

International Journal of Cardiology Sciences



ISSN Print: 2664-9020
ISSN Online: 2664-9039
Impact Factor: RJIF 5.42
IJCS 2023; 5(2): 25-28
www.cardiologyjournals.net
Received: 09-04-2023
Accepted: 20-05-2023

Haitham Ali Abdullah
Interventional Cardiologist,
Ibn Al-Bitar Specialized Center
for Cardiac Surgery, Baghdad,
Iraq

Hasan Ahmed Fadaam
Interventional Cardiologist,
Al-Kindy Teaching Hospital,
Baghdad, Iraq

Mohammed Qasim Khadim
Interventional Cardiologist,
Ibn Al-Bitar Specialized Center
for Cardiac Surgery, Baghdad,
Iraq

Corresponding Author:
Haitham Ali Abdullah
Interventional Cardiologist,
Ibn Al-Bitar Specialized Center
for Cardiac Surgery, Baghdad,
Iraq

The safety and patients comfort of the transradial approach in coronary angiography and coronary intervention

Haitham Ali Abdullah, Hasan Ahmed Fadaam and Mohammed Qasim Khadim

DOI: <https://doi.org/10.33545/26649020.2023.v5.i2a.35>

Abstract

Background: Coronary angiography via the transradial approach has gained worldwide popularity due to its perceived advantages, including a reduction in vascular complications and mortality compared to the transfemoral approach. This study aimed to evaluate the safety, patient comfort, and preference of patients undergoing transradial coronary procedures versus those using transfemoral access.

Method: The research included 302 patients, 144 of whom had transradial and 158 transfemoral surgery. The radial access group had more female patients according to their request, but demographics were similar. A specific radial kit was used for radial access, while the Seldinger method was used for femoral artery access. Procedure time, access issues, patient comfort, early mobility demand, and satisfaction were measured.

Results: Revealed that access time was slightly longer in the transradial group (5.8 ± 1.2 minutes) compared to the femoral group (4.2 ± 0.8 minutes, p -value = 0.012). Procedural time was also marginally extended in the radial group (25 ± 12.3 minutes) compared to the femoral group (22.7 ± 11 minutes). However, the significant advantage of radial access became evident in the time required for early standing and ambulation, with a notable difference of 0.16 hours (10 minutes) compared to 6 ± 0.7 hours in the femoral group (p -value < 0.0001).

Conclusion: Transradial treatment reduces access site problems, speeds healing, improves patient self-sufficiency, and allows early ambulation. These benefits increase patient happiness and willingness, although procedure duration is somewhat longer. This research highlights the transradial technique for coronary operations, emphasising patient-centered results and comfort.

Keywords: Safety, comfort, transradial, coronary, coronary, intervention

Introduction

Coronary procedures have become increasingly common in daily medical practice. There are several approaches for performing angiography, including the transfemoral approach (TFA), the transradial approach (TRA), and, less frequently, via the axillary or brachial arteries. In the contemporary era, coronary interventional procedures have a higher success rate [1]. However, there is growing attention to reducing complications associated with vascular access [2]. The search for ways to minimize bleeding and enhance patient comfort has led to renewed interest in the transradial artery access compared to the femoral artery access for coronary angiography and intervention. The first reported transradial coronary angiography was performed by Campeau *et al.* in 1989 [3], followed by the first transradial coronary stenting by Kiemeneij and Laarman in 1993 [4]. The primary advantage of using the transradial approach for cardiac coronary procedures is the reduction in access-site complications [5, 6, 7, 8]. The radial artery is relatively small and compressible, leading to rare bleeding complications associated with its use. TRA has gained popularity in recent years, particularly in Asia and Europe [9]. Percutaneous coronary intervention (PCI) via the transradial approach has become increasingly popular due to its lower rate of complications. From an anatomical perspective, the radial artery is located in a region with no nearby nerves or major veins, minimizing the risk of injury to these structures. Over the past decade, numerous studies have documented the benefits of TRA, such as reduced restrictions on patient movement, early ambulation, shorter hospital stays compared to TFA [5], increased

patient satisfaction and comfort, ease of compression for faster hemostasis, potential for same-day discharge, and a negligible risk of ischemia due to the dual blood supply provided by the radial and ulnar arteries [9-14]. This study aims to assess the safety, patient comfort and preference in patients undergone trans radial coronary procedures compared to trans femoral access.

Method

It is an observational study was conducted at Ibn Al Bitar Specialized Center for Cardiac Surgery from January 2021 to March 2022. A total of 302 patients were enrolled in the study for coronary angiography and coronary interventions, 144 patients underwent TRA and 158 TFA, (table 1) shows the demographic features of the patients with their risk factors, all were prepared for coronary artery procedures, a written consent is a routinely done in our center. In the Radial group, Allen's test was examined for the dual blood supply to the hand. Right radial artery was our first target, after standard sterilization, the procedure were done with radial artery kit, using 21 gauge needle via direct anterior puncture, 6French (F) sheaths are used in all patients, a mixture of nitroglycerine 200 microgram and occasionally verapamil 3 mg, unfractionated heparin (UFH) was used as 5000 IU for each 500 cc normal saline for routine wash out for the used equipment, hydrophilic and hydrophobic sheaths are used. Catheter to engage coronary arteries was the standard 6F Judkins left and right, XB catheters. Patient with negative Allen's test, absence of radial artery pulse from previous procedure, area with skin disease and limb deformity were excluded from radial approach. Post procedural hemostasis were applied by hand made bandage with subsequent gradual pressure relieve. Femoral group were accessed via routine procedures using 6F and 7F sheaths, catheters were 6 F and 7 F Judkins left, right and xb. Data analysis: SPSS V.22 (Statistical Package for the Social Sciences version 20) was used for data input and analysis. The Chi-square (X²) test was used but when one of the expected values was less than 5, Fisher exact test or Mid-P exact test was used to calculate P-value. Correlation between continuous variable was assessed using ANNOVA test. Significant P-value was < 0.05.

Results

The total of 302 patients were studied, there were 144 patients in the trans radial group and 158 in the femoral group. The access time was longer in the transradial patients than in femoral 5.8±1.2 min. verses 4.2±0.8 minutes (p value =0.012). Procedural time was also longer in the radial group than in femoral group 25±12.3 min verses 22.7±11 min. In contrast the valuable benefit of radial access was clearly obvious in the time need for early standing and ambulation, 0.16 hour (10 min) verses 6 ±0.7 hours in the femoral pulses (p value <0.0001). The cross over from right radial artery to the left radial artery or femoral approach was needed in 4 patients (2.7%), two of them because of spasm, one failure to puncture and one because of tortuosity in the subclavian artery. While the cross over in the femoral approach was done in 3 patients (1.9%), p value =0.07, Table 2 illustrate the time and cross over differences. All the patients in the radial group were satisfied with access site regarding position comfort, alleviation of back pain, and unwilling of femoral area exposure.

Table 1: patient demographic features

	Femoral N (%)	Radial N (%)	Total	P value
Age	55+6	53+4		0.28
Gender				
Female	74 (46)	88(61)	144	0.015
Male	84(64)	56(49)	158	
Diabetes	88(55)	79(54)		0.90
hypertension	78(49)	76(52)		0.72
smoking	55(34)	50(33)		0.63

Table 2: Difference in times and cross over

	Radial group	Femoral group	P value
Access time (min)	5.8± 1.2	4.2 ±0.8	0.021
Procedure time(min)	25.3 ±12.3	22.5 ±11.1	0.012
Time to Ambulation (hour)	0.16 ±0.1	6.2±1.2	<0.0001
Cross over N (%)	4 (2.7)	3(1.9)	0.712

Regarding access site complication, it was clear that the incidence is significantly lower in radial patients (table 3). Ecchymosis occurred in 26 patients in TFA compared to 8 patients in radial group (p value=0.0032), similarly hematoma was more in trans femoral group, 9 verses 1 (p value was 0.02). AV fistula not seen in radial group while in one patient in femoral group, statistical difference in the incidence of pseudo aneurysm which was more in femoral procedures, 6 verses 0 (p value = 0.032). Increase in the renal indices was comparable. No death or limb ischemia were seen in both groups

Table 3: Access site and systemic complications

	Radial group	Femoral group	P value
Ecchymosis (n)	8	26	0.0032
Hematoma	1	9	0.022
AV fistula	0	1	1.000
Pseudoaneurysm	0	6	0.037
Limb ischemia	0	0	1.000
Increase renal indices	4	5	1.000
Death	0	0	1.000

Discussion

Vascular access complications are one of the most common complications of coronary procedures with increasing attention toward preventing these events. One of those measures is to use radial approach instead of femoral approach. Main privileges of using radial approach are the superficial anatomy of radial artery leading to more efficacy of compression to control bleeding, not to mention less bleeding risk, lower morbidity and early ambulation and shorter length of hospital stay leading to better patient satisfaction [15-21]. In the present study patient demographic features were almost comparable and no statistical difference was in the selected patient, except that the female patients in TRA was significantly higher than in femoral group 61% versus 39% (p value=0.015), and this was due patient preference. The transradial group has clear advantage of time needed to stand and move after procedure compared to femoral group which obviously affect patient comfort regarding immediate patient independency and self-care, the result was comparable to many data [21, 22], this benefit was clearly applicable to patient with obesity, and patient complaining from back discomfort [23]. Like other studies radial approach associated with no limb ischemia

due to dual supply of the hand via radial and ulnar arteries [24]. There was no significant limitation to performing various form of PCI successfully, including complex interventions via the radial approach, and in high-risk subsets such as left main coronary artery, bifurcate lesions, and chronic total occlusion which was like many studies [25, 26]. In the present study access complication was significantly lower in transradial group, like ecchymosis, large hematoma compared to transfemoral patient. Interestingly no patient with transradial group has serious access site complication like pseudo aneurysm or AV fistula, even in patient loaded with anticoagulation. Thus, the potential benefit of radial approach was paramount regarding bleeding complication, these results were concomitant with most of published studies [27, 28]. Despite our interventional procedures being primarily for elective patients, studies have shown that the risk of bleeding and access-site adverse events is lower in patients with unstable angina and myocardial infarction. These findings have been further supported by the RIFLE-STEACS study (Radial Versus Femoral Randomized Investigation in ST-Segment Elevation Acute Coronary Syndrome) [29]. According to the latest European Society of Cardiology (ESC) guidelines on myocardial revascularization, radial access should now be considered the standard approach for coronary angiography and percutaneous coronary intervention (PCI) in all clinical settings (class I recommendation, level of evidence A) [30]. It is well established that the transradial approach (TRA) significantly reduces access-site complications in all patients. Numerous studies comparing TRA versus the transfemoral approach (TFA) have consistently shown a reduction in major bleeding with TRA [31, 32]. The access-site complications associated with TRA are generally benign and easily treatable, typically not requiring surgical intervention. The incidence of complications in our study aligns with the findings in the existing literature [32]. It's worth noting that TRA can be more technically challenging than TFA due to factors such as the smaller artery diameter, greater difficulty in puncturing the artery, and a higher chance of spasm. These challenges can lead to longer procedural times. In our study, the procedural times for accessing the radial artery and engaging the coronary arteries were consistent with those reported in other studies [16, 17]. Occasionally, TRA may require even longer procedural times due to specific vascular abnormalities such as tortuosity, atherosclerotic changes, calcifications, or arterial loops [33]. It's important to mention that TRA had a slightly higher access crossover rate compared to femoral access, which has been reported to be in the range of 4–7% in various studies. In our study, the crossover rate was approximately 2%, which was not statistically significant. Studies have suggested that the crossover rate tends to decrease with increasing experience and the learning curve [34]. Patient satisfaction and feeling more comfort was the main interest of our study, many factors affect this comfort in transradial group compared to patient with femoral access, like early mobilization, easily get relieved from positional aches, patient independency in addition to the patient preference for the radial approach and the unwilling for femoral site exposure, these result is well clarified and matched nearly all papers and studies [21-23]. Coronary angiography via transradial approach become very popular worldwide and is becoming more accepted in recent years, based on a reduction in vascular complications and mortality

as compared with the TFA [31-32]. However, these benefits come at the cost of increased procedure time and fluoroscopy dose [33-34].

Conclusion

Radial artery approach is effective, safe approach in coronary angiography and intervention, it dramatically associated with rapid recovery and early ambulation compared to transfemoral approach, which obviously increase patient comfort and satisfaction in addition access site complication was significantly lower in the transradial access. We recommend to outfit our centers with high quality equipment that specified to transradial approach to meet our patient willing and comfort.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article

Abdullah HA, Fadaam HA, Khadim MQ. The safety and patients comfort of the transradial approach in coronary angiography and coronary intervention. *International Journal of Cardiology Sciences.* 2023;5(2):25-28

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