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Impact of preoperative stroke on post cardiac surgery stroke incidence

Ehab Mohamed kasem[1,2*]

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Authors' Affiliation:
[1]Cardiothoracic surgery department, Zagazig university hospital, Zagazig, Egypt
[2]Cardiac surgery department, king Abdullah medical city, Makkah, Saudi Arabia

***Corresponding Author**
Cardiothoracic surgery department, ZAGAZIG university hospital, Zagazig, Egypt & Cardiac surgery department, King Abdullah medical city, Makkah, Saudi Arabia
Email: ehab_kasem@hotmail.com

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ABSTRACT

Introduction: Stroke is the most dreadful complications post cardiac surgery. In spite of advances in surgical techniques, its incidence still 3 to 5%, with associated mortality up to 26%. It's more post valve surgery. Does preoperative stroke affect incidence of post-operative stroke and impact timing of stroke on preoperative stroke are main objective to answer. *Patients and Methods:* This is retrospective study analyzing data of 68 patients with preoperative stroke from July 2013 to December 2020 in Zagazig university hospital. Preoperative, Operative and Postoperative data are collected from patients' medical files. *Results:* The mean age of patients was 53±11yrs, dominant female (63.2%). Infective endocarditis (IE) was the commonest cause of preoperative stroke (39.7%). Benign cardiac tumor a potential cause of preoperative stroke (7.3%). Most of cases done in chronic phase, 4 cases reported with postoperative stroke have no relation to surgery timing from preoperative stroke. It correlates with the cardiac pathology. The post-operative data other than stroke included bleeding 675 ml ± 125 ml, with 2 cases re-explored. We reported 1 case of mortality, early stroke post aortic dissection (AD). *Conclusions:* Surgery can be performed safely in patients suffered from preoperative stroke without burden on post-operative stoke incidence. Following guidelines is recommended, and surgery timing is still debated however early surgery is recommended if patient clinically deteriorated or biasing about negative outcome.

Keywords: Stroke, CABG, Valve surgery, Postoperative stroke, morbidity

1. BACKGROUND

Stroke is the most dreadful complications post cardiac surgery. The incidence of stroke post-cardiac surgery is higher than other surgery and more with valve (4.4%-8.1%) than coronary artery bypass grafting (CABG) (1.4%-3.8%), (Tarakji et al., 2011). Post-operative stroke incidence doesn't improve by advances in preoperative screening and surgical techniques (Sanders et al., 2015). Atherosclerosis of ascending aorta and aortic valve is main cause of perioperative stroke (Fan et al., 2011). Infective endocarditis (IE) and left atrial thrombus are main causes for preoperative (Hogue et al., 1999). Carotid artery stenosis and atrial fibrillation are risk factors for both preoperative and perioperative stroke (Head et al., 2018). It was found that infective

endocarditis (IE) is one of most important causes of septic preoperative stroke (Nikolaos et al., 2020; Cao et al., 2018). According to current guidelines classification of timing of stroke, it may be acute within 2 weeks, sub-acute 4-6 weeks and chronic more than 6 weeks. Surgery timing post stroke according to current guidelines with strong recommendation to delay surgery minimum up to 4 weeks post event (Pettersson et al., 2017). No clear consensus regarding surgery timing in patient with preoperative stroke, all depend on surgeons' preferences to delay surgery as long as possible. Objective is to answer Does preoperative stroke affect incidence of post-operative stroke and when to operate.

2. PATIENTS AND METHODS

This is retrospective study, for patients operated from July 2013 to December 2020, 68 patients with preoperative stroke operated in Zagazig university hospital. Preoperative data included demographic patient's data, cardiac pathology, comorbidities AF, Carotid artery stenosis, intra cardiac masses, timing of stroke (acute within 2 weeks, subacute 2 to 4 weeks and chronic after 6 weeks) and surgery in relation to stroke time. Operative data included type cardiac surgery, bypass and ischemic clamp time. Postoperative general variables are bleeding, re-exploration; ICU and hospital stay mortality and postoperative stroke in relation to time of preoperative stroke and cardiac pathology

Statistical analysis

Categorical data were presented as frequencies and percentages, while continuous variables were expressed as mean ±SD or median values.

3. RESULTS

In present study, the mean Age is 53±11 yrs. Female gender (63.5%). Infective endocarditis (IE) is the main cardiac pathology causing preoperative stroke in 27 patients (39.7%) while Coronary artery atherosclerosis in 21 (30.9%) valvular heart disease in 14 (20.6%) and others 6 (8.8%) (Figure 1). Sinus rhythm (SR) was the commonest rhythm in 49 (72.1%) pts while Atrial fibrillation (AF) in 19 (27.9%) the preoperative stroke type, ischemic stroke in 53 (77.9%), hemorrhagic in 9 (13.2%) patients, transient ischemic attacks (TIA) in 6 (8.8%) patients (Table 1).

Table 1 Preoperative Data of the Patients

Variable	Value
Mean age (y)	53±11
Gender F/M	43/25
BSA (m^2)	1.4±0.3
DM	7/68
HTN	9/68
Renal failure	3/32
Carotid artery stenosis*	9
Right ICA	5(55.5%)
Left ICA	3(33.3%)
Both CA	1(11.1%)
CARDIAC PATHOLOGY	
IE	27/68 (39.7%)
Non-IE	41/68 (60.3%)
CAD	21/68
Valvular heart disease	14/68
Myxoma	3/68
Papillary fibroelastoma	2/68
AD	1/68
PREOPERATIVE RHYTHM	49/68
SR	(72.1%%)
AF	19/68 (27.9%).

PREOPERATIVE STROKE Ischemic stroke Hemorrhagic stroke TIA	 53 (77.9%) 9(13.2%) 6(8.8%)

BSA: Body surface area, DM: Diabetes mellites, HTN: Hypertension, IHD: Ischemic heart disease, IE: Infective endocarditis, LA: left atrial, CAD: Coronary artery disease, AD: Aortic dissection, SR: Sinus rhythm, AF: Atrial fibrillation, TIA: Transient ischemic attacks. * Stenosis more than 75% as per guidelines

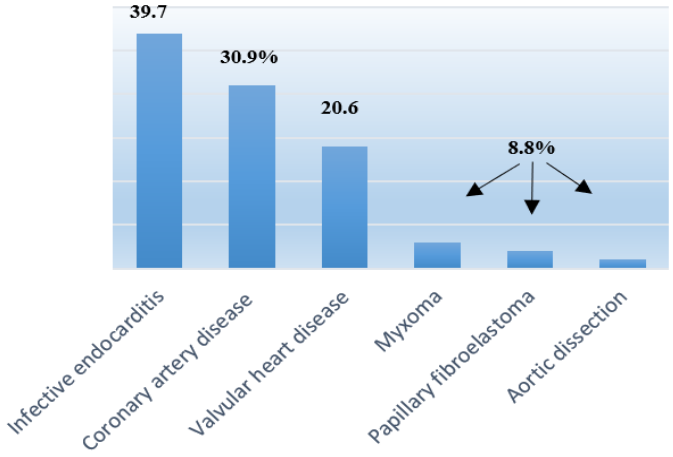

Figure 1 The main cardiac pathology of preoperative stroke

Cardiopulmonary bypass time was (97±12) min while ischemic clamp time was (83±9) min. Mitral valve surgery in IE group 24 patients (11repair and 14 replacement with tissue bio prothesis valve) while in non-IE (11 patients), Isolated CABG in 17 pts, CABG+MVR in 7 patients, Benign cardiac tumor 5 (myxoma in 3 pts, papillary fibroelastoma in 2pts,), aortic dissections 1 (Table 2).

Table 2 Operative data

Mean bypass time (min)	97±12
Mean Acx (min)	83±9
Surgery Timing from preoperative stroke Acute Subacute chronic	 8 (11.7%) 3 (4.4 %) 57 (83.8%)
Surgical procedure IE MV replacement MV repair AV replacement	 27 14 11 3
Non-IE CABG CABG+MVR MVR+LA thrombus excision Myxoma Papillary fibroelastoma AD	41 17 7 11 3 2 1

ACX, aortic, cross clamp time, IE, infective endocarditis, CABG, coronary artery bypass, MVR, mitral valve replacement, AVR aortic valve replacement

The mean ICU and hospital stay was (1.5±.7) and (8±2.5) days respectively. The post-operative consequences other than stroke included bleeding (825 ± 175 ml), with one case re-explored. Four patients were reported with stroke postoperative, one case post CABG operated urgent with LICA stenosis, second patient post Urgent intervention with huge endocarditis mass continuous showering to brain and body, third patient post elective CABG with previous stroke year ago, and 4th patient post Aortic dissection, patient stroke on spot so urgent surgery intervention. We reported 1 case of mortality, early stroke post aortic dissection (AD) Table (3). Postoperative stroke in relation to surgery timing and cardiac pathology were represented in (Figure 2).

Table 3 Postoperative data

Mean ICU /D	1.5± .7
Mean Hospital /D	8±2.2
Bleeding (ml)	825 ± 175
Re-explorations	1
Mortality	1
Postoperative stroke (The relation to surgery timing) Acute stage Subacute chronic	4 3/8 0/3 1/57
Postoperative stroke in relation to pathology IE Non-IE	 1/27 3/41

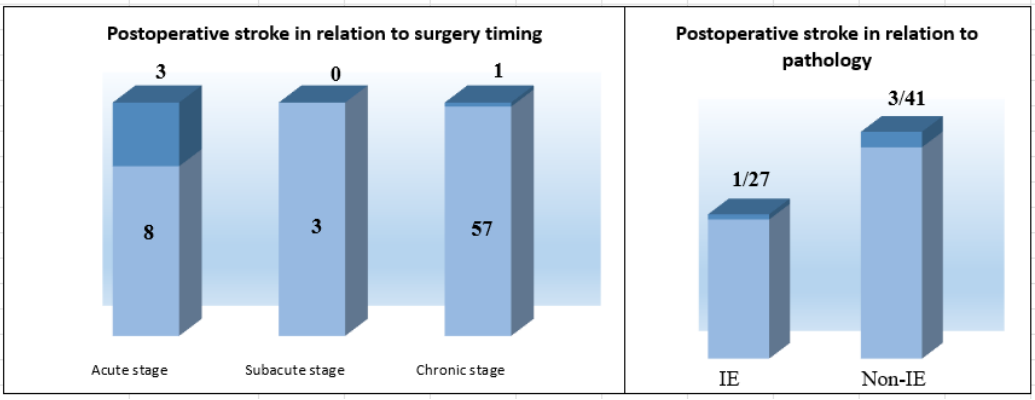

Figure 2 postoperative strokes in relation to surgery timing and cardiac pathology

4. DISCUSSION

Post-operative stroke is a dreadful complication associated with increased morbidity and mortality. Cardiac surgery complicated by stroke than other surgery. Stroke incidence is higher in valve than Coronary artery surgery and increased in mixed surgery. Preoperative stroke causes by multiple cardiac pathology. IE, Myxoma, LA masses are main causes for preoperative stroke primary due to its higher potential for thromboembolic showering while, aortic valve atherosclerosis and atheroma of ascending aorta are the main postoperative. Post-operative stroke may be early within 30 days or late more than 30 days (Gaudino et al., 2019). "Does preoperative stroke increase post-operative incidence of stroke, does the surgery timing after stroke is burden on post-operative stroke?" a question not answered by guidelines or surgeons and still debated.

We documented, IE as the main cause of preoperative stroke in 27 cases and CAD second commonest cause. Majority of preoperative stroke was Ischemic in 53 patients while 9 only hemorrhagic and TIAs in 6 patients. AF 19 patients, Carotid artery stenosis in 9 patients are potential causes for preoperative stroke. Intra cardiac masses are another potential for preoperative stroke, Left atrial thrombus, Myxoma and papillary fibroelastoma. These primary tumors had higher potential for showering and its initial diagnosis secondary to cerebrovascular attack.

Most of our patients done in chronic stage after 6 weeks from stroke event (83.8%) of our sample size patients while (11.8%) done in the acute stage. We have four patients with stroke postoperative. Three in patients operated in acute stage and one in chronic stages. One case post CABG operated urgent with LICA stenosis, second patient post Urgent intervention with huge endocarditis mass continuous showering to brain and body, third patient post elective CABG with stroke year ago, and 4th patient post Aortic dissection, patient stroke on spot so urgent surgery intervention.

In a study of Piper et al., (2001), they concluded that surgery is attainable and safe within 72 hours of ischemic stroke secondary to endocarditis provided low risk of secondary cerebellar hemorrhage. Same Yoshioka et al., (2014) documented low risk of postoperative neurological deterioration as a result of hemorrhagic lesions exacerbations, even in patients with IE who underwent valve surgery in 2 weeks of ICH onset. Morita et al., (2015), concluded that surgery was attainable and safe in patient with preoperative ischemic stroke secondary to endocarditis and early intervention is recommended. Contrary Okita et al., (2016) and colleagues in Japanese multicenter study sated that early surgery for endocarditis is recommended but when IE with cerebral complications early surgical interventions should be avoided.

Tam et al., (2018) recommend delaying surgery in patients who suffered from cerebral complications preoperative to avoid post-operative cerebral complications exacerbations for ischemic stroke recommend two weeks and for hemorrhagic stroke 4weeks. We have one case of re exploration in AD patient. Mean ICU and hospital stay was comparable to other studies. Post-operative stroke, early cases related to the type of surgery Aortic surgery and other risk factors deep circulatory arrest, bleeding and transfusion rather than preoperative stroke and our study show stroke mainly in non-IE patients.

Limitations of the study

Being retrospective, single center, need more patients and more time. We recommend extend the sample and follow up for further analysis and outcome.

5. CONCLUSION

Preoperative stroke does not burden the post-operative stroke incidence and surgery timing should be decided for each patient. Early surgery recommended when patient clinically deteriorated and outcome is negatively biasing.

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Author Contributions

Dr Ehab Kasem writing the manuscript, collecting data of the patients and do the study design

Ethical approval

The study was approved by the research ethical committee of Faculty of Medicine, Zagazig University (IRB no 9030 Oct 2021).

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Conflict of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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