Percutaneous Transluminal Coronary Angioplasty in King Chulalongkorn Memorial Hospital : A Four-Year Experience

SUPHOT SRIMAHACHOTA, M.D.*,
SMONPORN BOONYARATAVEJ, M.D.*,
TAWORN SUITHICHAIYAKUL, M.D.*,
CHALARD SOMABUTR, M.D.*,
PEUNGCHAI NGARMUKOS, M.D.*
WASAN UDAYACHALERM, M.D.*,
SURAPUN SITTISUK, M.D.*,
JAKRAPUN CHAIPROMPRASIT, M.D.*,
DUANCHAI CHAYANONT, M.D.*,

Abstract

From January 1993 to December 1996, 461 cases (743 lesions) of percutaneous transluminal coronary angioplasty (PTCA) were performed at King Chulalongkorn Memorial Hospital. Seventy eight per cent of the patients were male. Mean age was 61.1 ± 9.6 yrs and mean ejection fraction was 0.59 ± 0.18. The indications for PTCA were chronic stable angina (53%), post myocardial infarction (MI) angina (26.6%), unstable angina (17.4%) and acute MI (3%). Emergency PTCA was performed on 15 cases with 5 patients in cardiogenic shock. Fifty four per cent of the cases were performed in single vessel disease, 33 per cent in double vessel disease and 13 per cent in tripple vessel disease. The vessels dilated were the left anterior descending artery (44.2%), right coronary artery (27.8%), left circumflex artery (26.7%), left main (0.9%)and saphenous vein graft (0.4%). Mean balloon size was 2.48 mm. The overall success rate of PTCA, defined as residual diameter stenosis less than 50 per cent, was 91.5 per cent. In addition to PTCA, 123 stent implantations with mean stent size 2.98 mm and 15 rotational athrectomy were done in 114 cases. Complications of PTCA occurred in 32 cases (6.9%). Ten patients (2.2%) had abrupt closure, 1 of these needed emergency coronary bypass graft surgery (CABG). One patient (0.2%) had cerebral embolism with minor residual neurological deficit. One patient (0.2%) had toe gangrene which eventually needed amputation. One patient (0.2%) who presented with acute extensive anterior wall MI and failure of thrombolytic therapy died 8 hours after successful PTCA due to refractory cardiogenic shock. In the patients who also had stent implantation, there were 6 stent misplacements : 3 in the right femoral artery without any complication, 2 were misplacements in the coronary system and 1 dislodged in LM necessitating emergency CABG.

Conclusion : PTCA is the coronary interventional procedure that can be performed with a high success rate and minimal complications.

Key word : Percutaneous Transluminal Coronary Angioplasty, King Chulalongkorn Memorial Hospital

* Cardiac Center, King Chulalongkorn Memorial Hospital and Division of Cardiovascular Diseases, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Percutaneous transluminal coronary angioplasty (PTCA) is one of the treatments for revascularization in patients with coronary artery disease. Andreas Guntzig[1] performed the first coronary angioplasty in 1977 and after that many cases of angioplasty have been done worldwide. Many studies demonstrated that PTCA is better treatment for control anginal chest pain than medical treatment alone with a high success rate[2-4]. However, the restenosis after PTCA remains a most important problem, 30-40 per cent occur within 6 months after successful PTCA. To reduce the restenosis rate, many new devices[5-8] and pharmacologic drugs have been introduced or adjunctive such as intracoronary stent, rotational athrectomy, laser angioplasty, directional athrectomy, transluminal extraction athrectomy and platelet glycoprotein IIb IIIa receptor antagonist. In King Chulalongkorn Memorial Hospital, PTCA was initiated in 1993. The number of cases has increased every year from 28 cases in 1993 to 212 cases in 1996. This study was done to evaluate the initial procedural success and complication rate of PTCA.

PATIENTS AND METHOD

Patient population

All patients who had percutaneous transluminal coronary angioplasty at King Chulalongkorn Memorial Hospital from 1993 to 1996 were enrolled. History, angiographic information, initial procedural success and complications were recorded prospectively after complete angioplasty.

Definition

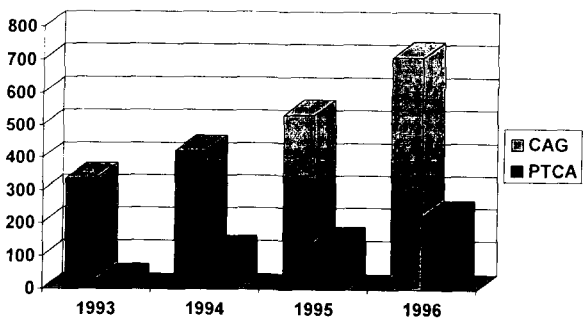
A successful case was defined as a patient who had less than 50 per cent post angioplasty residual diameter stenosis without adverse events such as acute myocardial infarction, emergency coronary artery bypass graft or death during the procedure or hospitalization.

Statistical analysis

The continuous variables are expressed as mean ± SD. For the analysis of continuous data, the two-tailed *t*-test was used to assess differences between the two groups. The nominal variables were expressed as counts and percentages. Statistical significance was expressed using the chi-square test. All tests were considered statistically significant when P value was less than 0.05.

RESULTS

Four hundred and sixty one patients underwent percutaneous transluminal coronary angioplasty from 1993 to 1996. The number of cases increased from 25 cases in 1993 to 91, 133, and 212 cases in 1994, 1995 and 1996 respectively (Fig. 1). The baseline characteristics of the patients are shown in Table 1. There were no statistically significant differences in age, sex, history of smoking, hypertension, diabetes, dyslipidemia, previous PTCA, previous coronary artery bypass graft (CABG), and previous myocardial infarction (MI) except for left ventricular ejection fraction (LVEF) which in 1996 was lower than the previous years. Stable angina pectoris was the most common indication for PTCA followed by post MI angina and unstable angina (Table 2). PTCA in acute MI was started in 1995 and is still small in proportion when compared to other indications. The number of vessels for PTCA and vessel distribution are shown in Table 3. An adjunctive to PTCA, stents were implanted in only 3 cases in 1994 but the number had increased very rapidly by 1996 or up to 35.9 per cent of PTCA cases (Fig. 2). Rotational athrectomy was done in 1995 with only 3 cases and up to 12 in 1996. Table 4 shows the results of the procedure. Mean number of lesions per procedure increased from 1.2 in 1993 to 1.8 to 1996 but in contrast, the procedural



CAG - coronary angiogram

PTCA - percutaneous transluminal coronary angioplasty

Fig. 1. Number of coronary angiogram and percutaneous coronary angioplasty in King Chulalonglong Memorial Hospital from 1993 - 1996.

Table 1. Baseline characteristics of the patients.

	1993	1994	1995	1996	Total
No. of pts.	25	91	133	212	461
Age (y)	61.1 ± 9.6	61.2 ± 9.1	60.1 ± 9.6	61.6 ± 9.8	61.1 ± 9.6
Sex , M : F	2.6 : 1	2.2 : 1	3 : 1	1.9 : 1	2.3 : 1
Smoking (%)	33.3	45.3	47.2	34.6	40.5
Hypertension (%)	45.8	50.0	45.6	45.6	46.5
Diabetes (%)	25.0	32.6	36.8	38.5	36.0
Dyslipidemia (%)	75.0	60.5	66.4	42.9	55.4
Previous PTCA (%)	8.0	14.3	18.8	29.9	22.4
Previous CABG(%)	0	7.7	2.3	2.4	3.3
Previous MI (%)	45.8	27.5	38.3	33.3	34.2
LVEF	57.0 ± 11.9	60.3 ± 17.7	63.2 ± 17.2	51.7 ± 17.2*	58.8 ± 17.7

: * $P < 0.05$

: PTCA - percutaneous transluminal coronary angioplasty; CABG - coronary artery bypass graft; MI - myocardial infarction; LVEF - left ventricle ejection fraction

Table 2. Indication for percutaneous transluminal coronary angioplasty.

Indication	1993	1994	1995	1996	Total
SAP (%)	52.0	53.5	51.6	53.8	53.0
UAP (%)	20.0	17.4	15.1	18.5	17.4
Acute MI (%)	0	0	3.2	4.6	3.0
Post MI angina (%)	28.0	29.1	30.2	30.2	26.6

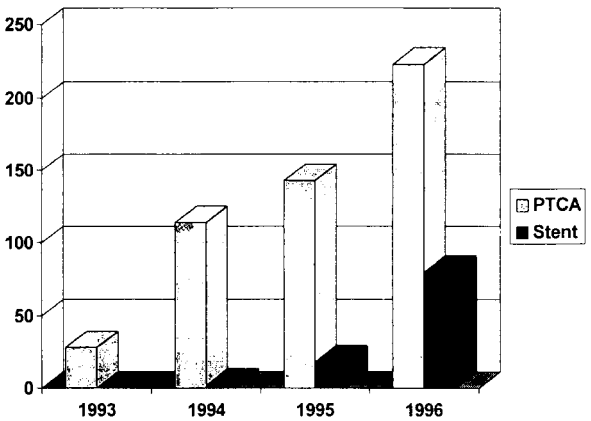
: SAP - stable angina pectoris; UAP - unstable angina pectoris; MI - myocardial infarction

Table 3. Number of vessels and distribution for percutaneous transluminal coronary angioplasty.

	1993	1994	1995	1996	Total
1 - VD (%)	80.0	42.9	57.1	54.5	54.3
2 - VD (%)	20.0	35.0	30.8	34.1	32.6
3 - VD (%)	0	22.0	12.0	11.4	13.0
LAD (%)	60.0	43.6	40.2	45.7	44.2
LCX (%)	16.7	27.0	27.9	27.0	26.7
RCA (%)	23.3	29.4	30.9	25.8	27.8
LM (%)	0	0	0.5	1.2	0.9
SVG (%)	0	0	0.5	0.3	0.4

Table 4. The results of percutaneous transluminal coronary angioplasty.

	1993	1994	1995	1996	Total
No. of pts	25.0	91.0	133.0	212.0	461.0
Mean lesions per PTCA	1.2	1.5	1.4	1.8	1.6
Fluroscopy time (min.)	27.9	29.9	28.5	25.8	27.7
Procedure time (min.)	125.8	109.0	87.6	76.2	89.5
Lesion success rate (%)	96.0	90.9	94.6	94.2	93.8
Case success rate (%)	96.0	87.9	92.5	92.0	91.5



PTCA - percutaneous transluminal coronary angioplasty

Fig. 2. Number of percutaneous coronary angioplasty and intracoronary stent implantation in King Chulalongkorn Memorial Hospital from 1993 - 1996.

Table 5. Complications of percutaneous transluminal coronary angioplasty.

Complications	cases	%
Abrupt closure	10	2.2
Acute myocardial infarction	2	0.4
Emergency CABG	1	0.2
Subacute thrombosis	1	0.2
Acute stent thrombosis	2	2
Stent dislodge	4	4
: Right femoral artery	3	3
: Left Main	1	1
Cerebral embolism	1	0.2
Groin hematoma	3	0.7
Retroperitoneal hematoma	1	0.2
Toe gangrene	1	0.2
Cardiac tamponade	1	0.2
Death	1	0.2

time had decreased, although fluoroscopy time remained the same. The lesion success rate and case success rate were about 90 per cent. There was one hospital death. The patient presented with acute inferior wall myocardial infarction with cardiogenic shock and diabetes ketoacidosis. Streptokinase was given but failed to reperfuse the infarct-related artery. Emergency coronary angiography showed severe triple vessel disease. Emergency CABG wasn't available at that time so rescue PTCA was done with good angiographic result. The patient was sent for coronary artery by-pass graft (CABG) 8 hours later but didn't survive.

Table 5 shows the complication of PTCA. Abrupt closure occurred in 10 cases (2.2%) and one case needed emergency CABG. Acute MI occurred in only 2 cases (0.4%) and subacute thrombosis developed in 1 case (2%). Two patients who had stent implantation developed acute stent thrombosis which was successfully treated with urokinase and re-PTCA. Three stents dislodged in the right femoral artery without any complication subsequently but one stent dislodged in LM and needed emergency CABG. Cerebral embolism with minor neurological deficit occurred in one case. Overall complication rate was 10.5 per cent.

DISCUSSION

The incidence of coronary disease in Thailand has increased very rapidly over the past few years according to the increase in number of coronary angiography and coronary intervention. Primary prevention is the best measure against coronary artery disease. But once the disease has developed, PTCA is one of the treatments to relieve symptoms of chest pain but not the best modality of treatment. The prevention of atherosclerosis is most important. People should be educated about dietary fat intake and modification of other risk factors. When the disease occurs, PTCA is one of the treatments which should be considered. The problem of PTCA is not how to do it and get the best success, restenosis is the most important problem. 30-50 per cent of cases after successful PTCA develop restenosis in 6 months[9-12]. New devices have been invented and stent is the breakthrough device for reducing the restenosis rate to 10-20 per cent[13-16]. From our data, the success rate was about 90 per cent even in the first year of PTCA because the cases were highly selected when we started to do PTCA. The lesions were more complicated and multivessel diseases were done later. The number of stent implantations were increased up to 35 per cent in 1996. The major complications in our center were accepted. Acute MI occurred in 0.4 per cent the same as emergency CABG. In hospital mortality rate was 0.2 per cent.

SUMMARY

In our institution, PTCA can be done with a high success rate and an acceptable complica-

tions rate. The number of coronary interventions have rapidly increased over the past 4 years. There was no significant difference in the success rate of PTCA over the past 4 years but more complicated lesions and more multivessel disease were increasingly encountered.

(Received for publication on January 8, 1998)

REFERENCES

1. Gruntzig AR, Senning A, Siegenthaler WE. Nonoperative dilatation of coronary artery stenosis : percutaneous transluminal angioplasty. N Engl J Med 1979;301:61-8.
2. Parisi AF, Folland ED, Hartigan P for the Veterans Affairs ACME Investigators : A comparison of angioplasty with medical therapy in the treatment of single vessel coronary artery disease. N Engl J Med 1992;326:10-6.
3. Deligonul U, Vandermael MG, Kern MJ, et al. Coronary angioplasty : A therapeutic option for symptomatic patients with two and three vessel coronary artery disease. J Am Coll Cardiol 1988; 11:1173-9.
4. O'Keefee JM Jr, Rutherford BD, McConahay DR, et al. Multivessel coronary angioplasty from 1980 to 1989 : Procedural results and long term outcome. J Am Coll Cardiol 1990;16:1097-102.
5. Topol EJ, Leya F, Pinkerton CA, et al. A comparison of directional atherectomy with coronary angioplasty in patients with coronary artery disease : the CAVEAT Study Group. N Engl J Med 1993;329:221-7.
6. Bertrand ME, Lablanche JM, Leroy F, et al. Percutaneous transluminal coronary rotary ablation with Rotablator (European experience). Am J Cardiol 1992;9:470-4.
7. Popma JJ, Leon MB, Mintz GS, et al. Results of coronary angioplasty using the transluminal extraction cathetor. Am J Cardiol 1992;70:1526-32.
8. Ghazzal ZM, Hearn JA, Litvack F, et al. Morphological predictors of acute complications after percutaneous angiographic analysis : importance of the eccentricity index. Circulation 1992;86: 820-7.
9. Holmes DR Jr, Vlietstra RE, Smith HC, et al. Restenosis after percutaneous transluminal coronary angioplasty (PTCA) : a report from the PTCA Registry of the National Heart, Lung, and Blood Institute. Am J Cardiol 1984;53:77c-81c.
10. Gruentzig AR, King SB, Schlumpf M, Siegenthaler W. Long-term follow-up after percutaneous transluminal coronary angioplasty : the early Zurich experience. N Engl J Med 1987;316:1127-32.
11. Nobuyoshi M, Kimura T, Nosaka H, et al. Restenosis after successful percutaneous transluminal coronary angioplasty : serial angiographic follow-up of 229 patients. J Am Coll Cardiol 1991;18: 647-56.
12. Hirshfeld JW Jr, Schwartz JS, Jugor R, et al. Restenosis after coronary angioplasty : a multivariate statistical model to relate lesion and procedure vriables to restenosis. J Am Coll Cardiol 1989;18: 647-56.
13. Fischman DL, Leon MB, Baim DS, et al. A randomized comparison of coronary-stent placement and balloon angioplasty in the treatment of coronary artery disease. N Engl J Med 1994;331: 496-501.
14. Serruy P, Jaegerc P, Kiemeneij F, et al. A comparison of balloon-expandable-stent implantation with balloon angioplasty in patients with coronary artery disease. N Engl J Med 1994;331:489-95.
15. Serruy P, Emanuelsson H, Giessen W, et al. Heparin-coated Palmaz-Schatz stents in human coronary arteries. Early outcome of the Benestent-II pilot study. Circulation 1996;93:412-22.
16. Versaci F, Gaspardene A, Tomai F, et al. A comparison of coronary-artery stenting with angioplasty for isolated stenosis of the proximal left anterior descending artery. N Engl J Med 1997; 336:817-22.

ประสบการณ์ 4 ปีในการทำบอลลูนขยายหลอดเลือดหัวใจในโรงพยาบาลจุฬาลงกรณ์

สุพจน์ ศรีมหาโชตะ, พ.บ., วสันต์ อุทันเฉลิม, พ.บ.*, สมนพร บุณยะรัตเวช, พ.บ.*, สุรพันธ์ สิทธิสุข, พ.บ.*, ถาวร สุทธิไชยากุล, พ.บ.*, จักรพันธ์ ชัยพรหมประสิทธิ, พ.บ.*, ฉลาด โสมะบุตร์, พ.บ.*, เดือนฉาย ชยานนท์, พ.บ.*, พึงใจ งามอุโฆษ, พ.บ.**

ระหว่างเดือนมกราคม พ.ศ. 2536 ถึงธันวาคม พ.ศ. 2539 ผู้ป่วย 461 รายได้รับการรักษาโดยการทำบอลลูนขยายหลอดเลือดหัวใจที่รพ.จุฬาลงกรณ์ ร้อยละ 78 ของผู้ป่วยเป็นชาย อายุเฉลี่ย 61.1 ± 9.6 ปี และมี ejection fraction เท่ากับ 0.59 ± 0.18 ข้อบ่งชี้ในการทำบอลลูนขยายหลอดเลือดหัวใจคือ stable angina (ร้อยละ 53), post myocardial infarction angina (ร้อยละ 26.6), unstable angina (ร้อยละ 17.4), และ acute myocardial infarction (ร้อยละ 3) ผู้ป่วย 15 ราย ได้รับการทำบอลลูนในกรณีรีบด่วนซึ่งในจำนวนนี้ 5 รายอยู่ในภาวะช็อคจากหัวใจ ร้อยละ 56 ของผู้ป่วยมีเส้นเลือดหัวใจตีบ 1 เส้น, ร้อยละ 33 มีเส้นเลือดตีบ 2 เส้นและร้อยละ 13 มีเส้นเลือดตีบ 3 เส้น บอลลูนถูกทำในเส้นเลือดแดง left anterior descending ร้อยละ 42.2, เส้นเลือดแดง right coronary ร้อยละ 27.8, เส้นเลือดแดง left circumflex ร้อยละ 26.7, เส้นเลือด left main ร้อยละ 0.9, และ เส้นเลือด saphenous vein graft ร้อยละ 0.4 ขนาดบอลลูนที่ใช้อยู่ในค่าเฉลี่ย 2.48 มม. อัตราการทำบอลลูนสำเร็จ (เหลือการตีบแคบของเส้นเลือดที่ทำบอลลูนน้อยกว่าร้อยละ 50) เท่ากับ 91.5 นอกจากใช้บอลลูนขยายหลอดเลือดอย่างเดียวแล้ว ยังมีการใส่ขดลวดขยายเส้นเลือดจำนวน 123 อันโดยมีค่าเฉลี่ยขนาดของขดลวดขยายเส้นเลือดเท่ากับ 2.98 มม. และมีการใช้หัวกรอเพชรจำนวน 15 ราย ภาวะแทรกซ้อนของการทำบอลลูนเกิดขึ้น 32 ราย คิดเป็นร้อยละ 6.9 10 ราย (ร้อยละ 2.2) เกิดการอุดตันของเส้นเลือดทันทีซึ่ง 1 รายจำเป็นต้องได้รับการผ่าตัดต่อเส้นเลือดอย่างรีบด่วน หนึ่งราย (ร้อยละ 0.2) เกิดก้อนเลือดไปอุดเส้นเลือดฝอยในสมองแต่ทำให้เกิดการทำงานของระบบประสาทผิดปกติเพียงเล็กน้อยและสามารถหายได้เกือบเป็นปกติ หนึ่งราย (ร้อยละ 0.2) เกิดการอุดตันของเส้นเลือดแดงที่ไปเลี้ยงบริเวณนิ้วเท้าและจำเป็นต้องทำการตัดนิ้วเท้าเนื่องจากการเกิดการตายของเนื้อเยื่อบริเวณนั้น ผู้ป่วยเสียชีวิต 1 รายภายหลังจากที่ทำบอลลูนสำเร็จแล้ว 8 ชั่วโมงโดยไปเสียชีวิตในห้องผ่าตัด ผู้ป่วยรายนี้มีภาวะกล้ามเนื้อหัวใจตายเฉียบพลัน และมีอาการช็อคจากหัวใจทำงานล้มเหลว ในผู้ป่วยที่ได้รับการใส่ขดลวดขยายเส้นเลือด พบว่า มี 3 รายที่ขดลวดหลุดไปใน femoral artery แต่ไม่พบภาวะแทรกซ้อนตามมา สองรายใส่ขดลวดในตำแหน่งที่ไม่เหมาะสม และมี 1 รายขดลวดหลุดที่ left main และจำเป็นต้องได้รับการผ่าตัดโดยรีบด่วน

บทสรุป : การทำบอลลูนขยายหลอดเลือดหัวใจสามารถทำได้ไม่ยากและประสพความสำเร็จในอัตราที่สูง โดยมีภาวะแทรกซ้อนน้อย

คำสำคัญ : การทำบอลลูนขยายหลอดเลือดหัวใจ, โรงพยาบาลจุฬาลงกรณ์

* ศูนย์โรคหัวใจ, โรงพยาบาลจุฬาลงกรณ์ และ หน่วยโรคหัวใจ, ภาควิชาอายุรศาสตร์, โรงพยาบาลจุฬาลงกรณ์, กรุงเทพ 10330.