

The Initiation of Coronary Angioplasty and Stenting in a Single Outpatient Centre in Barbados

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ABSTRACT

Percutaneous transluminal coronary angioplasty (PTCA) is a novel procedure to Barbadian healthcare. Only one centre in Barbados provides PTCA and stenting. This is a retrospective study aimed at describing the initial results of coronary angioplasty and stenting in the first 48 patients at the Carib-American Heart Centre and exploring the feasibility and safety of coronary angioplasty and stenting in Barbados. Forty-eight patients underwent PTCA during the period March 2002 to June 2004 inclusive, with or without intracoronary stenting. Most (64.6%) of the patients were male and 43.7% were diabetic. The most common vessels involved were the left anterior descending coronary artery (LAD) and the right coronary artery (RCA). In one patient, attempted stenting was unsuccessful but PTCA reduced stenosis. One patient had previous PTCA and stenting of the LAD and two patients had coronary artery bypass grafting (CABG) prior to the procedure. Twenty-one per cent of the patients treated had severe triple vessel disease. There were no cases of re-stenosis or acute vessel closure, during or immediately following the procedure that required emergency PTCA or CABG. All patients were discharged within 24 hours of the procedure. Procedural success was 100%. In conclusion, outpatient PTCA and stenting is safe and feasible in the Barbadian population. Coronary artery bypass grafting is still the procedure of choice for treating coronary artery disease (CAD) involving the left main coronary artery but PTCA is indicated in some cases of severe triple vessel disease.

La Iniciación de la Angioplastia y el Estent de la Arteria Coronaria en un Centro Ambulatorio en Barbados

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RESUMEN

La angioplastia coronaria transluminal percútanla (ACTP) es un procedimiento nuevo en la atención a la salud en Barbados. Sólo un centro en Barbados ofrece ACTP y estent (o cánula intraluminal de arteria coronaria). El presente trabajo es un estudio retrospectivo destinado a describir los resultados iniciales de la angioplastia y el estent coronarios en los primeros 48 pacientes en el Centro Caribe-americano de Cardiología, y explorar la factibilidad y seguridad de la angioplastia y el estent en Barbados. Cuarenta y ocho pacientes fueron sometidos a ACTP durante el periodo de marzo 2002 a junio 2004 inclusive, con o sin estent intracoronario. La mayor parte (64.6%) de los pacientes eran varones y un 43.7% eran diabéticos. Los vasos más comúnmente involucrados fueron la arteria coronaria descendente anterior izquierda (DAI) y la arteria coronaria derecha (ACD). En un paciente, el intento de estent no tuvo éxito, pero la ACTP redujo la estenosis. A un paciente le fue practicada previamente la ACTP y el estent de la DAI, y a dos pacientes se les realizó injerto de bypass de la arteria coronaria (IBAC) antes del procedimiento. El veintiún por ciento de los pacientes tratados tuvo enfermedad vascular triple. No hubo ningún caso de reestenosis o cierre vascular agudo, durante o inmediatamente después del procedimiento, que requiriera ACTP o IBAC de emergencia. Todos los pacientes fueron dados de alta dentro de las 24 horas tras el procedimiento. El éxito de los procedimientos fue del 100%. En conclusión, el estent y el ACTP ambulatorios son seguros y factibles para la población barbadense. El injerto de bypass de la arteria coronaria sigue siendo el

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procedimiento de elección para tratar casos de la enfermedad de la arteria coronaria (EAC) que involucren la arteria coronaria izquierda principal, pero la ACTP se indica en algunos casos de enfermedad vascular triple.

INTRODUCTION

In an article of the September 2002 issue of the Pan American Health Organization's Epidemiological Bulletin, diseases of the circulatory system are described as: "the greatest risk of dying" in the Americas, with 214 deaths per 100 000 population (1). Coronary artery disease (CAD) is the most common type of heart disease (2) and is a leading cause of death in Barbados.

Prior to the introduction of percutaneous coronary intervention (PCI) in the 1970s, CAD was controlled either non-surgically by medical management and treatment of related diseases such as hypertension, hyperlipidaemia and diabetes mellitus, as well as promoting changes to the patient's lifestyle and habits, or surgically with coronary artery bypass grafting (CABG), a means of myocardial revascularization. The technical advances in PCI with intracoronary stent implantation have made it the therapy of choice in patients with significant CAD, even in those with stable clinical conditions (3). Percutaneous transluminal coronary angioplasty (PTCA) is a less invasive technique of enlarging narrowed coronary arteries. Initially, PTCA was only performed for discrete, proximal, noncalcified, subtotal lesions in single-vessel coronary artery disease. However, a dramatic increase in the use of percutaneous intervention in multi-vessel disease, fuelled by improved angioplasty technology and new devices, accounts for the growth in these procedures worldwide (4) reducing the need for coronary artery bypass grafting (CABG). The stent has made balloon angioplasty considerably safer and more effective, reducing the incidence of re-stenosis during or following PTCA.

Coronary angiography and coronary revascularization have been available in Trinidad and Tobago for a decade (5) and there is some documentation of the initial results of trials of PTCA and intracoronary stent implantation in Trinidad and Tobago, and Jamaica. However, the use of PTCA as a means of treating CAD is still novel in Barbados. Indeed, while coronary angiography is now available at the Queen Elizabeth Hospital, there is only one cardiologist who is performing PTCA at the Carib-American Heart Centre (CHC) in Barbados. This report describes the initial experience with coronary angioplasty at the CHC, with the hopes of further highlighting the feasibility, safety and efficacy of the technique, and demonstrating the scope of angioplasty in treating coronary artery disease in Barbados and the Caribbean.

SUBJECTS AND METHODS

This is a retrospective, descriptive study aimed at describing the initial experience in coronary angioplasty at the Carib-American Heart Centre in Barbados. During the period, March 15, 2002 to June 4, 2004 inclusive, 48 patients under-

went PTCA and intracoronary stenting at the Carib-American Heart Centre. The records of these first 48 consecutive patients were reviewed. Patients who had attended the centre and were recommended for PTCA but had the procedure done elsewhere, were excluded from the study. Records of the coronary angiograms done at the centre during the period were also reviewed to compare the number of patients recommended for CABG instead of PTCA. All of the results were kept anonymous.

Numerical data

Continuous variables are represented as mean \pm SD and discrete variables as percentages (to 1 decimal place). The mean ages of the patients and the mean diameter stenosis before and after the procedure were calculated. The proportion of patients with hyperlipidaemia, hypertension and diabetes mellitus who smoked cigarettes were calculated. Other numerical data, including that related to the culprit lesions, number of vessels, number of partial and total occlusions, number of stents successfully deployed and procedural success were calculated.

The PTCA procedure

All of the procedures were performed in a Philips Digital Laboratory at the Carib-American Heart Centre. Using local anaesthesia, a 7 French sheath was inserted into the right femoral artery and under fluoroscopic guidance, a 6 French guiding catheter was advanced through the sheath to the target vessel. Using contrast dye and radiography, a coronary guide wire was then advanced into the target vessel and across the lesion *via* the guiding catheter. When PTCA was being done alone, a balloon catheter was then advanced over the wire, positioned at the site of the lesion and inflated. When stenting only was being done, a balloon catheter with a stent mounted on the deflated balloon was advanced to the site of the lesion and deployed at appropriate pressures. When PTCA and stenting were being done in the same procedure, then the lesions to be stented were ballooned first, followed by stent deployment. The balloon was then deflated and removed and the final angiographic images were taken and recorded on a computer hard drive. The percentage stenosis after PTCA and/or stenting was determined. Total re-occlusion was defined as no blood flow (TIMI 0 flow). Partial occlusion was defined as decreased blood flow (TIMI 1–2 flow). Procedural success was defined as complete revascularization (with TIMI 3 flow) with minimal or no residual stenosis.

Heparin, aspirin and plavix were used routinely throughout the procedure. When 7000 – 8000 units of heparin were used, the femoral sheath was removed five hours

after the procedure and pressure applied manually for 30–45 minutes to promote sealing of the puncture wound. A sandbag was then placed on the wound to maintain pressure on the wound and to prevent the patient from moving the leg. Patients were managed in the Recovery Room at the CHC and discharged within 24 hours of the procedure.

RESULTS

Of the 48 patients who underwent PTCA and stenting, 31 were male (64.6%). The mean age was 60.5 ± 10.3 years. Fifty per cent had hyperlipidaemia, 62.5% were hypertensive, 43.7% were diabetic and 20.8% either still smoked up until the procedure or had smoked in the past. Two patients were asthmatic and one had hyperthyroidism. One patient had received previous PTCA and two patients had had prior

CABG. One patient had also received a pacemaker. Thirteen (27.1%) patients had family history of heart disease and seven patients (14.6%) had had a previous myocardial infarction. One patient was hospitalized twice prior to PTCA for angina. Twenty-seven patients (56.3%) had multi-vessel CAD of whom ten patients (20.8%) had severe triple vessel disease (Fig. 2). No PTCA or stenting was done on patients

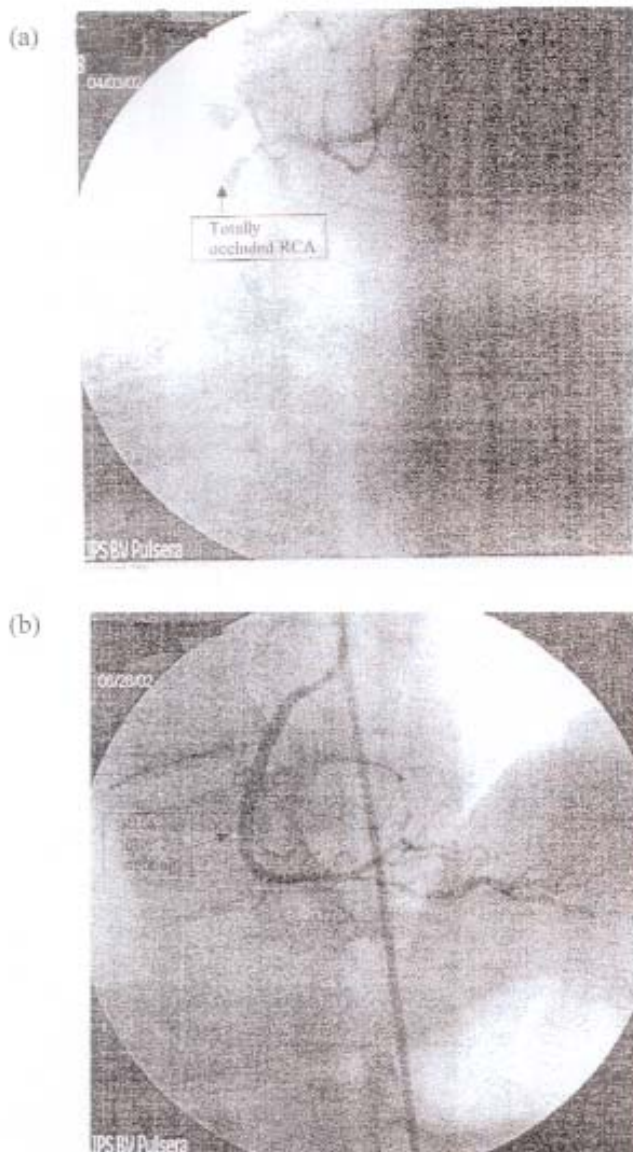


Fig. 1: PTCA and stenting of a totally occluded right coronary artery (RCA). (a) RCA before PTCA and stenting. (b) Fully patent RCA after PTCA and stenting at the CHC.

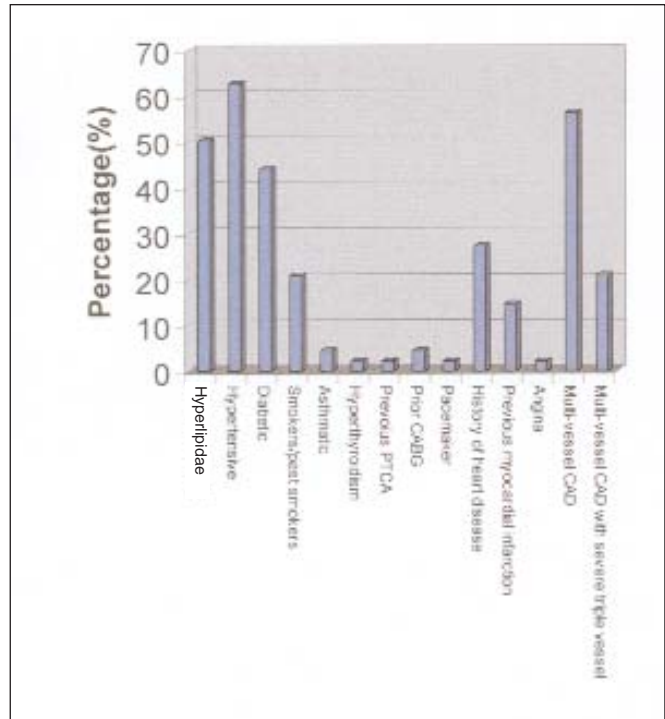


Fig. 2: Patient demographics.

with left main coronary artery disease. Stenting was done on all except those who had ostial stenosis within the RCA, left circumflex or within their branches. Unstable angina was found in 27.7% of the patients while a further 43.2% of patients had a history of MI and no patient had acute MI. The left ventricular (LV) function of the patients is stated in Figure 3.

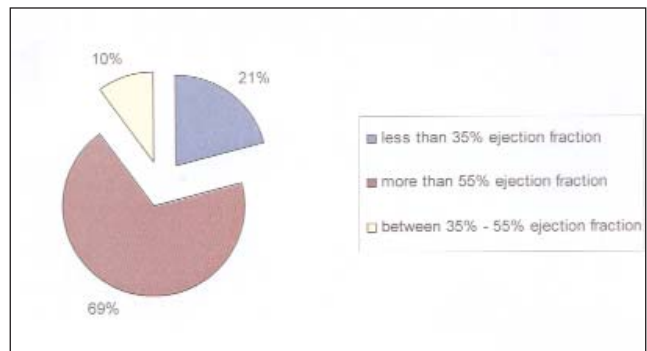


Fig. 3: Left ventricular functions.

Fifty-one vessels underwent attempted PTCA and stenting, stenting being done on forty-two (82.4%) vessels, with 45 stents being deployed. One vessel could not be stented while PTCA was unsuccessful due to an acute bend of the vessel. All other attempts at stenting were successful. The culprit vessels were the LAD artery (45.1%), the right coronary artery (45.1%) and the left circumflex artery [9.8%] (Table 1). There were 52 lesions, 50 (96.2%) of the lesions

Table 1: Patient lesion morphology

Patient ID	Artery	Length (mm)	Diameter (mm)	Type of Lesion
1	LCX	5	2.8	A
2	LAD	7	3.1	A
3	LAD	8	3	B
4	RCA	11	3.1	A
5	LAD	15	3.2	B
6	LAD	6	2.9	A
7	LAD	8.2	3	A
8	RCA	4	2.7	A
9	RCA	7.5	3.1	A
10	LAD	17	3.2	A
11	RCA	8	2.7	A
12	RCA	1	3.3	A
13	TCA	2	3.5	C
14	LAD	17	3	A
15	LAD	19.5	2.86	B
16	LCX	15	3	A
17	LAD	6.6	2.82	A
18	RCA	1	3	A
19	LAD	12	2.9	A
20	RCA	9.5	2.7	C
21	Diagonal Artery	4.5	2.5	A
22	RCA	12	3	C
23	LAD	15	3.3	C
24	RCA	1	3.1	A
25	LAD	16	2.9	C
26	RCA	11	2.5	C
27	RCA	9	3	A
28	RCA	12	2.9	B
29	RCA	7.5	2.8	A
30	RCA	12	3	A
31	RCA	11	2.8	A
31	LAD	8.6	3	B
32	RCA	2	3.1	A
33	LCX	16	2.5	A
34	LAD	2	2.9	C
35	RCA	12	2.8	B
36	LCX	4	3	B
37	TCA	7.3	2.9	B
38	Diagonal Artery	12	3	C
39	LCX	1	3	A
40	OMB	5	2.6	A
41	LAD	8.8	2.7	C
42	LAD	1	3	A
43	RCA	9.9	3	A
44	LAD	12	3	C
45	Diagonal Artery	11	2.6	C
46	LAD	9	3	A
47	RCA	8	2.7	A
48	LAD	11	3	B

were partial coronary occlusions while two (3.8%) were total coronary occlusions in the RCA. Figure 1 shows the results of coronary angioplasty and stenting on a patient with total occlusion of the RCA. The mean diameter stenosis before PTCA and stenting was $86.3 \pm 9.0\%$ and after, $0.8 \pm 4.8\%$ residual. Procedural success was 100%.

One patient experienced hypotension which responded to intravenous fluids and one patient had an allergic reaction to iodine dye. In the latter case, intravenous steroids and anti-histamine were given. There were no incidences of re-stenosis during or following the procedure that required repeat PTCA or CABG. There were no puncture site haematomas or groin infections.

All patients were discharged within 24 hours of the procedure. The survival rate was 100%. Patients were enrolled in a cardiac rehabilitation programme following a negative stress test within one month of the procedure. Where follow-up information was available, it was found that those patients who were active in the programme had promising results. During the same period seven patients with severe three-vessel disease, including some with left main stem disease, were recommended for CABG instead of PTCA.

A series of follow-ups were done over the period of one day, one week, one month, three months, six months, nine months and one year. Eight patients reported chest pain however their stress test results were negative and they were reassured. One patient complained of persistent chest pain but an angiogram showed totally patent procedural lesion.

DISCUSSION

Angina pectoris is the most common symptom in patients with coronary artery disease. The principal indication for catheter-based revascularization is angina pectoris that fails to respond adequately to medical management in a patient with coronary artery lesions in which PTCA is indicated (6). PTCA provides symptomatic relief of angina and may prevent future coronary artery occlusion which can lead to myocardial infarction (5). Severe myocardial infarction can be fatal. Patients presented to the clinic complaining of angina pectoris or experiencing angina during routine non-invasive tests, stenting and PTCA were successful at relieving angina in all patients.

The major complication of coronary angioplasty is abrupt closure (6). Acute vessel closure may occur in 2–10% of cases during or within 24 hours after PTCA and re-stenosis (proliferation of the intima of the dilated coronary artery) may complicate 30–40% of PTCA procedures and develops within four months of such a procedure (5). However, effective stent placement during angioplasty has a higher clinical success rate and reduces the incidence of re-stenosis and the need for subsequent revascularization of the treated lesion (7). The reduction of acute complications and late re-stenosis compared to conventional PTCA has led to a rapid increase

in stent implantation as initial treatment for coronary stenosis (8). The increasing use of stent implantation as coronary interventional therapy presents yet another problem, the issue of in-stent re-stenosis. In the present study, stenting was used in 82% of the cases with seemingly optimal results. Other studies will have to be done to investigate the prevalence and consequences of in-stent re-stenosis.

The use of stents facilitates same day discharge (9). Recently, studies have been done on the feasibility and safety of coronary angioplasty as an outpatient procedure. With careful selection of patients before and after angioplasty, PTCA can be performed safely in outpatients (10). The shortened length of hospital-stay is attractive and convenient from the viewpoint of cost effectiveness. This is especially so in a small country like Barbados with limited resources and finances. In this outpatient setting, procedural success was 100% with minimal complications. No patient required hospitalization after discharge.

Previously, PTCA was only indicated in patients with severe single-vessel and two-vessel disease and was almost never used in patients with severe 3-vessel CAD. Advances in angioplasty technology have allowed PTCA to be an option in some cases of severe 3-vessel CAD; screening of clinical data and angiographic findings being used to determine whether the procedure would be safe on the patient. In this study, 20.8% of patients had severe 3-vessel disease and PTCA and stenting were performed without complication. In patients with severe left main coronary artery disease, CABG is still the best option for revascularization.

Cardiac rehabilitation is aimed at altering patient behaviour with respect to diet, exercise habits and unhealthy habits such as smoking. It also promotes management of other risk factors such as diabetes mellitus and hypertension.

Such efforts are primarily to help patients control their CAD and to prevent future occurrences of angina pectoris or myocardial infarction. The effectiveness of cardiac rehabilitation requires further investigation.

In conclusion, it has been found that coronary angioplasty is a feasible, safe and effective procedure for the treatment of coronary artery disease in the Barbadian population and can be performed safely in an outpatient setting.

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