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Original Research Article

Cardiac Catheterization in Port Harcourt: Initial Two Years' Experience

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Abstract: ***Introduction:*** Cardiac catheterization for diagnostic and therapeutic purposes is now routinely done at the Save a Life Port Harcourt, since last two years. Also included are cardiac devices which include pacemakers, Implantable Cardiac Defibrillators and Cardiac Resynchronization Therapy. In this retrospective study, we review our initial two years' experience of Cardiac Catheterization at the Save a Life Mission Hospital, Port Harcourt. ***Methods:*** This is a retrospective study over a period of two years, form 1st February, 2021 to 31st March, 2023. A total of 216 consecutive diagnostic and therapeutic cardiac catheterization including cardiac devices performed in Save a life Mission Hospital between 1st February 2021 to 31st March 2023 were evaluated. Among them 88; (40.7%) were coronary angiogram, 41 (18.98%) percutaneous transluminal coronary angioplasty (PTCA) and stenting, 59(27.3%) permanent pacemaker insertion, 29 (13.4%) Implantable cardioverter defibrillators, 14 (6.5%) cardiac resynchronization therapy and 26 (12.1%) with peripheral angiography. Six patients were referred for coronary artery bypass surgery. Vascular complications [groin hematoma] occurred in two patients (0.9%). ***Conclusion:*** Both diagnostic and therapeutic cardiac catheterization procedures are safe with very low risk of complications even in its initial experience. The optimate goal of these procedures is to ensure the safety of the patients.

Keywords: Cardiac, catheterization, initial experience.

INTRODUCTION

Cardiac catheterization is one of the most widely performed cardiac procedures in the world [1]. Cardiac catheterization is an invasive intervention that being increasingly used both for diagnosis and treatment [2-4]. With improvement in technology and experience, pharmacologic development, the indications for this procedure are increasing. In Nigeria, this procedure is on the increase. There are many catheterization laboratories in Nigerian cities like Lagos, Abuja, Port Harcourt, Enugu, Ekiti, Uyo, Yenagoa, etc. In the south- South Nigeria, catheterization laboratory started at the Ibom Specialist Hospital 2012 and then the Bayelsa specialist Hospital in 2017. Cath lab services started in Port Harcourt at the Save a life Mission Hospital in March 2021, and the Dr Odili Cardiovascular and Cancer Center 2023.

Cardiac catheterization for diagnostic and therapeutic purposes is now routinely done at the Save a Life Port Harcourt, since last two years. Cardiac devices which include pacemakers, Implantable Cardiac Defibrillators and Cardiac Resynchronization Therapy are routinely done this center. In this retrospective study, we review our initial two years' experience of Cardiac Catheterization at the Save a Life Mission Hospital, Port Harcourt.

METHODS

This is a retrospective study over a period of two years, from February 2021 to March 2023. We analyzed 216 consecutive patients, ranging from 35 years to 104-year-old (mean, 67 ± 10 years), who underwent diagnostic as well as therapeutic cardiac catheterization, between February 2021 and March 2023 at the Save a life Mission Hospital, Port Harcourt were evaluated. Cardiac catheterization was done both from femoral and radial arteries access site. Cardiac devices were done from both left and right axillary and extra-thoracic subclavian vein access.

Diagnostic and therapeutic cardiac catheterization procedures include coronary angiography, peripheral angiography, carotid

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angiography, permanent pacemaker insertion, ICD, CRTs, percutaneous transluminal coronary angioplasty (PTCA) with stenting (including primary PTCA). Both written and informed consents were taken before the procedure. All periprocedural complications during catheterization and hospital stay were recorded. Patient with incomplete data were excluded. Data were analyzed using SPSS version 25.

RESULTS

There were 216 subjects. There were 98 men. The age ranges of the subjects were from 35 to 104 [mean, 67 ± 10 years]. Among the subjects, 88 (40.7%) underwent coronary angiogram, 41 (18.98 %) percutaneous transluminal coronary angioplasty (PTCA) and stenting, 59 (27.3 %) permanent pacemaker insertion, 29 (13.4%) Implantable cardioverter defibrillators, 14 (6.5%) cardiac resynchronization therapy and 26 (12.1%) with peripheral angiography. Six patients were referred for coronary artery bypass surgery. Vascular complications [groin hematoma] occurred in two patients (0.9%).

Seventy-six percentages of Coronary artery angiography procedures were done through femoral, and 24% cases were done through radial arterial access. Following procedure, the femoral arterial access site was compressed manually for at least 20 to 30 minutes and the patient was admitted in wards keeping the access site leg immobilized for 4 to 6 hrs. In case of access through radial artery, radial sheath was removed immediately, and the access site was compressed using bandage.

The vascular complications associated with the procedures were evaluated. This complication [groin hematoma] occurred in two patients (0.9%).

Table 1: Cardiac catheterization procedures

S/N	PROCEDURE	TOTAL n[%]
1	Coronary angiography	88 [40.7%]
2	PCI with stents	41 [18.98%]
3	Pacemakers implantation	59 [27.3%]
4	Implantable cardioverter defibrillators	29 [13.4%]
5	Cardiac Resynchronization Therapy	14 [6.5%]
6	Peripheral angiography and Peripheral Angioplasty	26 [12.1%]
7	Coronary artery bypass surgery	6 [2.78%]

Table 2: Complications observed with catheterization procedure

S/N	COMPLICATION	NUMBER OF PATIENTS	OUTCOME
1	Hematoma at puncture site	2	Improved after 24 h, blood transfusion not required in any patient
2	Bleeding from puncture site	3	Controlled by applying pressure in 10 min
3	Chest pain why injection of contrast	4	Resolves spontaneously

DISCUSSION

Cardiac catheterization is one of the most widely performed cardiac procedures [5]. Cardiac catheterization, whether diagnostic or therapeutic, invariably include both a chance of benefit and a chance of harm to the patient. The coronary angiography helps one to decide whether a patient will go for PCI or CABG [6].

In Nigeria, the need for this procedure is on the increase. As expected, in any invasive procedure, there are some patient-related and procedure-related complications. But in an experience hands and well thought out procedure and follow-up, the complication is low and the procedure is safe.

Coronary angiography and percutaneous coronary interventions

Coronary angiography is done as a separate procedure to image the right and left coronary arteries. During this procedure, the various branches of these major arteries are also imaged. The patient may end up having only coronary angiography or may proceed to PCI with stent or coronary artery bypass surgery [7].

This procedure is safe, very well tolerated and it usually takes between 20 to 40 minutes to be done [8].

The goal of CAG is to establish the diagnosis, prognosis, and chart a treatment pathway with or without coronary revascularization. The main indications for CAG among others included: acute coronary syndromes, chronic coronary syndromes or as a routine procedure for surgical work up of patients [8]. In this initial two year experience, the main indications for coronary angiography at the Save a life mission hospital included patient with Acute and chronic coronary syndromes and those for open heart surgery like valvular replacement or repair.

Among the 216 subjects in this two-year review, 40.7% underwent coronary angiography. Seventy-six percent of the patients with CAG had femoral access. In the Registry for Acute Coronary Events in Nigeria (RACE-Nigeria), 42.4% [7]. These are subjects diagnosed with RACE-Nigeria study. The incidence of normal coronary arteries in patients referred for invasive coronary angiography (ICA) ranges from 30-60%. National registry data indicate that approximately 60% of patients referred for invasive coronary angiography (ICA) have normal coronary arteries (NCA) or non-obstructive coronary artery disease (CAD) [8-10].

Coronary angiography is indicated for the diagnosis and treatment planning, for patients with anginal syndromes, atypical chest pain syndrome suggesting ischemia, congenital heart disease, following cardiac arrest thought to be due to ischemia or infarction, myocardial infarction, known atherosclerotic or other coronary disease, suspected graft or stent/PTCA closure, Prinzmetal's angina, coronary shunts and fistulae, cardiac trauma and for treatment planning in patients undergoing cardiac surgical procedures [11-16]. It is also indicated for treatment planning in high-risk patients with evidence of ischemic heart disease undergoing high-risk non-cardiac surgical procedures (arterial or aortic surgery, or surgery with large fluid shifts) [14, 15].

Percutaneous Coronary Interventions

Percutaneous coronary interventions are indicated in the following patients having coronary angiographies and these include: Acute ST-elevation myocardial infarction (STEMI) less than 12 hours of onset of symptoms and those with contraindications to fibrinolytic therapy, Non–ST-elevation acute coronary syndrome (NSTE-ACS) [17-21]. Early invasive therapy (within 2 hours of symptoms) recommended with refractory angina, recurrent angina, symptoms of heart failure, new or worsening mitral regurgitation, hemodynamic instability, or sustained ventricular tachycardia/fibrillation [18-20]. A worsening of troponin levels should trigger an early therapy (within 24 hours) in patients with Unstable angina, Stable angina or anginal equivalent (e.g., dyspnea, arrhythmia, or dizziness or syncope) and patient with High-risk stress test findings. PCI is indicated for critical coronary artery stenosis, which does not qualify for coronary artery bypass surgery (CABG) [17, 21].

Cardiac Devices

Cardiac resynchronization therapy (CRT) is an established treatment for patients with heart failure (HF), myocardial dysfunction and prolonged ventricular depolarization on surface electrocardiogram. CRT can be delivered by a pacemaker (CRT-P) or a combined pacemaker-defibrillator (CRT-D) [22]. These two types of devices are very different in size, function, and cost. Current published guidelines do not distinguish between them, leaving the choice of which device to implant to the treating physician and the informed patient [22]. These two types of CRTs are implanted in Port Harcourt. In this two-year review, one CRT-P and 13 CRT-D were implanted in the Save a life Mission cardiac catheterization laboratory.

As heart failure progresses, electrical remodeling occurs and the QRS duration may be prolonged, resulting in a poorer outcome.23 Intraventricular and interventricular mechanical dyssynchrony develop as a result of electrical remodeling and, in turn, negatively impact cardiac contractile performance [23]. CRT or biventricular pacing confers benefits on such patients through improvements in ventricular contractility, functional mitral regurgitation, ventricular remodeling and overall LV ejection fraction [23]. As it results in increased blood pressure, doses of GDMT may be further optimized with the potential for greater improvement [23].

Current established Class I indications for CRT include patients who fulfil the following criteria: NYHA Class III or ambulatory Class IV symptoms [24]; LV ejection fraction ≤ 35%; baseline LBBB; sinus rhythm; and QRS duration of ≥ 150 ms on optimal GDMT (European guidelines recommend at least three months of GDMT). NYHA Class I or II symptoms; LV ejection fraction ≤ 30%; baseline LBBB; sinus rhythm; and QRS duration ≥ 130 ms on optimal GDMT (European guidelines recommend at least three months of GDMT) [24]. Upgrade from a cardiac permanent pacemaker or ICD in a patient with LVEF ≤ 35%; high percentage of ventricular pacing; and NYHA Class III or ambulatory NYHA Class IV symptoms [24]. These guidelines were observed in the implantation of the cardiac devices.

Patients with LV dysfunction are at an increased risk of SCD secondary to ventricular tachyarrhythmias [25-27]. The risk of SCD increases with decreasing LV ejection fraction [26-31]. Those who have experienced previous sustained ventricular tachyarrhythmias or unexplained syncope are at the greatest risk of SCD [31]. The ICD is a device capable of detecting and terminating ventricular tachyarrhythmias [29]. It consists of leads attached to a pulse generator that houses the batteries, microprocessors and capacitors [27, 28]. An ICD pulse generator is usually implanted

subcutaneously in the left anterior chest wall under local anesthesia and conscious sedation, with leads introduced into the cardiac chambers via the subclavian or cephalic vein [28]. A single-chamber ICD has a single defibrillator lead implanted in the right ventricle, while a dual-chamber ICD has a right atrial pacing lead and a right ventricular defibrillator lead [31].

When an ICD detects ventricular tachyarrhythmias based on the programmed algorithms, it initiates therapy by way of anti-tachycardia pacing and/or defibrillation shocks [28-30]. In addition to anti-tachycardia therapy, ICDs are also capable of backup bradycardia pacing and heart rhythm monitoring with electrogram storage [28].

Pacemakers are electronic devices that stimulate the heart with electrical impulses to maintain or restore a normal heartbeat [31-33]. They are used for treatment of symptomatic bradycardia therapy. The most common indications for permanent pacemaker implantation are sinus node dysfunction (SND) and high-grade atrioventricular (AV) block [31]. In the sub-Saharan Africa, the commonest indication for pacing is symptomatic bradycardia with complete heart block [34, 35]. Guidelines for implantation of cardiac pacemakers have been established by a task force formed jointly by the American College of Cardiology (ACC), the American Heart Association (AHA), and the Heart Rhythm Society (HRS). The European Society of Cardiology has established similar guidelines [32]. ACC/AHA/HRS divides indications of pacemaker implantation into 3 specific classes:

CONCLUSION

Both diagnostic and therapeutic cardiac catheterization procedures are safe with very low risk of complications even in its initial experience. The optimate goal of these procedures is to ensure the safety of the patients.

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