Percutaneous transluminal coronary angioplasty in the treatment of coronary artery disease – the local experience : a review of 100 cases

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Summary

This paper reviews our first 100 consecutive PTCAs done between December 1988 and May 1990. There were 31 females and 69 males and their ages ranged from 37 years to 80 years. The mean age was 57.7 years. We achieved a follow-up rate of 66%. The restenosis rate was 22% of those that we could follow-up. There were 35 simple and 65 complex PTCAs. An average of 1.39 arteries were entered per PTCA. Of the 100 PTCAs done there was a primary success rate of 83%. On closer examination most of the failures were in the total occlusion group. There were 30 total occlusions done and 17 were successfully dilated. The primary success rate for acute total occlusions was 77% and the primary success rate for chronic total occlusions was 41%. Of the 100 PTCAs there were two deaths and only one patient had to go for emergency bypass surgery. The other complications were relatively minor including hypotension, groin bleeding, chills and rigors. This paper documents our initial 100 cases of PTCAs. It shows that our figures are compatible with other centres in this region and those around the world.

Key words: PTCA, angioplasty, coronary artery disease, restenosis, total occlusion.

Introduction

It is now 11 years since A. Gruentzig[1] first described the technique of PTCA for the treatment of coronary artery disease. During these 11 years PTCA has established itself, and is now generally accepted as a good method of treatment for coronary artery disease. There has been much modification of the original hardware but the basic technique remains much the same. Atherosclerotic stenosis of the coronary arteries can be effectively treated in the cardiac laboratory, resulting in relief of angina and increase in patients' exercise capacity. In spite of its many imperfections, PTCA can now be safely performed by experienced cardiologists in most medical centres where cardio-surgical standby is available. The improvements in PTCA hardware has made this procedure very safe. We now have steerable catheter systems and highly trackable balloon catheters which are of very low profile. This has increased our primary success rates and allowed us to dilate and treat more lesions. This paper reviews our first 100 cases.

We started doing angioplasties in December 1988. From December 1988 till 30 May 1990 the team had carried out 100 PTCAs. Part of this work was done at the Pantai Medical Centre and the bulk of the work was done at the Subang Jaya Medical Centre.

Materials and Method

We followed the standard PTCA approach of Gruentzig[1] and all the PTCAs were done following the Judkins technique. Eight French guiding catheters were preferably used. The preferred guide-wire was the 0.014 inch hyperflex (USCI). For total occlusions the 0.014 inch flexi steerible or standard wire (USCI) was used. A variety of balloon dilatation catheters were used beginning with the Profile-plus (USCI), the SULP 2 (ACS), the ACS RX catheters. In the last 50 cases, Miniprofile (USCI), was used almost exclusively. We preferred the over-the-wire technique. Fixed wire balloon dilatation catheters were rarely used.

The premedication was usually Diazepam 10mg orally and Nitroderm 10mg tropically. This was administered a half hour before the procedure. At the start of the procedure the patient was heparinised with 10,000'u' of heparin IV bolus. 5000'u' of heparin was given for every hour of procedural time thereafter. Intra-coronary Nitroglycerin was used liberally whenever required and had to be used for all patients (average dose 200ug – 400ug bolus). Intravenous Aramine was used whenever troublesome hypotension was encountered. The patients were monitored in CCU right after the procedure, overnight. Blood samples for CPK estimation and ECG were done in CCU right after the procedure and also the next morning. The patients were discharged either on the late evening the day following the procedure or the morning after coming out of CCU.

Cardio-surgical standby was available at all times. Initially an open operation theatre was kept in readiness but lately this has been dispensed with and the cardiac surgeons were only informed to standby. As there is an active cardio-surgical programme on in SJMC, this approach was deemed reasonable.

This was a retrospective study reviewing our initial 100 consecutive PTCAs carried out between December 1988 and May 1990. The 100 PTCAs included 31 females and 69 males giving a female to male ratio of approximately 3:7.

Their ages ranged from 37 years to 80 years with a mean age of 57.7 years (Fig. 1). We were able to follow-up 66% of these patients. 34% of them could not be traced. Some of the follow-up patients were not seen directly (about 50) but their clinical conditions were confirmed by their attending doctors through casual contact or phone enquiries.

Of the 100 PTCAs, 35 were simple, and 65 were complex (Fig. 2). A simple PTCA was defined as one in which only one lesion was dilated in only one artery. A complex PTCA was defined as one in which more than one lesion was dilated in more than one artery or in one artery. Direct PTCAs for acute myocardial infarction were grouped as complex PTCA. PTCA for total occlusion was also grouped as complex PTCA. All together 139 arteries were entered giving us a 1.39 arteries per PTCA attempted. The LAD was the sole culprit artery in 51 cases (Fig.3) followed by 10 cases of single vessel L.Cx and eight cases of single vessel RCA. There were four cases of 3V-PTCAs. Of the 2V-PTCAs, 15 involved the LAD-L.Cx, nine cases the LAD-L.Cx and only one case involved the L.Cx-RCA. The LAD was the artery most often angioplastied. There were in fact 69 IV-PTCA, 25 2V-PTCA and six 3V-PTCA (Fig. 4).

Fig. 2 : AGE DISTRIBUTION OF THE 100 PATIENTS.

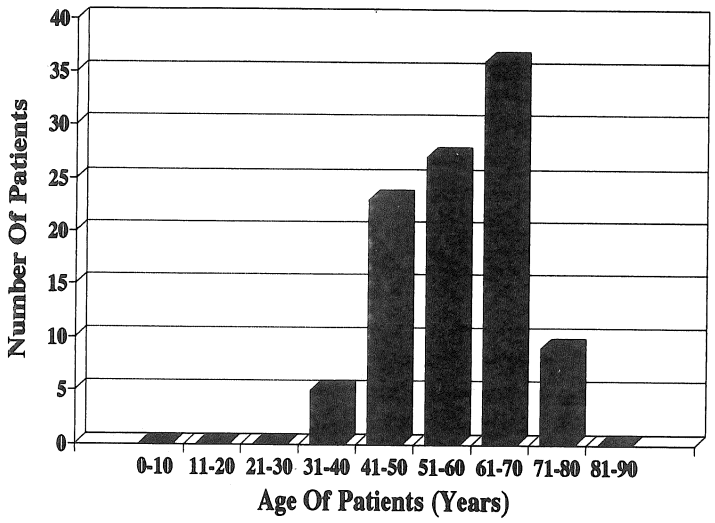

Fig. 1 : Age distribution of the 100 patients

Fig. 3 : TYPES OF PTCA.

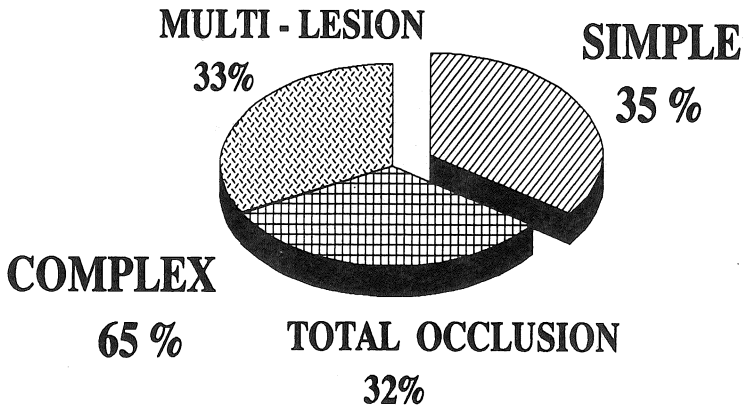

Fig. 2 : Types of PTCA

Fig. 4 : 100 PTCAs - *by ARTERY DISTRIBUTION*

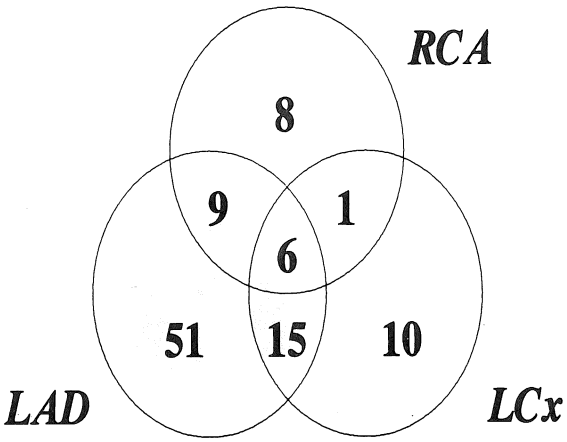

Fig. 3 : 100 PTCAs – by artery distribution

Fig. 5 : EXTENT OF CAD.

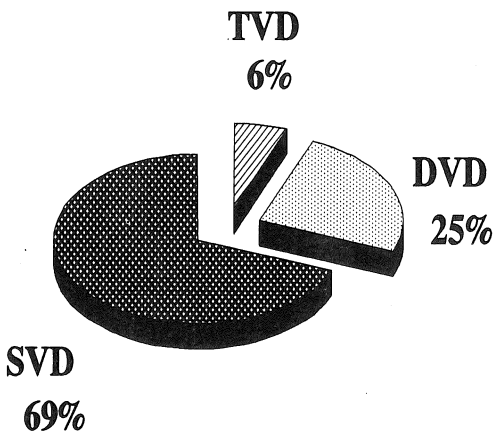

Fig. 4 : Extent of CAD

Fig. 6 : TOTAL OCCLUSION PRIMARY SUCCESS RATE.

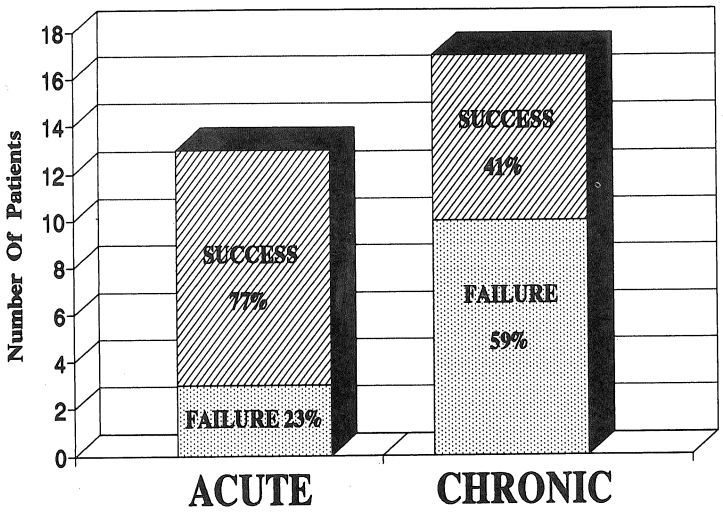

Fig. 5 : Total occlusion primary success rate

Results

Of the 100 PTCAs attempted, an overall primary success rates[5] of 83% was documented (Fig 5). (Primary success was defined as a PTCA producing a greater than 50% reduction in luminal diameter any major complication of acute infarction, emergency CABG or death).It is important to note that there were 30 total occlusions done. Of these 30 total occlusions, 17 were successfully dilated. A look at the sub-category showed that of the acute total occlusions, the primary success rate was 77%. Of the chronic total occlusions, the primary success rate was only 41%. An acute total occlusion is defined as one which is clinically less than three months duration. A chronic total occlusion is one which is clinically more than three months duration.

Of the 100 PTCAs there were two deaths giving us a mortality of 2% and one of our patients had to go for emergency bypass surgery for acute dissection of the LAD. The patient did well post-op and was now well. This gave us an emergency CABG rate of 1%.

One of the deaths was due to aspiration pneumonia post PTCA. The other death was a man who had acute myocardial infarction. He probably reinfarcted post-PTCA and developed cardiogenic shock.

We did see the usual range of 5% – 10% of minor complications, groin hematomas, occasional chills, minor intimal dissections and transient hypotension (3 patients) probably from hypovolemia. One patient required blood transfusion for significant bleeding at the groin but the majority were discharged apparently well (Table 1).

Table 1 : Complications of PTCA

		No	(%)
Major	Death	2	2%
	Emergency CABG	1	1%
	AMI	2	2%
	Subtotal	**5**	**5%**
Minor	Chills	2	2%
	Hypotension	3	3%
	Blood transfusion	1	1%
	Hematomas	7	7%
	Subtotal	**13**	**13%**

We have documented our experiencewith our first 100 PTCAs. The effect of these PTCAs on pain relief were satisfactory. With a primary success rate of about 83%, an emergency CABG rate of about 1%, mortality rate of about 2% and an acute MI rate of about 2%, we compared reasonably with other established centres in this region and around the world. In a developing country like ours with no national health insurance scheme, we worked under considerable constraints. We were fortunate to have an active cardio-surgical programme with two cardiac surgeons whom we could rely on. This gave us confidence and peace of mind when we performed our PTCAs. Cost was also an important consideration. We were happy to note that the cost per PTCA procedure presently was about half that for our first patient done in December 1988. In December 1988, the average cost per PTCA was about M$10,000 – $12,000. In 1990, the average cost per PTCA was about M$5,000 – $6,000 by prudent use of materials and collective bargaining with the supplier of catheter materials. We have learned to adapt the procedure cost-wise, keeping a good clear safety margin and yet keeping the budget down. This has allowed us to treat our patients effectively and affordably.

No paper on PTCA is complete without a mention of restenosis. This remains the "Achilles' heel" of PTCA.[8] It is extremely difficult in our setting to document accurately our restenosis rate. Our follow-up rate was not satisfatory as many patients came referred to us from distant locations including Sabah and Sarawak. The difficulty in documenting restenosis rate was made worse by the absence of an accurate definition of restenosis. We had seen patients with clinical restenosis and a normal stress ECG. We had also seen patients with clinical restenosis supported by a positive stress ECG with normal coronary arteries on coronary angiography, and patients with angiographic restenosis without symptoms.

It was difficult to pick out patients who restenosed without resorting to angiographing all our patients. We had a follow-up of 66 patients for at least six months. Fifteen of these patents had restenosis diagnosed angiographically giving us a restenosis rate of about 22%. We realised that this might not be a true restenosis rate for the whole study population but it was the best we could determine. The French Centre in Toulouse, in using coronary stenting had been able to reduce their restenosis rate to about 17%. We await confirmation of coronary stenting as an effective means of preventing restenosis.

Our initial experience with primary angioplasty in the management of acute myocardial infarction[4] showed that it could be safely carried out and the results were gratifying. Our first primary PTCA in acute myocardial infarction had a recurrence of chest pain two weeks following the PTCA. A stress ECG showed evidence of reversible ischemia but subsequent coronary angiography revealed a less than 5% stenosis on the culprit lesion that was done and a 50% stenosis of the left circumflex artery. His LV was normal with no segmental hypokinesia. He is now very well and no further PTCA is required.Primary PTCA in the treatment of acute myocardial infarction could form the topic for a subsequent paper.

PTCA has proven itself over the past 13 years, to be a very effective treatment modality for patients with coronary artery disease. It is safe with a low acute major complication rate. There was an average 30% restenosis rate and the patients might require repeat PTCA for better long term results. PTCA affords better relief of angina than medical therapy and is certainly less traumatic and also less costly per procedure than CABG. It avoided the need for major surgery in many of our patients who were in the sixth and seventh decade of their lives. There is promise of new innovations in interventional cardiology, for example, coronary stenting, laser angioplasty and atherectomy devices which may help to reduce restenosis, make the procedure even safer and allow us to better manage our patients with coronary artery disease.

References

1. Gruentzig A., Senning A., Siegenthaler W.E. Non-operation dilatation of coronary arteries: percutaneous transluminal coronary angioplasty. N. Engl. J. Med. 1979 ; 301 : 61 – 68.

2. David A. Clark. Coronary angioplasty. Alan R. Liss, Inc., New York, 1987.

3. Eric J. Topol. Textbook of Interventional Cardiology. W.B. Saunders Company, 1990.

4. Rold M. Gunnar, Chairman, ACA/AHA Task Force Report. Guidelines for the early management of acute myocardial infarction. Journal of the Am. College of Cardiology 1990 ; 16 : 249 – 92.

5. Hamad N, Pichard A.D., Lyle H.R.P., Lindsay J. Results of PTCA by multiple, relatively low frequency operators 1986–1987 experience. Am. J. Cardiol. 1988 ; 61 : 1229 – 31.

6. Myler RK, Topol EJ, Shaw RE, Sterzer SH, Clark DA, Fishman J, Murphy MC. Multiple vessel coronary angioplasty: Classification, results and patterns of restenosis in 494 consecutive patients. Catheter cardiovascular diagnosis 1987; 13 : 1.

7. Leimgruber TP, Roubin GS, Hollman J, Cotsonis GA, Meier B, Douglas JS, King SB Jr., Gruentzig AR. Restenosis after successful coronary angioplasty in patients with single-vessel disease. Circulation 1986 ; 73 : 710–720.

8. King SB III. : A symposium: Restenosis after percutaneous transluminal coronary angioplasty. Am. J. Cardiology 1987 ; 60 : 1B. Whole supplement.

9. Bourassa MG, Alderman EL, Bertrand M, De La Fuente L, Gratsianski A, Kaltenbach M, King SB, Nobuyoshi M, Romaniuk P, Ryant J, Serruys PW, Smith HC, Sousa JE, Bothing S, Rapaport E. Report of the joint ISFC/WHO task force on coronary angioplasty. Circulation 1988 ; 78 : 780 – 789.

10. Jean C. Fajadet, Jean Marco, Bernand G. Cassagneau, Gabriel P. Robert, Christian G. Jordan, Jean P. Laurent. Clinique Pasteur, Toulouse France. Restenosis Following Successful Single Palmaz-Schatz Stent Implantation. Circulation 1990 ; 82(4) III : 314.

11. Jean C. Fajadet, Jean Marco, Bernand G. Cassagneau, Jean P. Laurent, Yves M. Flores, Gabriel P. Robert. Clinique Pasteur, Toulouse, France. Balloon-Expandable Intracoronary Stents: Analysis of Complications in a Consecutive Series of 160 Patients. Circulation 1990 ; 82(4) : III : 539.