Post-thrombolysis Coronary Angiography of Acute Coronary Syndromes with ST-Segment Elevation at the Department of Cardiology of Aristide le Dantec Hospital

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ABSTRACT

Background: In Africa, where very few countries have a coronary angiography room, thrombolysis is the first-line treatment in ST-segment elevation myocardial infarction (STEMI). We wanted, through this study carried out in Senegal with a recent interventional cardiology activity, to describe the results of coronary angiography after thrombolysis. **Methodology:** This was a monocenteric, longitudinal, descriptive, and analytical study that took place from May 2013 to June 2017 at the Cardiology Clinic of the Aristide Le Dantec Teaching Hospital of Dakar, including all patients who had a STEMI and thrombolysis. **Results:** A total of 55 patients were included, and the average age of the patients was 59.07 ± 12.39 years, with a clear male predominance (sex ratio of 3.6). The main risk factors were coronary artery disease, known in eight patients (14.55%), as well as hypertension (41.82%) and smoking (34.55%). The average time to consult after the onset of pain was 5.06 ± 1.95 h (range of 1 ½ h–11 h). The anterior territory was the most frequently affected (57%). Streptokinase was the thrombolytic used in all patients with a success rate of 92.7%. The average time between admission and start of fibrinolysis was 59 ± 55.2 min with extremes of 0 and 240 min. Coronary angiography was performed within 24 h after thrombolysis in 13 patients. It was abnormal in 52 patients (94.5%). Significant monovessel stenosis was noted in 23 patients (41.82%), two-vessel in 16 patients (29.09%), and left main stenosis in 11 patients (20%). Thrombotic coronary lesions were found in five patients (9.09%). Significant coronary involvement was correlated with thrombolysis time. 27 patients underwent percutaneous coronary intervention (PCI) (49.09%) with a satisfactory final result in 96.3% of cases. **Conclusion:** Thrombolysis is still the acute phase treatment of STEMI in our countries. However, the development of interventional cardiology in Sub-Saharan Africa has made it possible to complete this treatment with PCI.

Key words: Coronary angiography, myocardial infarction, Sub-Saharan Africa, thrombolysis

BACKGROUND

Acute coronary syndromes (ACSs) are a major public health problem because of their prevalence and mortality rate. Indeed, the acute phase of myocardial infarction is a critical period with a high mortality rate. More than one third of deaths occur in the 1st h and half during the first 24 h in the absence of early reperfusion.[1,2]

The management of ACS has undergone significant challenges and improvements over the years. It is now well codified by learned societies which emphasize the need for the earliest possible diagnosis and myocardial reperfusion.

In Senegal, as in most African countries and elsewhere in the world, intravenous thrombolysis remains the standard treatment in the initial management of ACS with permanent ST-segment elevation.

Hence, we wanted to study the aspects of post-thrombolysis coronary angiography and to focus, in the era of new recommendations on the management of ACS from diagnosis to treatment in our department, without the possibility of percutaneous coronary intervention (PCI).

METHODOLOGY

It was a monocenteric, longitudinal, descriptive, and analytical study that was conducted from May 2013 to June 2017 at the Cardiology Clinic of the Aristide Le Dantec Teaching Hospital Center in Dakar.

All records of patients admitted for ST-segment elevation myocardial infarction (STEMI), who had thrombolytic therapy and coronary angiography, were included in the study.

The patients excluded from the study were those who had fibrinolysis without coronary angiography, those who had coronary angiography without fibrinolysis, and those whose records were unusable or misplaced.

The elements of coronary angiography were collected from the register of examinations and the electronic record of the reports.

The studied parameters were interrogation data (marital status, antecedent, and route), clinical, paraclinical, and therapeutic examinations (thrombolysis, coronarography, and angioplasty), and evolution.

The data were entered with the Epi info version 7 software. Their analysis was carried out with the STATA software version 11.0.

RESULTS

We collected 55 patient records, representing 7.34% of all patients with coronary angiography.

The average age of the subjects was 59.07 ± 12.39 years, with extremes of 28 and 89 years. The male gender predominated with 43 men (78.18%) against 12 women (21.82%), i.e., a sex ratio of 3.6 in favor of men.

Hypertension was the dominant cardiovascular risk factor, found in 23 patients (41.82%), followed by smoking and sedentary lifestyles found in 19 (34.55%) and 17 patients

(30.91%) respectively. Eight patients (14.55%) had a history of coronary heart disease and one patient had a stroke.

27 patients were admitted directly to the hospital, 15 had first gone through a health center before being referred, and 13 had come on their own. The average time to consultation after the onset of pain was 5.06 ± 1.95 h (range of 1½–11 h).

According to the Killip classification, 10.9% of patients with heart failure were in Stage II and one patient had reached a state of cardiovascular collapse.

Troponin was high in all 38 patients (69.1%) who had the dosage. Glucose levels were high in ten patients, i.e., 18.18% of cases.

The higher territory was the most frequently affected (57%). The other repolarization disorders were mainly localized in the lower territories (14 patients) and inferior with extension to the right ventricle (6 patients).

Left ventricular kinetic disorders predominated in the anterior territory, with five patients having a severe impairment of left ventricular ejection function (9.1%).

All patients were thrombolyzed with streptokinase. The success rate was 92.7%.

The average time between admission and start of fibrinolysis was 59 ± 55.2 min with extremes of 0 and 240 min.

Three patients had benefited from pre-hospital thrombolysis. The average time between onset of pain and initiation of fibrinolysis was 6.3 ± 1.78 h with extremes of 2 and 9.8 h. A proportion of 11% of patients had fibrinolysis in less than the first 3 h [Table 1].

Coronary angiography was programmed in the majority of cases (49.09%) with 13 cases of delayed angioplasty (23.64%).

It was performed within 24 h after thrombolysis in 13 patients.

The right femoral approach was the most used puncture site, i.e., 60% of patients. Seventeen patients had a right

Table 1: Delay of fibrinolysis between onset of pain and initiation of fibrinolysis

Delay (in hours)	*n* (%)
<3	6 (10.9)
(3–6)	27 (49.09)
(6–9)	18 (32.73)
9+	4 (7.28)
Total	55 (100.0)

radial approach of 30.91%. Radial femoral conversion was performed in 4 patients, i.e., 7.27%,

The average duration of the procedure was 67 min. The minimum and maximum durations were, respectively, 7 and 174 min.

The average cumulative irradiation dose was 7676 cGy. The minimum dose was 815 cGy and the maximum dose 21162 cGy.

At angiography, the right network was dominant in 63.64% of cases. Coronary angiography was abnormal in 52 patients (94.5% of cases) and normal in 3 patients (5.45%).

Significant coronary stenosis, >70%, was found in 82%. Monovessel lesions were the most common with 23 patients (41.82%), followed by two-vessel lesions found in 16 patients (29.09%) and three-vessel lesions in 11 patients (20%).

Most of these involved an involvement on the territory of the left coronary artery. The median segment of the left anterior descending artery was the most affected (50.9%), followed by the proximal segment of the circumflex artery and right coronary artery in its middle part (45.45%) [Table 2].

Coronary lesions were thrombotic in five patients, i.e., 9.09% of cases [Figure 1].

There was a significant difference between time to thrombolysis and coronary injury, including tight and occlusive lesions, with significant ($P < 0.001$. PCI was performed in 27 patients. The size 6 French angioplasty catheter was the most used in 29.09% of patients and the size 5 French in 31.3% of cases.

Seventeen lesions were treated by direct stenting against ten by balloon pre-dilatation.

An excellent result was noted with a TIMI 3 flow in 96.3% of cases. Angina per procedure and hypoglycemia were the only incidents noted in two patients. Three types of accidents were reported in three patients: Non-stenotic coronary dissection and no clinical or electrical translation, cardiogenic shock, and recovered cardiorespiratory arrest. 33 stents were deployed including 56.7% bare stents.

The average hospital stay was 11 days with extremes of 5 and 34 days. A case of death during hospitalization was found in a 66-year-old patient with probable cause of severe ventricular arrhythmia.

Table 2: Repartition of lesions type by coronary artery					
Coronary artery	Plaque/no significant lesion	Significant lesion	Tight lesion	Subocclusive/occlusive lesion	*n* (%)
Left					
Left main artery	5	1	1		7 (12.73)
LAD1	2	1	14	7	17 (30.9)
LAD2	6	3	13	6	28 (50.9)
LAD distal	4	1	4	2	11 (39.28)
Diagonal 1	5	2	5	1	13 (23.64)
Diagonal 2	2	2	5		9 (16.36)
Proximal LCX	10	1	12	2	25 (45.45)
Distal LCX	7	1	4	2	14 (25.45)
LMA1	2	2	2		6 (10.9)
LMA 2	2				2 (3.64)
Right					
RCA1	7	2	3	2	14 (25.45)
RCA2	11	5	8	1	25 (45.45)
RCA3	5	2	2	2	11 (39.28)
Lateral 1	4		1		5 (9.09)
Lateral 2	4				4 (7.27)
RMA	4	1		1	6 (10.9)
PDA	4		1		5 (9.09)

LAD: Left anterior descending artery, LCX circumflex artery, LMA: Left marginal artery, RMA: Right marginal artery, PDA: Posterior descending artery

Figure 1: Coronary angiography by left femoral access and left anterior oblique view showing a thrombotic occlusion of the right coronary artery after fibrinolysis of ST segment elevation myocardial infarction

DISCUSSION

According to the literature, ACS occurs earlier among African populations and the analysis of the results of several studies in Africa shows an average age of onset not exceeding the 60-year limit.[3,4] In the European and North American series, the average age of the occurrence of ACS is much higher. It is 68 in France, 67 in Canada and the United States, and 65 in Greece.[5]

In our series, 20% of patients were under the age of 50, reinforcing the assertion that coronary artery disease is being diagnosed more and more in the relatively young patient.[6]

This disparity between the Western countries and Africa could be explained by the much higher life expectancy in these countries but especially by the lack of effective programs to fight cardiovascular risk factors in Africa. The male predominance is corroborated by the data of the literature and this, whatever the region,[7] women being protected until menopause by estrogens.

The passage by peripheral health structures in our context is a factor in the lengthening of the care period due to a lack of care network organized between these structures and the cardiology departments.

Early reperfusion of the artery responsible for myocardial infarction reduces infarct size and mortality.[8] Medical information is, therefore, a very important support in the education of populations, and they will learn to recognize the signs of acute coronary heart disease so to consult early.

Overall delays are related to the lack of information and education of the population who do not recognize the symptoms and do not consult in time. These long delays could also be explained by the absence of decentralized diagnostic means and the lack of a care coordination network in most of these countries, which means that most patients go to another hospital (and therefore, waste time) before coming to the cardiology department.

In addition, we were able to note that only 7.5% of our patients had arrived within the first 3 h when the benefit of thrombolysis was optimal.

The European Society of Cardiology has proposed the concept of "first medical contact," defined by "the place (ambulance or hospital) where, at least in principle, the reperfusion treatment could be initiated," while in our regions, there is still no strategy or support circuit for ACS with permanent ST segment, which means that the deadlines defined by learned societies are still illusory.[9] The French FAST MI registry (564 patients treated with primary angioplasty in October 2005) reported a median "onset of symptoms-first call" time of 75 min followed by a "first call - arterial puncture" delay of 165 min.[9]

An average delay of 59 min, with extremes of 0 and 240 min, was observed between admission of patients and initiation of thrombolysis.

The study by Kelly *et al*. in Canada[10] reported median "admission-thrombolysis" delays of 36 min (range 0–365 min) for the urban area and 43 min (range 9–272 min) in rural areas. This too long waiting time in our services before the introduction of thrombolytic treatment could partly be explained by the unavailability, sometimes, of the product on the spot.

Numerous studies have shown that the reduction in mortality from the administration of thrombolytic therapy is significant within 12 h of symptoms. Similarly, the earlier the thrombolysis was administered, the better were the TIMI flow, left ventricular function, and survival,[11] and hence, the concept of "Golden Hour," where Boersma demonstrated that the benefit of thrombolysis was very low, quickly after the 2nd h follows the onset of symptoms.

In our series, six patients had benefited from thrombolysis in the "golden hour" and 49.09% of patients had benefited from it between the 3rd and 6th h.

In angiography, the femoral approach is still the most used, but constant progress is being made in the use of the radial path that is recommended. The return to our center of young cardiologists trained in the radial in France makes this first one used by default.

Indeed, it is now clearly demonstrated that this route reduces the risk of bleeding complications.[12]

The lesions found in our patients were poorly calcified (9%). Calcification of the coronary arteries is a major predictor of cardiovascular events and is an indicator of overall mortality in the general population.

The success of angioplasty was noted in 96.3% with very few incidents and complications, and this partly due to the progress made in interventional cardiology with the improvement of equipment, adjuvant treatments, and the emergence of stents.[13]

Hospital mortality in our series was only 1.82%. This decline in ACS mortality is due to considerable advances in interventional cardiology.

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