PERCUTANEOUS BRACHIAL ARTERY CATHETRIZATION FOR CORONARY ANGIOGRAPHY AND PERCUTANEOUS CORONARY INTERVENTIONS (PCI): AN ENCOURAGING EXPERIENCE OF 100 CASES

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ABSTRACT

Objective: To evaluate the practicability and safety of the percutaneous transbrachial approach (TBA) for diagnostic coronary angiography and therapeutic percutaneous coronary interventions.

Study Design: Quasi experimental study.

Place and Duration of Study: The study was carried out in Armed Forces Institute of Cardiology–National Institute of Heart Diseases (AFIC-NIHD) from March 2009 to May 2011.

Patients and Methods: We collected data of 100 consecutive patients who underwent coronary catheterization by the percutaneous transbrachial approach. Transbrachial catheterization was performed only if the radial access failed or radial pulse was feeble. Study endpoints included successful brachial artery catheterization, vascular and neurological complications at access site and procedure success rate.

Results: Mean age of the patients was 54 years (range 33-79 yrs) and 65(65%) were males and 35 (35%) were females. The right brachial artery was used in all of the cases. Procedural success was achieved in 100% of the patients. Coronary angiography was performed in 70 patients and percutaneous coronary interventions were done in 30 cases. Out of these 30 cases, PCI to left coronary arteries (LAD and LCX) were performed in 19 patients while 11 patients had PCI to right coronary artery (RCA). No case of vascular complications such as major access site bleeding, vascular perforation, brachial artery occlusion causing forearm ischemia, compartment syndrome, vascular spasm or failure to catheterize coronary arteries requiring alternate vascular access were observed.

Conclusion: Brachial artery is a safe and easily accessible approach for coronary angiography and percutaneous coronary interventions.

Keywords: Brachial artery, Coronary angiography, Percutaneous intervention.

INTRODUCTION

Worldwide, percutaneous femoral artery approach is the most common form of arterial access for diagnostic coronary angiography and therapeutic percutaneous coronary interventions. The transfemoral route is preferred due to easy accessibility to puncture large caliber femoral arteries. However it is coupled with a low but potentially life threatening incidence of vascular complications as retroperitoneal hematomas[1]. Transradial access is becoming popular rapidly which involves a minimal vascular complication rate, does not require prolonged compression, and allows earlier ambulation for the patient, rendering the radial approach more comfortable for the patient and one that decreases hospital costs and length of stay when compared to transfemoral access[2]. But radial approach is more difficult to access as it is a small caliber vessel, needs more expertise to puncture and handle vascular spasm due to small caliber, radioradial and radiobrachial loops and resistance that may make catheter manipulation difficult and painful[3]. A percutaneous brachial artery approach is occasionally used in patients with severe peripheral vascular disease or when the groin approach is not possible or technically difficult. Transbrachial access has advantages like transfemoral access due to its larger caliber without any risk of life threatening complications as massive bleed or retroperitoneal haematomas and benefits of early mobilization akin to transradial approach. Large size (5- 8 French) sheaths can be safely used through transbrachial approach. But still

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this approach is sparingly used due to fear of neurovascular injuries revealed by various studies[4,5]. Most of these studies were carried out by brachial cut down where as more recent studies and case reports demonstrated relative safety of percutaneous transbrachial approach. This study was designed to evaluate the safety and efficacy of transbrachial approach for diagnostic and therapeutic coronary interventions.

PATIENTS AND METHODS

A quasi experimental study was carried out in Armed Forces Institute of Cardiology – National Institute of Heart Diseases (AFIC-NIHD) from March 2009 to May 2011 involving 100 patients. Patients referred for coronary catheterization that had a feeble radial pulse or attempt at cannulating radial artery failed were considered for transbrachial catheterization. The brachial artery was punctured anteriorly (Seldinger technique of double puncture was avoided) with a 21 gauge needle. After appearance of pulsatile blood from the arterial needle, a 0.019-inch guide wire was advanced, followed by insertion of a radial sheath. The percutaneous transluminal brachial arterial entry technique was used in all patients instead of brachial artery cut down procedure. All transbrachial procedures were performed with intravenous administration of 5000 IU of unfractionated heparin in order to prevent brachial artery occlusion. 6Fr diagnostic catheters, Judkins right 4 and Judkins left 3.5 were used in majority of the cases, but we also used tiger catheters to engage both left and right coronary arteries, and various catheters used for PCI. A 260 cm long exchange wire was used in catheter exchange to facilitate the procedure. At the completion of the procedure, the sheath was immediately withdrawn and pressure was applied over the puncture site with a gauze roll and crape bandage dressing for approximately four hours to achieve haemostasis. The pressure dressing was then replaced by a light dressing after checking the capillary refill and the patient was allowed to be discharged the same day. Vascular complications such as puncture site hematoma, brachial artery occlusion, forearm ischemia and compartment syndrome were noted. Access site bleeding was defined as major if associated with haemoglobin loss of at least 2gm/dl, administration of blood transfusions, vascular repair or prolonged hospitalization and minor if bleeding at vascular access site only resulted in haematoma formation which did not require specific therapy.

Data Analysis

Data was analyzed using SPSS version 15. Descriptive statistics were used to describe the data i.e.mean and standard deviation (SD) for quantitative variables where as frequency and percentages for qualitative variables.

RESULTS

Mean age of the patients was 54±24.5 years with 95% confidence interval (range 33-79 yrs) with 65% males and 35% females. The right brachial artery was used in all of the cases. Procedural success was achieved in 100% cases (n=100). Twelve (12%) patients had previous history of PCI while two (2%) had previous history of coronary artery bypass graft surgery.

Coronary angiography was performed in 70 (70%) patients and percutaneous coronary interventions were done in 30 (30%) cases. Out of these 30 cases, PCI to left coronary arteries (LAD and LCX) were performed in 19 patients while 11 patients had PCI to right coronary artery (RCA). Other procedural characteristics are given in table 1. No case of vascular complications such as major access site bleeding, vascular perforation, aneurysm formation, brachial artery occlusion causing forearm ischemia, compartment syndrome, vascular spasm or failure to catheterize coronary arteries requiring alternate vascular access, and major adverse cardiac and cerebrovascular events was observed peri or post-procedurally. There were 3 (3%) cases of minor bruising and 1 (1%) case of minor forearm hematomas that occurred just after the completion of the procedure and settled with arm elevation and pressure. All patients had a palpable radial artery post procedure and no patient had symptoms or physical signs of hand ischemia. One (1%) patient developed feeling of

Table -1: Procedural characteristics

	Coronary angiography (n= 70)	PCI (n= 30)
Procedure time (Min)	12 ± 3	25 ± 5
Fluoroscopy time(Min)	4 ± 2	10 ± 3
Average amount of contrast used(ml)	80 ± 25	230 ± 25

numbness in median nerve distribution of right hand that subsided within 24 hours.

DISCUSSION

Cardiac catheterization and endovascular procedures can be performed achieving access in to body's arterial system from either femoral artery (in groin), brachial artery (in elbow) and radial or ulnar artery in the wrist. Worldwide, a percutaneous femoral artery approach is the most common form of arterial access during cardiac cath and has dominated the explosive growth of invasive cardiology in past three decades. Generally speaking, catheterization through the arm is considered to cause fewer problems in recovery than catheterizing the femoral artery. This is primarily because, when the femoral artery is catheterized, there is a greater risk of hemorrhage, numerous vascular complications, such as arteriovenous fistula, pseudo aneurysms, arterial occlusion and most seriously, retroperitoneal bleed[7-10]. The standard approach to left-sided cardiac catheterization from the arm has been transradial access or by brachial artery cut down. Transradial access is an excellent alternative to femoral puncture[11,12]. Transradial access to perform diagnostic cardiac catheterization procedures, was introduced by Campeau[13] and was later adapted for therapeutic procedures of coronary angioplasty by Kiemeneij and Laarman[14].

In past few years, transradial access for coronary intervention has been increasingly becoming popular because of the various reasons. The most advantage is very low access site bleeding complication even with aggressive use of anticoagulation and antiplatelet therapies[15].

A percutaneous brachial artery approach is occasionally used in patients with severe peripheral vascular disease or when the radial or groin approach is not possible or technically difficult. Brachial artery is the access site of choice for procedures like subclavian artery stenting, renal and mesenteric artery stenting. Brachial artery catheterization, as an adjunctive technique to endoluminal Abdominal Aortic Aneurysm repair, offers noteworthy technical advantages with few, but self-limiting complications. The brachial artery is an easily accessible site for cannulation and standard practice for the repair of aneurysms and dissections of the aortic arch[16]. Brachial cannulation has excellent neurologic outcome, provides better surgical exposure, and it is less time consuming[17]. Transbrachial access has advantages like transfemoral access due to its larger caliber but without any risk of life threatening complications as massive bleed or retroperitoneal haematomas and benefits of early mobilization akin to transradial approach. But still this approach is sparingly used due to fear of neurovascular injuries revealed by various studies[18]. Most of these studies were carried out by brachial cut down where as more recent studies demonstrated relative safety of percutaneous transbrachial approach. Vascular complication rates with transbrachial access are extremely low.

In our study there were 3 cases (3.0 %) of minor bruising and 1 case (1%) of minor forearm haematomas that occurred just after the completion of the procedure and settled with arm elevation and pressure bandage. There were no major vascular complications (major access site bleeding, vascular perforation, major forearm haematomas requiring blood transfusion or surgical repair, radial artery occlusion, forearm ischemia or compartment syndrome). Transradial or transbrachial intervention (PCI) can be advantageous in patients with acute coronary syndrome (ACS) where aggressive antithrombotic and antiplatelet therapy is often instituted, leading to a higher potential for access site bleeding complications. One of the main advantages of radial and brachial access over the femoral

route is rapid mobilization of the patient and earlier discharge from hospital coupled with preserving patient's modesty by avoiding exposure of groin. Other unique advantages of transbrachial access are extra length of catheter available for intervention beyond coronary arteries in branches of descending aorta as celiac trunk, mesenteric arteries and renal arteries.

CONCLUSION

The brachial artery is a safe and an excellent access site for coronary interventions and a safe alternative to femoral catheterization.

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