Original Article

Causes of hospital readmission after heart surgery

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ABSTRACT

The objective was to identify readmission's profile and causes of heart surgery patients. A retrospective, descriptive study, through the revision of records from patients submitted to myocardial revascularization surgery or valvar prosthesis implantation with posterior readmission. Sixty-two patients composed the sample. The readmission rate was 5.9%. Surgical site infection was the main cause for readmission in 87.5% of patients submitted to myocardial revascularization surgery and in 12.5% of valvar implantation (p<0.001) and, it was associated with obesity (p=0.05) and dyslipidemia (p=0.007). To identify patients at risk of surgical site infection can minimize readmission rates and decrease care costs and, it deserves a special planning of multi-professional actions.

Descriptors: Perioperative Nursing; Patient Readmission; Surgical Wound Infection; Cardiovascular Surgical Procedures.

INTRODUCTION

Non-communicable chronic diseases are a global health issue, especially the cardiovascular ones[1], responsible for about 20% of deaths of individuals older than 30 years. Coronary syndromes represent 80% of these diseases and can culminate the need of surgical interventions[2-3].

Still, there is the growing increase of heart surgeries performed in people older than 65 years, linked to the increase of life expectancy of the population; thus, elderly become strong candidates for the process of myocardial revascularization, due to the worsening of the coronary atherosclerotic disease[1-5].

The surgical treatment intends to improve patients' quality of life, especially myocardial revascularization (MR) surgeries conducted when there is occlusion of coronary arteries[4] and the valvar prosthetics (IVP) implantation, frequent among men older than 40 years and postmenopausal women[5].

Heart surgeries increase morbidity, related to patient's health state, previous habits. The intrinsic complexity of the procedure that contributes for hemodynamically unstable post-surgery individuals, presenting complications more frequently, increasing hospitalization periods or requiring readmissions[6].

A study analyzing 3,004 American hospitals and 479,471 hospital discharges after large surgical procedures, including MR, observed readmission rates in 30 days that varied between 10.5% and 17.4%; and, especially affected elderly with previous comorbidities. Besides, the relationship between readmission and quality of care offered at the perioperative period was noted[7].

Readmission rates of patients submitted to heart surgeries can vary between 6.1% and 18% and, they are especially associated with heart failure and infection[6,8]. Ages, preoperative comorbidities, body mass index, diabetes mellitus, within others, are risk factors for the occurrence of this event [9].

Therefore, readmissions are a frequent problem in health institutions, causing discomfort to patients and their families, burdening the society, and overloading the healthcare system[10].

Thus, to know readmission motives in a cardiology service can benefit hospital assistance's planning and reduce readmissions. Thus, the present study aimed to identify readmission's profile and causes of heart surgery patients.

METHODS

A retrospective, descriptive study that reviewed records of patients submitted to MR or IVP surgeries, who were readmitted in a high complexity public hospital, which is reference for cardiology in a capital at the Brazilian southeast region.

We collected data from January to April of 2014, in a Medical and Statistical Archive Service (MSAS), in two steps. In a first moment, we checked hospital readmissions from 2012, after MR or IVP surgical procedures, through a search on the MSAS. We collected: admission date, unit, cause, time interval between admissions and patient's length of stay.

We identified 573 myocardial revascularization procedures and 484 valve replacements; totalizing 1,057 procedures in 2012, from those, 62 patients were readmitted after surgery.

In a second moment, we collected sociodemographic profiles from the 62 selected records, including gender, age, address, marital status, education and employment situation. To characterize hospital attention, we used medical diagnoses, treatment received, length of stay, number of admittances and, comorbidities as, hypertension, dyslipidemia, tobacco use, obesity, stress, and sedentary behavior, within others. To characterize readmission, we analyzed cause, time between readmission and previous admittance, medical diagnosis and, patient's clinical development.

We descriptively analyzed data with the program SPSS 20.0, using Fisher's exact test (categorical variables), Student's t test (numerical variables), and logistic regression. We considered significant *p* values lower or equal to 0.05.

This research project followed the recommendations of the resolution 466/2012[11] approved by the

Ethics in Research Committee of the study hospital under the protocol number 4351 (CAAE 18774113.0.0000.5462).

RESULTS

Sixty-two medical records (5.9%) of readmitted patients during the study period composed the sample, representing a rate of 6.3% among MRs and 5.4% among IVPs.

Within the readmissions, 36 (58%) patients were submitted to MR and 46 (42%) to IVP.

The main cause for the first readmission was surgical site infection (SSI) in 24 (38.7%) patients. Only nine (14.5%) patients were readmitted a second time and one (1.6%) a third time. In the last two situations, admittance was overall motivated by the treatment of complications as cardiac tamponade, pleural effusion, within others (Table 1).

Table 1: Distribution of readmission motives of patients submitted to myocardial revascularization and valvar prosthetics implant. São Paulo, SP, Brazil, 2012.

Readmission	Readmission motive	N	%
1ª readmission	Surgical site infection	24	38.7
	Clinical/surgical/diagnostic procedure (cardiac catheterization, pacemaker assessment, new surgeries)	14	22.6
	Cardiovascular problems (arterial insufficiency with ischemia, heart failure, acute coronary syndrome, cardiomyopathy)	9	14.5
	Clinical or surgical procedure's complication (cardiac tamponade, pleural effusion, within others)	4	6.4
	Neurological complications	3	4.8
	Others (respiratory problems, rheumatic disease, within others)	8	12.9
	Total	**62**	**100**
2ª readmission	Clinical or surgical procedure's complication (cardiac tamponade, pleural effusion, within others)	3	33.3
	Arterial insufficiency with ischemia	2	22.2
	Others(arteriovenous fistulae, hemothorax, exams, within others)	4	44.4
	Total	**9**	**100**
3ª readmission	Heart failure	1	100
	Total	**1**	**100**

In the admission to conduct the proposed surgical procedure, 69% of the sample was admitted for more than seven days, 18% until seven days and 13% were admitted longer than 30 days. Patients were outside the hospital between the proposed surgical procedure and the first readmission, on average for 51.6±70.4 days, and the length of stay on the first readmission was on average 16.9±14.5 days (Table 2).

Among the patients who developed SSI (n=24), 19 (79.2%) were readmitted between eight and 30 days, three (12.5%) in seven days and two (8.3%) in a period longer than 30 days.

On Table 3, we observe the sociodemographic characteristics of readmitted patients after heart surgery and their relationship with the main complication on the first readmission, that is, SSI.

Table 2: Number of days per admission, readmission and period between readmissions of patients submitted to myocardial revascularization and valvar prosthesis implant. São Paulo, SP, Brazil, 2012.

Variable	Mean (days)	Median (days)	Standard deviation (days)	Minimum (days)	Maximum (days)
First admission	17.3	12.0	16.7	1	99
Time between first admission and first readmission	51.6	23.5	70.4	1	265
First readmission	16.9	13.0	14.5	1	62
Time between first and second readmission	58.6	14.5	82.4	7	271
Second readmission	20.6	13.5	26.7	1	90
Time between second and third readmission	5.0	5.0	5	5	5
Third readmission	11.0	11.0	0	11	11

Table 3: Distribution of characterizing variables of patients submitted to myocardial revascularization and valvar prosthetics implantation and, readmission by surgical site infection. São Paulo, SP, Brazil, 2012.

Variables	Readmission		Readmission by SSI		
	N (62)	%	N (24)	%	*p*
Gender					0.780*
Male	41	66.1	15	62.5	
Female	21	33.9	9	37.5	
Age					0.390+
18-40 years	6	9.7	0	0	
41-60 years	25	40.3	11	45.8	
61 years or more	31	50.0	13	54.2	
Marital status					0.640*
Single	7	11.4	2	8.3	
Married	42	67.7	15	62.5	
Widowed	3	4.8	2	8.3	
Separated/divorced	8	12.9	4	16.6	
Unfilled	2	3.2	1	4.2	
Education					0.950*
Illiterate	6	9.8	2	8.3	
1-11 years of study	43	69.3	16	66.7	
12 years of study or more	10	16.1	4	16.7	
Not filled	3	4.8	2	8.3	
Chronic diseases					
Hypertension	49	79.0	20	83.3	0.500*
Dyslipidemia	28	45.2	16	66.7	0.007*
Diabetes mellitus	18	29.0	9	37.5	0.250*
Obesity	13	21.0	8	33.3	0.050*
Smoking	6	9.7	2	8,3	1.000*
Employment situation					0.860*
Paid activity	29	46.8	9	37.5	
Retired	16	25.8	0	0	
Withdrawn	3	4.8	0	0	
Stay at home	10	16.1	4	16.7	
Others	4	6.5	11	45.8	
Origin					0.470*
São Paulo – capital	32	51.6	14	58.3	
São Paulo – interior	27	43.6	10	41.7	
Other states	3	4.8	0	0	

* Fisher's Exact Test; + Student's t Test

Readmitted patients were predominantly men, over 60 years, hypertensive and dyslipidemic. There was a statistically significant association between readmission by SSI and dyslipidemia (p=0.007) and, obesity (*p*=0.05) (Table 3).

It is noteworthy that among cases presenting SSI, 21 (87.5%) patients were submitted to MR and only three (12.5%) to IVP (*p*<0.001). The logistic regression analysis indicated that individuals submitted to MR in the first admittance had 16.7 more chances to be readmitted by SSI when compared to those submitted to valvar prosthetics implant.

DISCUSSION

The data found in this study established the relationship with the scientific literature in relation to the main cause of readmission, the SSI, and the association of comorbidities as significant factors for its occurrence[9,12], however, men were predominant in the investigated sample and admission rates were lower than the ones from the scientific literature[9,13].

An American study analyzing 11,823 hospital discharges of patients submitted to MR observed a 13.2% readmission rate in 30 days, and post-operative infections were the most frequent readmission' cause. There was an association between readmission and patients' characteristics as, being older, being female, and having comorbidities before the surgery[9].

Another investigation analyzing 180,568 patients submitted to IVP between 1999 and 2010, verified that 49.1% of those, especially women, elderly and black were readmitted one year after surgery due to heart failure, arrhythmias, sepsis and post-operative complications, with a 38 days average length of stay after readmission[12].

In our investigation, patients took an average of 52 days to be readmitted and half of them stayed up to 13 days hospitalized during readmission, contrasting values comparing to the ones found in a previous study that also analyzed MR and IVP surgeries and, found 13% readmission in 30 days, with a median readmission of six days after discharge and new hospitalization with length between one and 138 days[13].

SSI was the main cause of readmission in our study; it is known that its development is linked to higher morbidity and long-term complications, increasing the time of hospitalization and costs[14]. SSI incidence in MR and IVP is expected to vary between 0.2 and 5.6 because they are considered clean surgeries[15-16].

Thus, many factors can influence the appearance of severe post-operative infections, between those, obesity, previous heart surgery or emergency surgery, kidney failure, immunosuppression, heart failure and cerebrovascular or peripheral diseases[17].

Smoking is a predictor for post-operative complications due to decline of the pulmonary function[18] and inflammatory and repairing cells, causing delay in healing, necrosis, SSI and dehiscence, for example. Thus, smoking cessation for four weeks, or 30 days before surgery is able to recover cellular function, although the cell proliferative response remains impaired[19].

Another evident aspect is the association of obesity and dyslipidemia that makes patients more

susceptible to develop coronary atherosclerosis, frequently resulting in MR surgery. It is noteworthy that for many individuals, the compromising is so extensive that drug or percutaneous therapies are insufficient to maintain a good quality of life[20-21].

Obese patients submitted to heart surgery more frequently have important post-operative complications as the SSI, pulmonary thromboembolism, and systemic inflammatory response syndrome[20-21]. Obesity is an independent risk factor for mediastinitis, beyond its association to longer hospital stay, lower survival in five years and difficulty of the systemic distribution of antibiotic prophylaxis[20].

Diabetes mellitus (DM) is another important risk factor for cardiovascular disease (CVD), as well as, for SSI. The association between DM and CVD is well established, indicating the isolated presence of DM increasing the risk of vascular disease and stroke in two to four times, when compared to non-diabetic individuals[22]. A national study demonstrated that 45.7% of patients readmitted by mediastinitis were diabetic[23].

Hyperglycemia stimulates the release of certain inflammatory mediators, compromising healing and immunity, which would lead to damage when fighting infections[23], and it should be the goal of the health team to maintain the blood glucose of patients in levels lower than 200mg/dl on the first two post-operative days[20,23].

In this context, the patient submitted to MR without complications will stay an average of seven days hospitalized, with a foreseen recovery period of six to 12 weeks[4]. Therefore, SSI in heart surgery deserves attention, because it extends hospitalization time, it exposes the patient to high morbidity and mortality, it causes important economic and social impact, increasing the costs of hospitalization[14-16] and reflecting in possible readmission[6,8-9].

The repercussion brought by the heart surgery to the patient's life is noteworthy, with challenges related to the maintenance of the lifestyle and the need of support from the health team[24]. Thus, the health team should establish programs to minimize possible post-operative complications, as the SSI that will negatively impact the treatment success.

CONCLUSION

We conclude that most readmitted patients after heart surgery were men, older than 60 years, hypertensive, sedentary and dyslipidemic, submitted to myocardial revascularization. The readmission rate after MR and IVP was 5.9%, lower than the observed in the scientific literature.

Surgical site infection was the main cause of readmission. Obesity and dyslipidemia were significantly associated to surgical site infection.

Considering these findings, we reinforce the need to plan a multi-professional perioperative management for elective heart surgeries, through the idealization of actions to control risk factors for the development of surgical site infection, which was the main readmission cause in the analyzed institution.

Thus, new investigations should be conducted, especially by nurses, who are responsible for

perioperative care, trying to establish the best propositions to control these intrinsic factors associated to the patient that contribute with increase of SSI cases and post readmission.

As limitation of the study, it is important to highlight the retrospective data collection that faced problems related to the quality of registries, but which allows analysis of a larger group of procedures.

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