

Impact of Risk Factors on Complications of Coronary Intervention in Non-ST-Elevation Acute Coronary Syndrome

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ABSTRACT:

BACKGROUND:

Percutaneous Coronary Intervention ; PCI has become important tool of treating patients with Ischaemic Heart Disease however it is associated with serious complications.

OBJECTIVE:

This paper is a survey of the complications that occur during hospitalization for such treatment of patients with Non-ST-Elevation Acute Coronary syndrome, assess relation of those complications with the clinical severity, and with number of five classical predisposing Risk Factors for atherosclerosis

METHODS:

Data of 142 consecutive hospital pts with Non-ST-Elevation Acute Coronary syndrome were analyzed. All patients had early coronary angiography following stabilization. Apart of 27 patients who had either medical treatment only or surgery 115 pts had PCI

RESULT:

Complications were reported in 19 out of the 115 pts who underwent PCI (16.5%). They were; 1- Significant Coronary Artery dissection in 13 pts (11%), 2- Signif. Coronary thrombi, 3 pts {3%} culminating in NSE-MI in two, 3- Signif. Creatine Kinase rise; NSE-AMI, 2 pts (2%), 4- Arterial Rupture and death 1 pt; 1%. These primary complications had led to Secondary complications in 9 pts and tertiary complications in six. Dissection, the most frequent primary complication had culminated in five of the ten infarcts (NSTE-AMI). B-Predictors of complications:- Complications rate was not affected by worsening of clinical severity of the various groups of pts while it was directly linked to the no. of risk factors. Their rates were zero, 12%, 15% and 33% in pts with no risk factor, 1, 2, and 3-5 Risk Factors respectively. The data of the 79 patients with one or two risk factors suggested that hypertension was associated with the highest rate of complications ;(27%). This was probably attributed to the finding in this study that Likelihood of sustaining dissection, the precursor of most complications, was more than twice frequent in the hypertensive pts compared to those without hypertension (18% compared to 8% respectively).

CONCLUSION:

Inhospital Complications of coronary intervention in patients with NSTE-ACS were in one sixth of patients (16.5%). Dissection was most common complication (11%). It had precipitated five of the eight cases of coronary thrombosis (63%) and five of the ten Acute myocardial Infarctions (50%). Complications had probably increased with the increment of the number of Risk Factors but they were not related to clinical severity. Hypertension probably was associated with highest complication rate, this might be due a possible association between dissection and hypertension and underlined the need for further study

KEY WORD: coronary angioplasty and stenting = percutaneous coronary intervention = pci, unstable angina and non-st-elevation myocardial infarction = non-st-acs

INTRODUCTION :

Acute Coronary syndrome is a serious manifestation of atherosclerosis as it is associated with considerable morbidity and mortality ⁽¹⁾. It is responsible for 1.4 millions admissions to hospital in the United States

every year ⁽²⁾. Revascularization by percutaneous coronary intervention (PCI) is the cornerstone of treatment of this problem, however this treatment is associated with some important complications ⁽³⁻⁷⁾. In this retrospective study we surveyed the complications of pts with Non-ST-elevation Acute coronary syndrome. Also we explored the relationship of these complications with the clinical

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severity of the cases and with five classical predisposing Risk Factors (Hyperlipidaemia, Hypertension, Diabetes Mellitus, Smoking, and Family History of IHD).

PATIENTS AND METHODS:

The data of 173 patients admitted to Dallah Hospital in Reyiad, Saudi Arabia, between 1998 and 2002 with Unstable Angina and Non-ST-Elevation myocardial Infarction ie Non-ST-Elevation Acute Coronary syndrome were analyzed. Thirty one pts were excluded for having incomplete data. The traditional Risk Factors were; Hyperlipidaemia (HL;Cholestrol= > 200mg/100ml), Diabetes Mellitus (D.M.), Hypertension (HTN), Smoking (SM), and Positive Family History for Ischaemic heart Disease (PFH).

The diagnosis is based on typical presentation and course. Typical presentation with characteristic chest discomfort /pain that is poorly localized in the anterior chest, throat or left shoulder. The discomfort/pain has at least one of the following features; It occurred on minimal exertion or at rest and usually lasts for up to 20-30 minutes. The discomfort/pain response to sublingual Nitroglycerine is not usually prompt (It usually needs larger dose). The pains had crescendo pattern being severe, prolonged, and more frequent than previously. The pain was usually much longer in pts with Non-ST-elevation Myocardial Infarction (NSTEMI). The diagnosis of NSTEMI required the confirmation of cardiac muscle necrosis by Cardiac enzymes elevation.

The pts with UA were classified into three groups of progressively worsening ischaemia based on their predominating clinical findings during hospitalization. The three groups were;

A. New-onset severe Angina; (group 1) 27 pts., B- Deteriorating Chronic Angina; (group 2) 28 pts. C - Rest Angina (group 3) 33 pts.

B. The classification was inspired by Eugene Braunwald 1989 but it did not comply with it strictly because the no. pts without chest pain during the last 48 hrs was too small.

D-The patients with Non-ST-Elevation Myocardial Infarction (NSTEMI) (27 pts) were regarded as group 4

All Pts with suspected Non-ST-elevation Myocardial Infarction and most pts with UA were admitted to the Coronary care unit. Some pts with Unstable Angina were admitted to the intermediate care unit when the Coronary Care Unit was full. All pts were given the

standard treatment with nitrate and Heparin infusion, Aspirin, Beta blockers, and Statins. AC-Inhibitors were given to pts with LV dysfunction. Abciximab was given to some pts with Non-ST-elevation Myocardial Infarction and UA during catheterization with possible intervention in the presence of a thrombus. Coronary angiography was done, during hospitalization or soon after discharge. . The pts were managed according to the clinical background and the angiographic findings along one of three lines of management; 1- Medical Treatment 10 pts. 2- coronary bypass grafting, 17 pts 3- Percutaneous Coronary Intervention (PCI) 115 pts.

Percutaneous Coronary Intervention was performed following the diagnostic catheterization (in one session) or soon after. QCA was used to measure the lesion length and severity however in borderline cases intra vascular ultrasound was used. The standard interventional treatment (then) was followed such as prior treatment with Ticlopidin/ clopidogrel and heparinization during the procedure etc

RESULT:

A –Inhospital Complications:

Complications were reported 19 pts out of the 115 pts who underwent Percutaneous intervention (16.5%). These Initial Complications were labeled:-

Primary Complications

They were;

- 1- Coronary artery dissection in 13 pts (11%),
- 2- Coronary artery thrombosis 3 pts {3%},
- 3-Significant Creatine Kinase rise in 2 pts {2%},
- 4-Arterial Rupture and death 1 pt; 1%

The Primary complications above had triggered the development of other complications which sometimes took the form of chain reaction. There were secondary complications in nine pts (46%) and tertiary Complications in six pts see table -1-. Hence almost all pts had more than one complication, see table -1-. The complications were:-

- 1 Coronary artery dissection, 13 pts; 11%.

Coronary Dissection had led to other complications in six out of the 13 pts (46%). Five of them had coronary thrombosis which had resulted in a significant enzyme leak in four pts, yet without clinically relevant deterioration of cardiac function, dissection in the sixth pt had led into acute closure with the consequent peaking of cardiac enzymes ; NSTEMI- AMI. The patient's condition was helped by stenting.

- 2 – Acute Myocardial Infarction, 10 pts; 9%.

The table shows that there were ten pts with Acute

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Myocardial Infarction. None of them were transmural M.I; all were Non-ST-Elevation M.I. Half of these infarcts were complications of Coronary dissection; 50%

3 - Coronary thrombosis, 8 pts; 7%

Five of the eight pts developed thrombosis secondary to dissection while the remaining three were primary ones. Two of the later developed NSE-AMI.

4 – Coronary rupture and death, 1 pt; 1%.

The only mortality in this study was a pt. that developed acute coronary rupture. The Rupture was successfully sealed by a graft stent however seventy two hours later he suddenly developed cardiogenic shock. Recatheterization showed coronary thrombosis at the stent site. Two more were deployed but the distal flow was too poor. Then he died.

Table-1: Showing primary, secondary, and tertiary complications

Primary complications		Secondary complications		Tertiary complications	
C. Dissection	13	C. Thrombi	5	NSTEMI	4
		Acute closure	1	NSTEMI	1
C. Thrombi	3	NSTEMI	2	-	
NSEMI	2	-	=	-	
Acute c. rupture	1	NSTE-Mi	1	Death	1

B- Relationship of the Complications with other parameters: -

1 – with Clinical severity

The data showed that the progressively worsening ischaemia based on their predominating clinical findings during hospitalization was not associated with increase of the complication rate. Table-2- shows that complication rate in the group of pts with Acute Severe Angina, Deteriorating Severe Angina, Rest Angina, and NST-AMI was 11%, 18%, 21%, and 15% respectively.

Table -2: PCI Complications in various groups of NSTEMI-ACS based on clinical severity

Clinical class 115 pts	Complication Rate
Group 1: New Onset Angina 27 pts	11%
Group 2: Deteriorating Chronic Angina 28 pts	18%
Group 3: Rest Angina 33 pts	21%
Group 4: Non-ST-Elevation Myocardial Infarction 27 pts	15%

2 – with the number of Risk Factors:-

Table 3 shows that the Complication rate had increased from zero in pts without any Risk Factor to 12% in pts with 1 , to 15% in pts with 2 risk

factors and to 33% in patients with 3- 5 risk factors respectively

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Table -3: The relation of Complications of PCI and the number of Risk Factors

R.F/ No. of Risk factor	Complication Rate
No Risk Factor 12 pts	- nil
One Risk Factors 40 pts	5 12.5%
Two Risk Factors 39 pts	6 15.4%
3-5 Risk Factors 24 pts	8 33.3 %

3- with Individual Risk factor:-

Since the no. of complications in the pts with single risk factor was too low (five complications), which hindered any meaningful analysis, we studied the complications of pts with single (40 pts) and those with two risk factors (39 pts *) together; eleven complications. This meant that each patient of those with two risk factors had appeared twice in the table;

once for each of the two risk factors. Data showed that hypertension, was associated with the highest complication rate (27.3%). The frequency of those complications were much lower at 13.6%, 13.5%, 8.3%, and 8.0% in pts with diabetes Mellitus, hyperlipidaemia, PFH for I.H.D., and smoking, see table -4- .

Table-4: Relation of complications to Risk Factors

Risk Factor*	Complication rate
Hypertension 22	27.3 %
Diabetes Mellitus 22	13.6%
Hyperlipidaemia 37	13.5%
Positive Family History 12	8.3 %
Smoking 25	8.0 %

Important note:- Complications in table 4 (above) and Coronary dissection in table 5 (below), in pts with two risk factors had appeared twice; once with each of the two risk factors.

C -Relation of individual Risk Factor with dissection:-

To look at any relationship between risk factors and

coronary dissection we studied the data of the 79 pts with one and two Risk Factors*. Data gave the impression that the frequency of Coronary Dissection, the precursor for the other complications, in pts with hypertension was more than twice its frequency in pts who did not have -hypertension (18% compared to 8% respectively) Table -5-

Table -5: Coronary dissection and Hypertensive in pts with one or two risk factors

Risk factor *	Coronary dissection
Hypertension 22	18%
No Hypertension 96	8%

DISCUSSION:

Percutaneous Coronary Intervention had surely assumed effective role in revascularization of pts with ischaemic heart disease (4-7). It is associated with some serious complications. In our study the complication rate was 16.5%. Ramondo .A etal from Italy, had reported a complications rate 10%) on patients with Unstable Angina (8). The TIMI 111B reported a low complication rate of less than 5% on patients with Acute coronary syndrome (9). This

variation depends at least partly on what events were regarded as complications. In our study we included all serious and potentially serious events linked to the procedure; Dissection, thrombosis, Infarction, Acute closure, Rupture and death. The TIMI 111B Trial report only included Myocardial Infarction, Emergency coronary Bypass surgery and death. We did not include emergency Bypass Surgery as none of our pts needed such treatment. Obviously their

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report may reflect early nineties practice while our data reflected the late nineties and early two thousands practice where the advance in technology and mounting experience reduced drastically the need for emergency surgery.

Dissection was the leading complication in our study with an incidence of 9%. Sharma et al had reported a dissection rate of 30.3% in 363 pts who had Angioplasty⁽¹⁰⁾. Schachinger V. et al from Germany reported incidence of 21% in 210 similar patients⁽¹¹⁾. Five of the ten pts with dissection, in our study, developed non-ST-Elevation Myocardial infarction. In Ilija R et al report on 170 patients with Angioplasty there was significant association of dissection with non-ST-Elevation myocardial infarction⁽¹²⁾. Savechenko AP et al from Russia had reported data on 162 patients and found half with dissection sustained Myocardial Infarction⁽¹³⁾.

In our study five of the thirteen patients with dissection had thrombosis. This association was reported by many workers⁽¹¹⁾; Vatikus P.T. et al had reported that thrombosis was significantly associated with dissection⁽¹⁴⁾.

In our study the only patient who suffered Acute Closure had dissection. This Predisposition to Acute Closure was reported by many others^(13, 15). These findings lend support to the overwhelming evidence that most complications of PCI are related to dissection⁽¹⁶⁾.

Extensive research into the predisposition to Dissection had concentrated on the lesion level where some local factors such as eccentric lesions and vessel /balloon ratio were identified as possible predisposing factors⁽¹⁷⁾. In this work we have studied role the risk factors and found that increasing the number of Risk Factors was probably associated with increased frequency of complications which may reflects worsening of the underlying disease. however when it to trying to find which particular Risk factor, if any, we faced the obstacle of having low incidence of complications in the pts with single risk factor. Nonetheless the data gave a hint that hypertension is the most frequent risk factor associated with complications and the data pointed at a possible association between dissection, the precursor of most complications, and hypertension. This reminds of the predisposition, to aortic dissection, by hypertension. Though we cannot draw parallel comparison here for obvious reasons but underline the need for further research into the role of risk factors using a larger sample.

CONCLUSION:

Inhospital Complications of coronary intervention in patients with NSTEMI-ACS were 16.5%. Dissection was most frequent complication 11%. It had precipitated five of the eight cases of coronary thrombosis, 63% and five of the ten Acute myocardial Infarction, 50%. The study had shown that the number of risk factors and not the clinical severity was more relevant to the likelihood of complications. Data had hinted that Hypertension was probably associated with more complications than the other traditional risk factors. This might be explained by the finding in this study of increased incidence of dissection, the precursor of most complications; in hypertensive patients but this need a much larger study to evaluate.

REFERENCES :

1. American Heart Association: 2004 Heart and Stroke Statistical update. (www.americanheart.org)
2. Yeghiazarians Y, Brunstien JB, ASKERI A, Stone PH. Unstable Angina Pectoris, NEJM 2000;37,101-15.
3. Zhao X-Q, Theroux P, Snapinn SM, Sax FL, for the PRISM-PLUS Investigators: Intracoronary thrombus and platelet glycoprotein 11b/111a receptor blockade with Tirofiban in unstable angina or non-Q-wave myocardial infarction. Angiographic results from the PRISM-PLUS trial (Platelet Receptor Inhibition for Ischemic Syndrome Management in Patients Limited by Unstable Signs and Symptoms). Circulation 1999;100,1609.
4. kamp O, Beatt KJ, De Feyter PJ, et al: Short-, medium-, and long-term follow-up after percutaneous transluminal coronary angioplasty for stable and unstable angina pectoris. Am Heart J 1989;117,991.
5. Moses JW, Leon MB, Popma JJ, et al: Sirolimus-eluting stents versus standard stents in patients with stenosis in a native coronary artery. N Engl J Med 2003;349,1315.
6. The Bypass Angioplasty Revascularization Investigation (BARI) Investigators: Comparison of coronary bypass surgery with angioplasty in patients with multivessel disease. N Engl J Med 1996;335,217.

COMPLICATIONS OF CORONARY INTERVENTION

7. Morrison DA, Sethi G, Sacks J, et al: Percutaneous coronary intervention versus coronary bypass graft surgery for patient with medical refractory myocardial ischemia and risk factors for adverse outcomes with bypass: the VA AWESOME multimember registry: Comparison with the randomized clinical trial. *J Am Coll Cardiol* 2002;39,266.
8. William DO, Braunwald, E, Thompson B, Sharaf BL, Buller CE : Results of Percutaneous Transluminal Coronary Angioplasty in Unstable Angina and Non- Q-wave Myocardial Infarction. Observations from the TIMI 11B Trial, *Circulation*. 1996;94 ,2749.
9. Ramondo A, Corbara F, Isabella G, Madalena F, Bellotto F ,Budano S etal: Coronary Angioplasty in Unstable Angina. Immediate and Short term results *Ital Cardiol*. 1998; 18,731.
10. Sharma SK, Israeli DH, Kaman JL, Bodian CA, Ambrose JA :Clinical, Angiographic, and procedural determinants of major and minor coronary dissection during Angioplasty: *Am Heart J*. 1993;126,39-47.
11. Schachinger V, Kasper W, Wollschlager H, Zeiher AM: Incidence, Predisposing factors, acute complications and prognostic significance of intracoronary Thrombus Formation during PTCA; *Z Kardiol*. 1993;82,712-20.
12. Ilija R, Kolansky D, Setaro J, Cabin H, Cieman M, etal: percutaneous transluminal coronary angioplasty :*Cardiology*. 1992;81,245-50.
13. Savchenko AP, Matchin iuG, Liakishev AA. Acute occlusion of the coronary artery after Percutaneous transluminal coronary angioplasty *Vestn Rentgenol Radiol*. 1995 ,10-4.
14. Vatikus PT, Hermann, HC, Laskey WK. : Management and immediate Outcome of patients with intracoronary thrombus during Percutaneous transluminal coronary angioplasty :*Am. Heart J*. 1992;124,1-8.
15. Liu MW, Voorhees WD3rd, Agrawl S, dean LS, Rubin GS: Stratification of risk of Thrombosis after intracoronary stenting for threatened or acute closure complicating coronary balloon angioplasty : a Cook Registry Study: *AM Heart J* 1995 ; 130,8-13.
16. Thel MC, Califf RM, Tardiff BE, Gardner LH, Sigmon KN etal :Timing of and risk factors for Myocardial Ischaemic events after
17. Fussi R, Burkhard-Meier C, Kaspers S, Deutsch HJ, Hopp HW etal Dissection following balloon angioplasty; predictive possibilities using pre interventional intravascular ultrasonography; *Z Kardiol*. 1995 ; 84 ,205-15.