight, six and five patients, respectively. Five of them underwent percutaneous coronary intervention in addition to coronary angiography. All of the procedures were completed successfully. In the first cases, we applied sequential hemostasis (radial artery compression via TR band followed by ulnar artery). In most cases, we have used simultaneous hemostasis method with two overlapping balloon-based compression devices on RA and UA. During 1 years follow up, there was no adverse complications including hematoma, pain or paresthesia, pseudoaneurysm formation, arterial
obstruction or limb ischemia as well as in-hospital period. Radial artery occlusion (RAO) was occurred in one and three cases in early (first 24 hour) and late period respectively.

It has been shown that TUA could be a safe and feasible alternative approach for cardiovascular interventions when ipsilateral radial is inaccessible [6]. Recent studies illustrated high success rate and an extremely low incidence of puncture site complications for TUA, which was similar to TRA [8, 9]. In the other hand, the cannulation of ulnar artery is associated with longer procedural and fluoroscopy times, and higher crossover rate compared to TRA [10]. Whereas, radial artery has more superficial course, readily palpable and compressible that make TRA a more preferable approach than TUA.

After TRA failure the most commonly alternative approach is trans femoral or contralateral TRA. Despite the limitations of the femoral access, when the mechanism of failure is the radial artery by itself, ipsilateral TUA may be considered [11]. In our patients tortuosity, dissection/perforation, severe spasm and highly take off radial artery were the reasons that halted the procedure and made the crossover from radial to ipsilateral ulnar artery; however, recently, using distal radial artery access had been safe and helpful in these cases [12].

There are two major concerns about simultaneous sheath insertion in both RA and UA. The first concern is hand ischemia due to obstruction of two major arteries supplying the hand by two sheaths during the procedure. Kedev and colleagues showed that there were no occurrences of hand ischemia in the patients with radial artery occlusion undergoing ipsilateral trans ulnar catheterization procedures. This was most likely due to rapid recruitment of collateral flow from the interosseous arteries [6]. The second concern is about simultaneous hemostasis of both arteries. Manual compression is feasible but using two overlapping balloon-based compression devices on RA and UA is also helpful. Pulsera hemostatic device also could be safe and practical for achieving simultaneous hemostasis in RA and UA.
Regarding to complications, it should be noted that there are several causes for relatively high incidence of RAO (approximately 35%) including: multiple RA puncture and manipulation, prolonged sheath removal time, atretic/small diameter RA, severe tortuosity and loop, highly take off RA and limited experience in hemostasis approaches.

This report demonstrated that ipsilateral TUA could be a secure and viable alternative approach for cardiovascular interventions in case of inaccessible radial and femoral arteries.
References


Figure 1. Angiographic depiction of the radial artery tortuosity (a), radial artery spasm (b), high take off radial artery (c), radial and ipsilateral ulnar artery sheath insertion (d) and cannulation of both radial and ulnar arteries (e).