

Percutaneous Coronary Intervention in Acute Coronary Syndromes with ST-Segment Elevation: Prospective Study About 54 Cases Collected At the Center of Interventional Cardiology of Aristide Le Dantec Hospital of Dakar

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Received: 17 June 2019; Accepted: 03 July 2019

Citation: Momar Dioum, Papa Nguirane Ndiaye, Fatou Aw, et al. Percutaneous Coronary Intervention in Acute Coronary Syndromes with ST-Segment Elevation: Prospective Study About 54 Cases Collected At the Center of Interventional Cardiology of Aristide Le Dantec Hospital of Dakar. *Cardiol Vasc Res.* 2019; 3(4); 1-5.

ABSTRACT

Background: Myocardial infarction has benefited from therapeutic progress but, it remains a major public health problem. Coronary angioplasty is the treatment of choice.

The objective of this study was to evaluate the results of angioplasty in acute coronary syndrome with persistent ST segment elevation (STEMI).

Methodology: We conducted a prospective, descriptive and analytical study from January 1st, 2017 to March 31st, 2018. All patients admitted for STEMI who underwent coronary angioplasty were included.

Results: Fifty-four patients were included with a mean age of 59 years. There was a male predominance with a sex ratio of 2.3. Patient's cars were the main means of transport (n=29, 53.7%). A sedentary lifestyle was frequently found (75.9%). Chest pain included: typical (n = 45, 83.3%) and atypical (n=9, 16.7%). The mean time between the onset of the pain and the completion of an electrocardiogram was 7h 19 min. All patients had a subepicardial lesion with anterior territory predominance in 32 patients (62.8%). The right radial access was mostly used (n=30, 55.6%). The anterior interventricular artery was the most affected branch (n=31, 57.4%). The artery was occluded (TIMI grade 0 in fourteen patients). The treatment included: primary angioplasty (n=10, 18.5%), rescue angioplasty (n=11, 20.4%), and delayed angioplasty in the majority of cases (61.2%). Direct stenting was performed in 23 patients and 30 patients had balloon pre-dilatation. Active stent was the most used (n=33). A successful angioplasty was obtained in 49 patients (90.7%) with a TIMI grade 3. Three cases of thrombotic occlusion were noted per procedure and one case of coronary dissection. Short-term evolution was marked by 3 cases of death caused by cardiogenic shock (n=1) and intrastent restenosis (n=1).

Conclusion: Angioplasty is the treatment of choice of acute coronary syndromes. But in our context, his current practice is hampered by the delay in diagnosis, the patient transfer time and the availability of the catheterization rooms.

Keywords

Acute coronary syndrome, Angioplasty, Dakar.

Background

Coronary artery disease is a result of decreased blood flow in the coronary arteries. It is due to atherosclerotic lesions in the majority of cases. Acute coronary syndromes with ST elevation STEMI (or myocardial infarction) are the most serious form because occlusive coronary thrombosis is responsible for myocardial necrosis.

Myocardial infarction has benefited from considerable therapeutic progress, but despite everything, it remains a major public health problem with mortality and morbidity rates still high. Its prevalence will likely double by 2020 with a 140% increase in myocardial infarction mortality in Africa, while the expected increase in northern countries will be less than 30% [1,2].

Myocardial reperfusion is the cornerstone of treatment for myocardial infarction (MI). The rapidity and effectiveness of this reperfusion are the two factors that condition immediate and long-term morbidity and mortality. The challenge is to recanalize the guilty artery and reperfuse the myocardium that depends on it as soon as possible [3]. Today, two reperfusion strategies are possible: intravenous thrombolysis and percutaneous coronary intervention (PCI) [4]. According to international literature [5], PCI has demonstrated superiority over intravenous fibrinolysis with lower early and late mortality and better survival without major cardiac events.

But its current practice in sub-Saharan Africa is hampered by some constraints namely the delay and diagnostic difficulties, the catheterization rooms do not cover all cities and the transfer of patients wastes a lot of time.

Senegal is one of the few countries in sub-Saharan Africa where PCI has been an integral part of the means available for the management of coronary heart disease since 2014. In our context, the existence of an interventional cardiology center facilitates the evaluation of myocardial reperfusion.

Therefore we conducted this study with the main objective of evaluating the results of PCI during STEMI and the specific objectives to:

- Describe the socio-demographic, clinical and paraclinical aspects of patients undergoing PCI;
- Evaluate the deadlines for completion;
- Describe the treated coronary lesions and the characteristics of PCI;
- Report immediate and short-term results.

Methodology

Our work was done in the cardiology department of Aristide Le Dantec hospital in Dakar. It was a prospective, descriptive and analytical study over a period of fifteen months. The recruitment was carried out during the period from 01 January to 31 December 2017 and the follow-up was carried out over a period of three

months for each patient after PCI.

Included were all patients admitted STEMI and PCI, complete medical record, and oral consent.

We analyzed the epidemiological data (age, sex, assumption of costs), modes and time of admission (means of transport and delays chest pain and qualifying electrocardiogram) and modifiable cardiovascular risk factors (high blood pressure, diabetes, smoking, sedentariness...). Clinical data (chest pain, dyspnea and other signs), paraclinical data (electrocardiogram, biology, cardiac echo-Doppler) as well as aspects of PCI (radial or femoral approach, guilty artery, flow TIMI: Thrombolysis In Myocardial Infarction, the type of lesion according to the ACC / AHA classification, type of PCI, rescue or programmed, the final result good, satisfactory or mediocre, complications in per and post procedure) were listed.

Results

The number of patients included was fifty-four. The average age was 59 (28 - 81 years old). The most represented age group was between 50 and 59 years old (35.2%). There was a male predominance with a sex ratio of 2.3. The cost of PCI was borne by the patient in 48.1% of the cases. The general characteristics were summarized in Table 1.

The personal car was the most used mean of transportation in 29 patients (53.7%). The average time between the beginning of the pain and the completion of an electrocardiogram was 7h 19 min (20 min and 72h).

Cardiovascular risk factors were dominated by sedentariness in 41 patients (75.9%), followed by obesity in 24 patients (44.4%), smoking in 23 patients (42.6%) arterial hypertension in 21 patients (38.9%). Clinically, chest pain was consistent: typical (83.3% patients, n = 45) and atypical (16.7% patients, n = 9). The majority of patients (83%, n = 44) had a KILLIP I stage at entry. Five patients (9.4%) were in KILLIP II, two in KILLIP III and KILLIP IV, respectively.

General characteristics	Number	Percentages %
Number	54	100
Mean age (years)	59,22	-
Sex-ratio	2,3	-
Hypertension	21	38,9
Diabetes mellitus	11	20,4
Smoking	23	42,6
Menopause	13	24,1
Physical inactivity	41	75,9
Dislipidemia	14	25,9
Obesity	24	44,4
Pain	54	100
Typical	45	83,3
Non typical	9	16,7

Dyspnea	18	33,3
Other symptoms	36	66,7
Anterior	20	37
Anterior-septal	11	20,3
Lateral	1	1,8
Inferior/posterior	17	31,5
Circonférentiel	2	3,7
Extension to right ventricle	8	14,8

Table 1: General characteristics.

The electrocardiogram showed sub-epicardial lesion on admission in all patients (Figure 1).

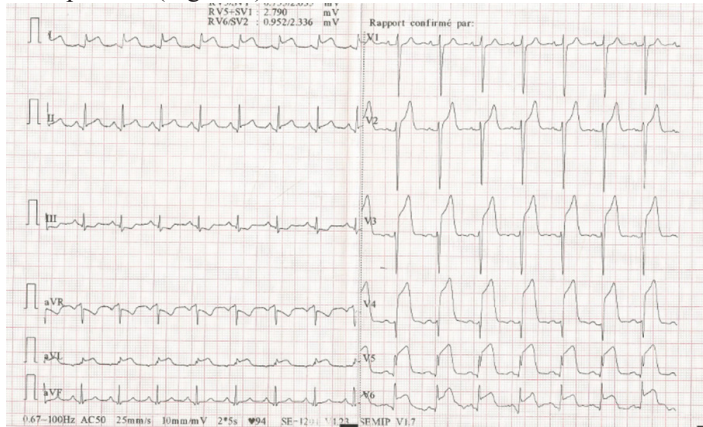


Figure 1: Standard 12-leads electrocardiogram recording ST segment elevation in anterior territory (orange arrow) with mirror (black arrow) in inferior territory and apical-lateral necrosis.

The anterior territory was the most affected (62.8%, n = 32), followed by the inferior territory (33.3%, n = 17). Q waves of necrosis were found in 38 patients (77.6%).

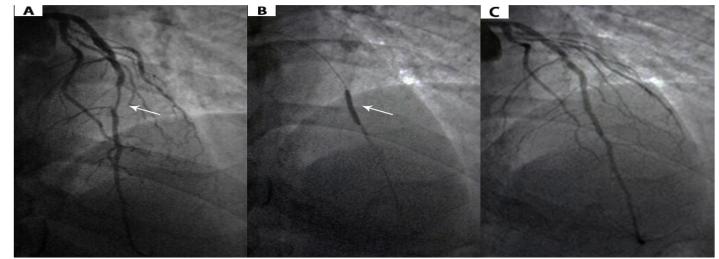
The troponin at admission (n = 27) averaged at 60.56 µg / l (0.12 - 967.5 µg / l). The average fasting glucose level (n = 40) was 1.35 g / l (0.71 - 3.33 g / l). It was high (> 1.26 g / l) in fourteen patients.

Echocardiography was performed in 47 patients and showed left ventricular systolic dysfunction in 48.9% of cases. Disturbances of left ventricular segmental kinetics with hypokinesia occurred in 64% of patients, akinesia in 34% of patients and dyskinesia in 02% of patients.

The coronary angiography was performed by right radial access in 30 patients (55.6%). The right femoral access was used in 24 patients (44.4%). The left anterior descending artery was the most affected branch (57.4%, n = 31 patients), followed by the right coronary artery (33.3%, n = 18 patients), and the circumflex artery (3.7%; n = 2 patients). An injury to the left main coronary artery was noted in one patient.

The guilty artery was occluded with a TIMI 0 flow in 14 patients; TIMI 1 flow was noted in 2 patients (4%), TIMI 2 in 9 patients (18%), TIMI 3 in 25 patients (50%). Most coronary lesions observed (51.2%) were type C.

PCI was realized in 10 patients (18.5%) and the mean time between the qualifying ECG and balloon inflation was 140 min. It was a rescue PCI in 11 patients (20.4%) and in the majority of cases, 61.2% was deferred or programmed.



A: Tight stenosis of left anterior descending artery (arrow); **B:** Stent deployment (arrow); **C:** Results after PCI.

Balloon pre-dilatation followed by stent placement was performed in 30 patients. The active stent was used in 33 patients. The average duration of the procedure was 54 minutes (15 - 180 min). Successful PCI was achieved in 49 patients (90.7%) with a TIMI 3 flow.

Complications were noted including three cases of thrombotic occlusion per procedure, one case of ventricular fibrillation, one case of acute pulmonary edema, one case of syncopal complete atrioventricular block and one case of coronary artery dissection. There were no deaths in the proceedings. The characteristics of PCI were summarized in Table 2.

Characteristics of PCI	Number	Percentages %
Right radial access	30	55,6
Right femoral access	24	44,4
LAD lesion	31	57,4
RCA lesion	18	33,3
CX lesion	2	3,7
LMCA lesion	1	1,8
TIMI flow 0	14	28
1	02	4
2	09	18
3	25	50
Type of lesion Type A	11	25,6
Type B	10	23,3
Type C	22	51,2
Primary PCI	10	18,5
Rescue	11	20,4
Programmed	33	61,2
Pre-dilatation + stenting	30	55,5
Direct stenting	23	42,6
Direct stenting direct + thrombus aspiration	1	1,8
Success	49	91
Failure	4	9
Complications	7	13%

Table 2: Characteristics of PCI.

PCI: Percutaneous Coronary Intervention; LAD: Left anterior descending artery; RCA: Right Coronary Artery; Cx: Circumflex artery; LMCA: Left main coronary artery.

Hospital progress was generally favorable; however, there were three cases of recurrent angina, three hematomas at the point of femoral puncture, and one death from cardiogenic shock. In the short term, the evolution was marked by the occurrence of two deaths and intra-stent restenosis in one patient.

Discussion

In our series, we noted a male predominance (70.4%). This result is comparable to those found in the literature [6-8]. This difference between the two genders could be explained by the protective effect of estrogen in women who disappear after menopause.

Our patients were relatively young with an average age of 59 years. This observation is the same in the Mboup series [9]. However, in Western series [8-11], patients are a decade relatively older.

Unlike in the West [12], the pre-hospital structures (emergency response unit) are exceptionally solicited in case of suspicion of an acute coronary syndrome (ACS) in sub-Saharan Africa. The personal car is the most used mean of transportation for our patients (53.7%) to reach hospital emergency departments (ED). These combine to lengthen the admission deadlines at the level of the ED.

The average time between chest pain and admission to the cardiology department was more than 6 hours longer than those observed in the North American and European registers [8]. The radial approach was the most used (55.6%). The European Society of Cardiology based on the RIVAL study [13] recommends the radial approach as a method of choice in reducing the occurrence of hemorrhagic complications in ACS in addition to being associated with a low mortality rate in the post-infarction.

The PCI rate was low in our series 18.5% of patients. In Europe, according to FAST-MI 2015, PCI was performed in 76% of patients [14]. This rate was 40% in the ACCESS study [15]. These better results observed in developed countries are favored by the existence of a well-organized care network including the emergency medical assistance service and a larger offer of care. In Africa, revascularization techniques are difficult to access in many African countries where the technical platform is often non-existent or defective.

Rescue PCI was performed in 20.37% of cases. The medico-invasive strategy has shown benefits [16, 17]. In our context of exercise and given the scarcity of interventional cardiology centers, it seems appropriate to develop this strategy.

There is currently no consensus on the benefit of PCI beyond the 12th hour in STEMI. However, the data from the randomized

BRAVE-2 study [18, 19] show that in the group undergoing PCI there was a preservation of the myocardial reserve and an improvement in survival of 4 years compared to the conservative strategy group (medical treatment only). In our work, PCI has been delayed in the majority of cases of STEMI due mainly to the long admission time.

In our study, the immediate results of PCI were satisfactory in 90.7% of cases. Per-procedure complications were dominated by thrombotic occlusion in 3 patients. This is explained by the thrombotic environment during ACS and the absence of anti GP IIB IIIA in our cardiac catheterization rooms. A case of coronary artery dissection was noted in an elderly patient with calcified lesions. There were no deaths in the proceedings.

Conclusion

Percutaneous coronary intervention is the treatment of choice when it is performed early by an experienced team. But in sub-Saharan Africa, its current practice is hampered by certain constraints namely the delay and the diagnostic difficulties, the catheterization rooms do not cover all the cities and the transfer of the patients is wasting a lot of time.

Abbreviations

STEMI: Acute coronary syndromes with ST elevation; ACS: Acute Coronary Syndrome; MI: Myocardial Infarction; ED: Emergency Departments; PCI: Percutaneous Coronary Intervention; TIMI: Thrombolysis In Myocardial Infarction.

Acknowledgments

We are indebted to all patients who gave their consent to participate to the study. Our thanks to all the devoted personnel of Dakar Cardiology Department.

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