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Original Article

Registry Study of Patients Who Needed Emergent Surgery due to Complications of Cardiac Catheterization in Rajaie Heart Center Between 2005 and 2015

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ABSTRACT

Background: Coronary artery disease is the leading cause of death in most societies today. One of the most important diagnostic and therapeutic methods used in this field is cardiac catheterization. This procedure is, however, invasive and can lead to cardiac complications, vascular complications, and even death.

Methods: In this study, we reviewed the characteristics of adolescent patients who needed emergent surgery due to catheterization complications between 2005 and 2015 at Rajaie Cardiovascular, Medical, and Research Center, Tehran, Iran. This study was done descriptively. Of 1028 patients transferred to the operating room in the first 24 hours after catheterization, a total of 36 patients needed emergent surgery due to catheterization complications. The data of these patients were extracted from the archives and analyzed using the SPSS software.

Results: Acute mitral valve regurgitation post percutaneous transmitral commissurotomy occurred in 8 (22%) patients, vascular rupture and retroperitoneal hematoma in 8 (22%), rupture of the cardiac chambers and tamponade in 5 (14%), coronary artery dissection in 4 (11%), vascular access thrombosis in 3 (8%), vascular access dissection in 3 (8%), embolization and malposition of the Amplatzer device in 2 (6%), clot formation on the Amplatzer device in 1 (3%), cardiac arrest in 1 (3%), and vascular sheath fracture in 1 (3%). Of the 36 patients, 6 died.

Conclusions: A comparison of the incidence rates of post-cardiac catheterization complications leading to emergent surgery between our center and other similar centers shows no significant difference. ***(Iranian heart Journal 2018; 19(3): 60- 63)***

KEYWORDS: Cardiac catheterization, Complication, Emergent surgery

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Coronary artery disease is the leading cause of death in most societies today, accounting for 70% of deaths in individuals over 75 years of age and 25% of mortalities in individuals aged over 30 years. [1-3] One of the important diagnostic and therapeutic methods used in this field is cardiac catheterization. Cardiac catheterization is, however, an invasive method with a reported mortality rate of 0.1%. [4,5] The most important complications of cardiac catheterization are arrhythmias, hematomas, pseudoaneurysms, vascular access bleeding, cardiac chamber perforation and tamponade, aortic dissection, and arterial embolism. Some of these complications require emergent surgery. [6-9] Rajaie Cardiovascular, Medical, and Research Center in Tehran is the largest research and treatment center for cardiovascular diseases in Iran and has served as a pioneer in modern cardiovascular disease treatment for over 30 years. Given the dearth of systematic research in our country on post-cardiac catheterization complications, we sought to review the characteristics of adolescent patients who needed emergent surgery due to such complications between the years 2005 and 2015 in our hospital.

METHODS

In this descriptive study based on cardiac catheterization and surgical reports, from a total of 1028 patients with a 24-hour interval between catheterization and surgery, 36 patients who needed emergent surgery due to post-cardiac catheterization complications were selected. The data were extracted through the archival records of the patients and were analyzed using the SPSS software, version 16.

RESULTS

In this study, 36 patients at an average age of 45.1 years and a standard deviation of 18.3 were included. Twenty-three (64%) patients were female and 13 (36%) male. The mean ejection fraction in the study population was 48.2%, with a standard deviation of 6.9%. With respect to the prevalence of cardiovascular risk factors, hypertension was reported in 32.7% of the study patients, chronic kidney disease in 2.7%, and diabetes mellitus 16.2%. Table 1 depicts the prevalence of the types of the cardiac catheterization procedures.

Table 1. Prevalence of the procedure types

Procedure Type	10 Years' Prevalence	Number of Procedures Leading to Major Complications	Percentage
PTMC	1444	12	0.85
Coronary angiography	55647	5	0.009
Elective PCI	20155	4	0.02
Peripheral angioplasty	1300	4	0.3
Coarctoplasty	374	4	1.1
ASD device closure	503	2	0.4
Primary PCI	2252	1	0.04
PTPC	179	1	0.57
Pericardiocentesis	235	1	0.4
RHC in CHD	3743	1	0.02

PTMC, Percutaneous transcatheter mitral commissurotomy; PCI, Percutaneous coronary intervention; ASD, Atrial septal defect; PTPC, Percutaneous transcatheter pulmonary commissurotomy; RHC, Right-heart catheterization; CHD, Congenital heart disease

One patient with hypertrophic obstructive cardiomyopathy had alcohol septal ablation; however, the procedure was complicated with cardiac arrest. After resuscitation, the patient was transferred to the operating room for the implantation of extracorporeal membrane oxygenation.

Overall, 95% of the procedures were done electively and 2 (5%) cases were done emergently. Thirty-four procedures were done on the morning shift, 1 procedure on the evening shift, and 1 procedure on the night shift.

The frequency of the complications is presented in Table 2.

Among the 36 patients, 6 deaths occurred (all at the same admission) and the other patients were alive at 6 months' follow-up. The characteristics of these patients are presented in Table 3 based on the type of the procedures and the type of the complications.

Table 2. Prevalence of the complications

Complication	Prevalence	Percentage
Post-PTMC acute severe mitral regurgitation	8	22
Vascular rupture and hematoma	8	22
Chamber perforation and tamponade	5	14
Coronary artery dissection	4	11
Vascular access thrombosis	3	8
Dissection of the vascular access	3	8
Device embolization/malposition	2	6
Clot formation on the closure of the device	1	3
Cardiac arrest	1	3
Vascular sheath fracture	1	3
Total	36	100

PTMC, Percutaneous transcatheter mitral commissurotomy

Table 3. Procedures and complications leading to death

Procedure	Complication	Prevalence	Percentage
Peripheral angioplasty	Dissection of great artery	2	33.6
Alcohol septal ablation	Arrhythmia	1	16.6
RHC in CHD	Vascular rupture and hematoma	1	16.6
PTMC	Chamber perforation and tamponade	1	16.6
Elective PCI		1	16.6
Total		6	100

PTMC, Percutaneous transcatheter mitral commissurotomy; PCI, Percutaneous coronary intervention; RHC, Right-heart catheterization; CHD, Congenital heart disease

There were 2 pregnant women with severe mitral stenosis and dyspnea (functional class IV) resistant to medical treatment. These women underwent percutaneous transcatheter balloon valvuloplasty. One of them was transferred to the operating room due to left atrial perforation and tamponade for pericardiocentesis. After pericardiocentesis, no bad outcome threatened the mother and the fetus, and the patient was discharged with a good outcome. The other pregnant patient was transferred to the operating room for mitral valve replacement to treat acute mitral regurgitation. The patient's fetus suffered intrauterine death on the first postoperative day, but the mother was discharged in a stable condition.

In 2005, Chessa et al [10] evaluated 417 patients with atrial septal defect device closure and reported that 10 (2.4%) patients were in need of emergent surgery due to device displacement. In our study, of 503 cases of the device closure of atrial septal defects, 2 (0.4%) patients required emergent surgery.

In 2005, Praveen et al [11] reported that out of a total of 1388 cases of percutaneous transcatheter mitral commissurotomy (PTMC), 31 (2.2%) patients required emergent surgery: 23 (74.2%) due to acute mitral regurgitation and 8 (25.8%) due to tamponade. In our study, out of 1444 patients with PTMC, 12 (0.8%) cases needed emergent surgery: 8 (66.7%) due to acute mitral regurgitation and 4 (33.3%) due to tamponade.

In a study conducted by Molaei et al [12] in the pediatric ward of our center, only 1 (3.8%) patient from a total of 26 patients who had undergone transient catheter coarctoplasty developed major complications. In our study, of 374 patients who underwent this procedure, only 4 cases (1.1%) needed emergent surgery.

CONCLUSIONS

A comparison between the previous articles and our study shows no significant difference between our center and its counterparts in terms of the incidence of post-cardiac catheterization complications. Nonetheless, we encountered problems regarding data collection, which can be overcome with the implementation of a catheterization complications registry system in our cath-lab service.

REFERENCES

1. Bainey KR Jugdutt BI. Increased burden of coronary artery disease in South-Asians living in North America. Need for an aggressive management algorithm. Atherosclerosis 2009; 204(1): 10-1

2. Weinstein MC. Coxson PG. Williams LW. Pass TM. Stason WB. Goldman L. Forecasting coronary heart disease incidence, mortality, and cost: the Coronary Heart Disease Policy Model. American journal of public health. 1387; 77(11): 1414-26

3. Delahaye F, Roth O, de Gevigney G. Epidemiology of acute coronary syndrome. Rev Prat 2003.

4. Cale L, Constantino R. Strategies for decreasing vascular complications in diagnostic cardiac catheterization patients. *Dimens Crit Care Nurs*. 2012;31(1):13–17.

5. Kiernan JT, Ajani AE, Yan BP. Management of access site and systemic complications of percutaneous coronary and peripheral interventions. *J Invasive Cardiol*. 2008;20(9):463–469.

6. Valgimigli M, Gagnor A, Calabro P, Frigoli E, L eonardi S, Zaro T, Rubartelli P, Briguori C, Ando G,Repetto A, Limbruno U, Cortese B, Sganzerla P, Lupi A, Galli M, Colangelo S, Ierna S, Ausiell o A,Presbitero P, Sardella G, Varbella F, Esposit o G, Santarelli A, Tresoldi S, Nazzaro M, Zingare lli A, de Cesare N, Rigattieri S, Tosi P, Palmieri C, Brugal etta S, Rao SV, Heg D, Rothenbuhler M, Vranck x P, Juni; Investigators M . Radial versus femoral access in patients with acute coronary syndromes undergoing invasive management: a randomised multicentre trial. Lancet. 2015;385:2465–2476.

7. 7. Zeevi B, Berant M, Fogelman R, Galit BM, Blieden LC. Acute complications in the current era of therapeutic cardiac catheterization for congenital heart disease. Cardiol Young. 1999;9:266–272

8. 21. Stone PA, Campbell JE, AbuRahma AF. Femoral pseudoaneurysms after percutaneous access. J Vasc Surg. 2014;60:1359–1366.

9. 19. De Bono D The Joint Audit Committee of the British Cardiac Society and Royal College of Physicians of London. Complications of diagnostic cardiac catheterisation: results from 34,041 patients in the United Kingdom confidential enquiry into cardiac catheter complications. Br Heart J. 1993;70:297–300.

10. Spence MS. Qureshi SA. Complications of trans catheter closure of atrial septal defects. Heart 2005; 91:1512–1514

11. Kerala Varma P. Emergency surgery after percutaneous transmitral commissurotomy: Operative versus echocardiographic findings, mechanisms of complications, and outcomes. The Journal of Thoracic and Cardiovascular Surgery.September 2005

12. Molaei A. Complications of Aortic Stenting in Patients below 20Years Old: Immediate and Intermediate Follow-Up. J Teh Univ Heart Ctr 2011;6(4):202-205.