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CHARACTERIZATION OF PATIENTS DIAGNOSED WITH STEMI SUBMITTED TO PRIMARY ANGIOPLASTY

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Abstract: Primary angioplasty is proposed as the treatment of choice in acute myocardial infarction with ST-segment elevation, providing better clinical evolution and outcome as long as its indications are respected. The objective was to write and analyze the clinical and epidemiological profile of patients diagnosed with ST-segment elevation acute myocardial infarction who underwent primary angioplasty. This is a retrospective cohort study assembled from medical records admitted via emergency under ICD-10 I21 (Acute Myocardial Infarction) at the Hospital de Clínicas de Passo Fundo, in Passo Fundo - RS during 2019. Demographic data, past clinical history, chronological presentation, therapy used, recovery evolution and outcomes made up the objectified description and analysis. Pearson's chi-square test, Fisher's exact test and Student's t test were performed. The adopted statistical significance level was 5%. Of the 301 patients with AMI, 143 had STEMI and 63 underwent primary angioplasty. Statistical significance was found for the following analyses: patients from Passo Fundo were more submitted to primary angioplasty ($p = 0.007$); and patients undergoing primary angioplasty had more minor bleeding than all other therapeutic approaches ($p = 0.046$). Primary angioplasty stands out as a central strategy in the treatment of STEMI. Despite the similarity of patients' characteristics with regional patterns, the clinical outcomes, influenced by the reperfusion procedure, highlight the need for an individualized assessment, aligning with trends in developed countries and showing variations in relation to the current literature.

Keywords: Angioplasty; Myocardial Infarction with Elevation of the ST Segment; Percutaneous Coronary Intervention.

INTRODUCTION

Among the main causes of global mortality, cardiovascular diseases stand out significantly. In the Brazilian context, pathologies associated with the circulatory system are the main causes of death. Although there has been a downward trend in mortality rates from these diseases in recent years, the numbers are still worrying, especially with regard to acute myocardial infarction, one of the most representative pathological events of the coronary arteries (Brazil; Ministry of Health, 2021)

These diseases fall into the category of non-transmissible chronic diseases, whose emergence is largely associated with factors related to the individual's lifestyle. This suggests that, with non-pharmacological measures, many of these events can be prevented or, at least, postponed. However, when these diseases manifest themselves acutely, such as infarction, approaches are sought for a quick and effective management. It must be noted that, despite its severity, an acute myocardial infarction is not synonymous with a fatal outcome.

Historically, the use of fibrinolytic agents in response to these events has been associated with a variety of side effects, including significant bleeding risks for patients. Thus, since the end of the 1970s, an interventionist alternative, percutaneous coronary intervention, has been adopted in many health services around the world. In Brazil, the forefront of this practice was marked by the intervention carried out by Costantino Costantini in Curitiba - PR, in 1979.

Several decades after the introduction of this technique, a multitude of factors involved in its application have been listed, from the correct indication to the patient's recovery after the procedure. In this context, the present study aims to analyze and describe the clinical and epidemiological profile of patients

diagnosed with ST-segment elevation acute myocardial infarction, seeking to evaluate the efficacy and safety of this therapeutic approach.

METHODS

it is about in one study in cohort hindsight. The study population involves patients diagnosed with acute myocardial infarction, under ICD 10 – I21, who were admitted to the emergency department of the Hospital de Clínicas de Passo Fundo (HCPF), a tertiary reference hospital at the regional level with a hemodynamics center. The non-probabilistic sample, for convenience, consisted of patients seen from 01/01/2019 to 12/31/2019.

Adult patients, aged 18 years or older, of both genders admitted to the HCPF during 2019 diagnosed with acute myocardial infarction under ICD 10 – I21, specifically with ST-segment elevation, were included. Patients whose medical records were sparsely completed and those whose diagnosis of acute myocardial infarction was not confirmed during the clinical evolution of hospitalization were excluded.

Data collection took place from August to September 2021 from the electronic medical records hosted in the HCPF Hospital Management System MV2000. The data collected were: date and time of admission to the HCPF, city of origin, gender, age, past pathological history (diabetes mellitus, dyslipidemia, previous coronary artery disease, chronic obstructive pulmonary disease, peripheral vascular disease, previous stroke, hypertension arterial hypertension, heart failure, chronic renal failure and smoking), diagnostic evaluation of the infarction, use of fibrinolytics (Streptokinase, Alteplase or Tenecteplase), reperfusion procedure performed (primary percutaneous coronary intervention or other), access route and intracoronary device used (in case of primary PCI), complications after the therapy adopted (angina, arrhythmias, stroke, cardiogenic shock, mechanical complications, complications due to the use of contrast, decompensation of chronic obstructive pulmonary disease, arterial dissection, heart failure, reinfarction, minor bleeding, major bleeding, cardiorespiratory arrest and thrombosis), need for a new procedure for reperfusion, in-hospital outcome (hospital discharge, transfer or death), estimated time from onset of symptoms to arrival at the HCPF emergency room, intra-balloon door-to-balloon time -hospital and length of stay.

These data obtained were checked and double entered to increase the precision of the results in a database developed in the Epidata program version 3.1 (free distribution). Statistical analysis was carried out using the freely available software PSPP and comprised the distribution of frequencies, absolute and relative, mean and standard deviation of numeric variables. Categorical variables were described using absolute and relative frequency and, based on that, they were tested using Pearson's chi-square test, Fisher's exact test or Student's t test, depending on the case. A p-value less than 0.05 was considered statistically significant.

This research was approved by the Research Ethics Committee of the ``Universidade Federal da Fronteira Sul`` (UFFS) Passo Fundo *campus* under opinion, number: 4,769,932 and complied with the provisions of Resolution No. 466/2012 of the National Health Council (CNS), with the mandatory Free and Informed Consent Form (TCLE) being waived.

RESULTS

Data from 323 patients were collected, but after applying the exclusion criteria, a sample of 301 patients diagnosed with acute myocardial infarction was obtained. Among these individuals, 143 were diagnosed with acute myocardial infarction with ST-segment elevation (STEMI), configuring a prevalence of 47.5%.

It is emphasized that there was a reduction in the sample number from 143 to 141, due to the death of two patients prior to the taking of medical procedures at the referral hospital. That said, the study made it possible to identify a prevalence of 44.7% (n=141) for choosing primary Percutaneous Coronary Intervention (PCI) as a therapeutic approach to STEMI, that is, 63 individuals underwent this procedure.

With regard to these individuals undergoing primary PCI, Table 1 represents a demographic profile typically male (69.8%), intercity origin (68.3%) and mean age of 64.1±11, 8 years. In addition, the difference between the percentage of patients from Passo Fundo (31.7%) and those transferred from other municipalities (68.3%) was statistically significant in relation to the adoption of the therapeutic approach. As the origin of Passo Fundo was more submitted to primary PCI (p=0.007).

The following stood out as cardiovascular risk factors at hospital admission: systemic arterial hypertension (61.9%), active smoking (31.7%) and diabetes mellitus (27.0%), as shown in table 2. Furthermore, there were no reported patients with peripheral vascular disease in the sample as a whole. There was no statistically significant difference in the analysis of clinical history between those indicated for each therapeutic approach.

For patients who underwent primary PCI, the mean Delta T time was 418.9±311.25 minutes. Table 3 illustrates that the individuals mostly fell into the categorical interval <6 hours. The Door-to-Balloon time had its mean estimated at 142.38±288.36 minutes and in this case the categorical interval <90 minutes was the most prevalent.

Variables	n	%
Delta T	60*	100
≤6 hours	32	53.3
6 to 12 hours	18	30.0
12 to 24 hours	10	16.7
Balloon holder	63	100
≤90 minutes	44	69.8
>90 minutes	19	30.2

Table 3. Distribution by chronological presentation of patients with STEMI undergoing primary PCI. Passo Fundo – RS, 2021. (n = 63)

Source: Own. *Reduced sample size due to missing data in three records.

Table 4 presents aspects inherent to the primary PCIs performed, such as access route and intra-coronary device of choice. It was found that the preferred access route for performing PCI was the radial route (52.4%). In addition, it was observed that the drug-eluting stent (74.6%) was the most used device. No use of balloon catheter or bioabsorbable stent was registered.

Variables	n	%
Access way	63	100
Radial	33	52.4
Femoral	5	7.9
Uninformed	25	39.7
device used	63	100
Pharmacological balloon	1	1.6
Drug-eluting stent	47	74.6
non-pharmacological stent	3	4.8
Uninformed	12	19.0

Table 4. Distribution by technique and devices used in the procedure of patients with STEMI undergoing primary PCI. Passo Fundo – RS, 2021. (n = 63)

Source: Own.

Demographic data	primary PCI (n = 63)		Others (n = 78)		All (n = 141)		*P*
Gender							0.710
Masculine	44	(69.8%)	57	(73.1%)	101	(71.6%)	
Feminine	19	(30.2%)	21	(26.9%)	40	(28.4%)	
Age							0.733
<59 years	24	(38.1%)	32	(41.0%)	56	(39.7%)	
≥60 years	39	(61.9%)	46	(59.0%)	85	(60.3%)	
Origin							0.007*
Passo Fundo	20	(31.7%)	10	(12.8%)	30	(21.3%)	
Other	43	(68.3%)	68	(87.2%)	111	(78.7%)	

Table 1. Distribution by demographic data and therapeutic approach of patients with STEMI treated at a tertiary hospital. Passo Fundo – RS, 2021. (n = 141)

Source: Own. *Pearson's chi-square test.

Past clinical history	primary PCI (n = 63)		Others (n = 78)		All (n = 141)		*P*
Diabetes Mellitus	17	(27.0%)	15	(19.2%)	32	(22.7%)	0.515
Dyslipidemia	9	(14.3%)	8	(10.3%)	17	(12.1%)	0.645
Prior Coronary Artery Disease	1	(1.6%)	3	(2.1%)	4	(2.8%)	0.779
COPD	two	(3.2%)	0	(0.0%)	two	(1.4%)	0.398
Chronic Kidney Disease	two	(3.2%)	1	(1.3%)	3	(2.1%)	0.721
Prior Cerebral Vascular Accident	3	(4.8%)	4	(5.1%)	7	(5.0%)	0.862
Systemic Arterial Hypertension	39	(61.9%)	47	(54.7%)	86	(61.0%)	0.961
Cardiac insufficiency	1	(1.6%)	4	(5.1%)	5	(3.5%)	0.475
smoking							0.827
Active	20	(31.7%)	30	(38.5%)	50	(35.5%)	
No	27	(42.8%)	32	(41.1%)	59	(41.8%)	
former smoker	16	(25.4%)	16	(20.5%)	32	(22.7%)	

Table two. Distribution by past clinical history data and therapeutic approach of patients with STEMI treated at a tertiary hospital. Passo Fundo – RS, 2021. (n = 141)

Source: Own.

Outcome	Primary PCI (n = 63)		Others (n = 78)		All (n = 141)		*P*
In-hospital outcome							0.752
High	58	(92.1%)	73	(93.6%)	131	(92.9%)	
Death	5	(7.9%)	5	(6.4%)	10	(7.1%)	
length of stay							0.862
≤5 days	38	(60.3%)	49	(62.8%)	87	(61.7%)	
>5 days	25	(39.7%)	29	(37.2%)	54	(38.3%)	

Table 6. Distribution by in-hospital outcome data, length of stay and therapeutic approach of patients with STEMI treated at a tertiary hospital. Passo Fundo – RS, 2021. (n = 141)

Source: Own.

Clinical evolution	primary PCI (n = 63)		Others (n = 78)		All (n = 141)	P
Angina	8	(12.7%)	5	(6.5%)	13 (9.2%)	0.317
Arrhythmias	8	(12.7%)	5	(6.5%)	13 (9.2%)	0.249
Brain stroke	1	(1.6%)	0	(0.0%)	1 (0.7%)	0.450
Cardiogenic shock	6	(9.5%)	4	(5.2%)	10 (7%)	0.345
mechanical complications	0	(0.0%)	two	(2.6%)	2 (1.4%)	0.338
arterial dissection	1	(1.6%)	0	(0.0%)	1 (0.7%)	0.450
Cardiac insufficiency	3	(4.8%)	two	(2.6%)	5 (3.5%)	0.812
cardiopulmonary arrest	3	(4.8%)	two	(1.6%)	5 (3.5%)	0.657
Extra reperfusion procedure	10	(15.9%)	7	(9.1%)	17 (12/%)	0.299
Reinfarction	0	(0.0%)	1	(1.3%)	1 (0.7%)	1,000
minor bleeding	7	(11.1%)	1	(1.3%)	8 (5.6%)	0.046*

Table 5. Distribution by clinical evolution data and therapeutic approach of patients with STEMI treated at a tertiary hospital. Passo Fundo – RS, 2021. (n = 141)

Source: Own. *Pearson's chi-square test.

Post-PCI complications are shown in table 5. Of these, the most described were: repetition of the reperfusion procedure (15.9%), angina (12.7%), arrhythmia (12.7%) and minor bleeding (11. 1%). Statistical significance was obtained only for a greater involvement of minor bleeding in those individuals undergoing primary PCI (p=0.046). There was no record of complications such as: reaction to the use of contrast, Chronic Obstructive Pulmonary Disease in exacerbation, major bleeding or stent thrombosis.

As for the hospital outcomes, the patients progressed to hospital discharge in 92.1% of the cases, to death in 7.9% and no post-admission transfer to the Hospital de Clínicas de Passo Fundo (HCPF) was described. Furthermore, the mean length of hospital stays for patients who underwent this technique was 5.68±5.05 days, however most individuals fell within the categorical range ≤5 days, as shown in Table 6 below.

DISCUSSION

The prevalence of ST-segment elevation acute myocardial infarction estimated at 47.5% is substantially above the 32% found in a study carried out in a hospital with characteristics similar to those of the Hospital de Clínicas de Passo Fundo — a tertiary reference at the regional level with a center of hemodynamics.

The demographic profile of patients with STEMI undergoing primary PCI is in line with expectations: predominance of men (69.8%) aged over 60 years (61.9%). In a study also conducted in the state of Rio Grande do Sul, the male type and age group 65-74 years were highlighted, however this study was not restricted to patients undergoing primary PCI.

As for origin, a majority (68.3%) of patients from other municipalities were referred to Passo Fundo, characterizing a typical pattern of capturing patients in specialized centers with hemodynamics as provided for by the current guideline (PIEGAS et al., Although a study carried out in a hospital in the capital

of Rio Grande do Sul found a completely opposite pattern of origin, being mostly composed of patients from the municipality itself in spontaneous demand.

The prevalence of performing primary percutaneous coronary intervention in these patients was practically identical to that described in the VICTIM study carried out in the state of Sergipe: 44.7% vs. 45.8%. In absolute data, 63 primary angioplasties were performed within one year. According to a study conducted in North American hospitals, performing more than 33 primary angioplasties per year would already indicate lower mortality compared to other less acidic centers. Such a premise, however, cannot be confronted for the national scenario at the time of this study, in view of the lack of publications that included this type of analysis in their scope.

Furthermore, there was statistical significance for greater use of the aforementioned technique in patients from the city of Passo Fundo ($p = 0.007$). This situation may be due to the shorter presentation times of these patients at the center with hemodynamic cardiology, thus more easily fulfilling one of the permissive criteria for performing primary PCI. Although there are positive reports, this analysis was not included in the study.

Of the listed cardiovascular risk factors, there was no statistically significant difference in either of the two therapeutic groups compared.

Systemic arterial hypertension was the most prevalent, accounting for 61.9% of primary angioplasties performed. Similar studies carried out in the southern region of Brazil found very close percentages such as: 59%, 60% (MATTE et al., 2011) and 63.4%. Therefore, it can be said that the referred population does not present disparity in this regard in relation to local standards.

Among individuals who underwent primary PCI, there was a prevalence of 31.7% for active smoking, which alone is already above the national (12.6%) and state (14.7%) average for the year 2019, but does not exceed the percentage observed in a study located in Belém do Pará (53.2%). However, if added to those former smokers, more than half of the patients observed were linked to this variable.

This study aligns with the previous finding in the literature regarding the prevalence of diabetes mellitus in approximately a quarter of patients undergoing primary PCI. In addition, on the occasion of the HORIZONS-AMI study, it is known that this very present cardiovascular risk factor resulted in more restenosis of the target lesion in the medium to long term and, consequently, there was a greater number of revascularization procedures in these arteries (STONE et al. Due to the design of this study being limited to the in-hospital observation period only, there were no notes of restenosis or reinfarction in these patients.

The indication of the therapeutic approach and consequently its success is very well related to the duration of myocardial ischemia, having been proven to increase the relative risk of death for every 30 minutes of delay in performing a PCI (BASTOS et al., 2012; DE LUCA. As a result, patients with STEMI who underwent primary PCI were categorized according to the time of total myocardial ischemia in 3 intervals up to the upper limit of 24 hours, when PCI is now considered elective and also does not change the patient's prognosis in relation to pharmacological therapy.

According to the PRAGUE study, for an interval ≤6 hours, the best outcomes were indicated in comparison with the adoption of alternative therapies such as isolated fibrinolysis. Moving to the Passofundense scenario, 53.3% of the patients treated at

the HCPF were able to fit into this range considered optimal. This finding confirms the premise that up to half of individuals undergoing primary PCI present with a delay in relation to temporal metrics.

From 12 hours of total ischemia, the performance of primary PCI is subject to the fulfillment of eligibility criteria, which, when positive, benefit patients in terms of mortality in 12 months — 9.3% versus 17.9% in the pharmacological approach. This is the case of 17.7% of the patients described in the sample, although the premise cannot be validated due to the in-hospital observational cut and the non-categorization of the eligibility criteria.

The average ischemia time obtained was 418.9±311.25 minutes, that is, approximately 7 hours. When compared to studies in the national scenario, there is an important heterogeneity: the maximum time found was 1315 minutes and the minimum 264 minutes.

As for the door-to-balloon time, the study was limited to timing it from the moment they arrived at the HCPF and therefore the patients were categorized considering the interval up to 90 minutes as optimal, in which mortality reaches its lower limit — approximately 3% (. 69.8% of the sample fell into this category. Despite this, the average door-to-balloon time obtained was 142.38±288.36 minutes, which exceeds both records in the American (BENNIN et al., 2016) and Brazilian context.

The preferred access route in primary angioplasties was the radial, which was present in at least 52.4% of the procedures, considering that of the total number of angioplasties performed, 39.7% did not present this data in the medical records. By way of comparison, a general hospital located in a medium-sized city in the south of Brazil recorded 69.3% adoption for the same route. Above all, the choice of this route requires professionals with a greater learning curve (generally found in large centers) and takes longer to perform, but reflects in less vascular complications and mortality compared to the femoral route (BASTOS et al., 2012; BERNAT)

The drug-eluting stent was the most used device (74.6%), which may have reached even higher levels, taking into consideration, that 19% of the medical records omitted this data. The widespread adoption of this intracoronary device represents an advance in the prognosis of patients when taking into consideration, implications previously described in the literature, such as: lower chance of restenosis and, consequently, less need for revascularization of the target lesion.

The recorded percentage of arrhythmias was 12.7% — identical to that published in South Korea, with the caveat that this study observed only atrial fibrillation among participants.

After performing the primary PCI, 15.9% of the patients underwent a new reperfusion procedure. In this aspect, there is a limitation of the study to confront the literature in view of the non-discrimination between target lesion revascularization and reperfusion of *non-culprit arteries.*

A retrospective cohort carried out in Indonesia observed that 5.35% of the patients undergoing primary PCI evolved with cardiogenic shock, while in the Passofundense context, the value reached was 9.5%. Furthermore, in the Indonesian study, a prevalence of post-primary PCI angina was almost twice as high. Thus, it was expected that these patients would have less than half the percentage of angina compared to fibrinolysis. As the comparative group is not only composed of fibrinolysis, it is presumed that aspects related to other therapeutic approaches are exerting pressure on the results obtained. There was, however, agreement regarding the non-description of reinfarctions in the post-primary PCI group.

It is noteworthy that the prevalence of

stroke (1.6%) despite being close to a value already described in the literature (0.6%), behaved in an antithetical way to what was expected when compared to other referral procedures that did not No cases of this complication have been reported.

Finally, it must be noted that the statistical tests did not indicate significance for a greater occurrence of cardiovascular complications in patients undergoing primary angioplasty, only for bleeding at the puncture site (p=0.046). Regarding this association, similar test results were not found in the literature.

Then, having submitted a STEMI patient to primary PCI at the HCPF during 2019 resulted in the death of 7.9% versus 6.4% for other approaches. This result is very close to the mortality already described for primary PCI (7.8%) , but it is contrary to expectations when compared to the other group, since PCI is considered the gold standard treatment. However, the Others group also included patients already managed in emergency care who were transferred to the HCPF for invasive protocol stratification; it is understood that such patients were not at risk of imminent death.

The average duration of hospitalization (5.68±5.05 days) depends on the US context — 5 days (PEDERSEN et al., 2014) — and lower than that already described in Brazil — 7.77 ± 11.94 days. In this study, there was no statistical significance in the comparison between the length of stay of the two groups.

While the length of stay is relatively short, but the complications are generally more pronounced, one can hypothesize relationships that explain this dilemma. Faced with a limitation of the study, it is not possible to know in which general condition the patient arrives at the HCPF; therefore, if it presents a condition that has already worsened, its prognosis tends to be difficult to reverse, bringing it closer to death. Verification of this sentence is subject to structural modification of this scientific production.

CONCLUSIONS

In this study, we observed that patients, although sharing cardiovascular risk profiles similar to regional patterns, exhibited different clinical outcomes, depending on the reperfusion approach adopted. Even if the characteristics of these patients with STEMI were in line with those of other regional studies, their clinical evolution proved to be comparable to the standards of developed countries. However, the results regarding the selected therapeutic strategy differed from the existing literature.

Such findings underline the relevance of primary angioplasty in the treatment of STEMI, while at the same time highlighting the imperative consideration of an individualized approach for each patient.

AUTHORS' CONTRIBUTION

Research conception and design: Berleze MB, Rabello RS, Graebin R; obtaining data: Berleze MB; statistical analysis: Berleze MB, Rabello RS, Graebin R; manuscript writing: Berleze MB; critical review of the manuscript: Rabello RS, Graebin R.

POTENTIAL CONFLICT OF INTEREST

The authors ratify that there are no conflicts of interest.

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