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Post Operative Cognitive Dysfunction After Cardiac Surgeries - An Institutional Study

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Abstract: ***Background: Post Operative Cognitive Dysfunction (POCD) is a less known but serious complication after any major surgery especially after open cardiac surgeries. Cognitive decline after major surgeries can be transient. But the impact of POCD in the post operative recovery is troublesome which makes it a topic of interest. POCD can range from impaired memory, attention, learning, executive function to impairment of psychomotor dexterity. It can also be accompanied by behavioural changes. POCD by definition requires both pre- and postoperative psychometric tests. Though there are several studies on POCD worldwide, a reliable test has not been identified to diagnose POCD. Aim: The aim of this study is to establish the incidence of POCD and devise a reliable methodical test to diagnose POCD with available resources at Dept of Cardiothoracic Surgery, Govt Stanley medical college hospital. Settings and Design: Department of cardio thoracic surgery, retrospective study Methods and Material: Inclusion Criteria: All patients who underwent elective open cardiac surgeries in department of CTS in Stanley medical college Exclusion Criteria: 1. All patients who had previous cognitive disorders 2. Patients with psychiatric illnesses 3. Patients with preexisting cerebral dysfunction, pulmonary, renal insufficiency SAMPLE SIZE : 100 PATIENTS DURATION : Cases operated from 2020 to 2023 Statistical analysis used: SAS Results: 1.Incidence of POCD is 46% at the time of discharge, 29% at six weeks and 18% at six months after surgery 2.Montreal cognitive Assessment (MoCA) as a preoperative screening test and Wisconsin Card Sorting Test (WCST) as a post operative confirmatory test are reliable tests in our setup 3.Incidence of POCD is higher with CABG ON PUMP, followed by other open cardiac cases such as valvular replacements especially ones involving aortic valves. Conclusions: POCD is a serious complication of cardiac surgery. The incidence of POCD is the highest at the time of discharge which gradually decreases over the period of time. MoCA and WCST are useful tests for cognition where in the patients are subjected to simple methods of cognitive functional analysis.***

Keywords: open heart surgery, POCD, Cognition, MoCA, WCST

1. Introduction

Open cardiac surgeries are associated with significant decline in cognition of patients post operatively.

Post Operative Cognitive Dysfunction exhibits an iceberg phenomenon wherein only a subset of patients are symptomatic and thereby diagnosed clinically. Majority of them are left undiagnosed. POCD has been observed to be associated with mortality within one year after surgery, earlier retirement, early need for financial and psychological assistance and so on. This study aims at learning the incidence of POCD in our department and establishing a standard tool for its assessment with available resources. Cardiac surgeries are one of the highly skilful and demanding ones of all. Since open cardiac surgeries have high chances of compromising the cerebral blood flow and require longer duration of general anaesthesia, there is a significant fraction of patients who develop psychological and neurological disturbances especially during early post-op period. One of the most common yet less explored entity is Post Operative Cognitive Dysfunction. POCD is a dreaded complication of all major surgeries especially open cardiac surgeries. POCD has been documented as early as 1955 by Bedford. It is a well-defined clinical phenomenon of multifactorial origin. It can be defined as a decline in cognitive function that may last from 1-12 months after surgery or longer. POCD can be subclassified into short term and long term POCD. Short term POCD is defined as decline in cognitive function which lasts up to 6 weeks after surgery, whereas long term POCD lasts up to 6 months after surgery. However, the causes and risk factors of POCD are less understood and studied.

The risk factors can be

- Advancing age
- Preoperative Mild Cognitive Impairment
- Cerebral, cardiac or vascular insufficiency
- Low educational status
- Alcohol abuse
- Longer duration of surgery
- Intraoperative or postoperative surgical and anaesthesiological complications • Secondary surgery
- Long-acting anaesthetics

Most important of all these is advancing age. The trend of incidence of POCD appears to increase with advancing age. increases many folds with older patients with history of alcohol abuse. Mild cognitive impairment can be a transient in between normal and impaired mental status. It is usually unrecognised and many of the cognitive tests are able to pick it up preoperatively. Longer duration of surgery means longer duration of general anaesthesia specially in cardiac surgeries. Longer duration of GA can significantly cause cerebral hypoxia which can produce cognitive impairment postoperatively.

Pathogenesis of POCD is not well understood, but the possible mechanisms could be inflammatory cascades involving NF-kB signalling leading to release of cytokines impairing the BBB. Long-acting anaesthetics also seem to increase the incidence of POCD but nothing is clinically

proven. Hypoperfusion, emboli and inflammation due to use of CPB in cardiac surgeries have association with POCD. Worldwide incidence of POCD after cardiac surgery in the literature is 53% at the time of discharge, 36% after six weeks and 24% after six months postoperatively. POCD by definition needs both preoperative and postoperative evaluation of cognitive status in patients. Various psychometric tests are available for evaluating the cognition level of subjects. Some of them are

- Montreal Cognitive Assessment
- Wisconsin card sorting test
- The Rey Auditory Verbal Learning test
- The Trail Making Test
- The Grooved Pegboard Test
- The Digit Span Test
- Stroop test
- The paper and pencil Memory test
- Letter and Number Replacement Test
- Four-Field test
- Erzigkeit's Short Cognitive Performance Test
- Mini Mental Status Examination

Though there are innumerable tests available to assess POCD no definite test has been proven to be efficacious and reliable.

2. Materials and Methods

This is a Retrospective study consisting of 100 patients who underwent cardiac surgeries and were evaluated for Cognitive dysfunction both pre and post operatively. Montreal Cognitive Assessment (MoCA) is used as a screening test for preoperative assessment of cognition. While Wisconsin Card Sorting Test (WCST) along with

MoCA is used as a confirmatory test to assess post operative

Cognition status. More than one standard deviation (1SD) in decline of cognitive function between preoperative and post operative scores is considered significant.

Inclusion Criteria

All patients who underwent elective open cardiac surgeries in department of CTS in Stanley medical college

Exclusion Criteria

1) All patients who had previous cognitive disorders
2) Patients with psychiatric illnesses
3) Patients with pre existing cerebral, pulmonary, renal insufficiency
4) Patients who have not studied beyond 7th grade

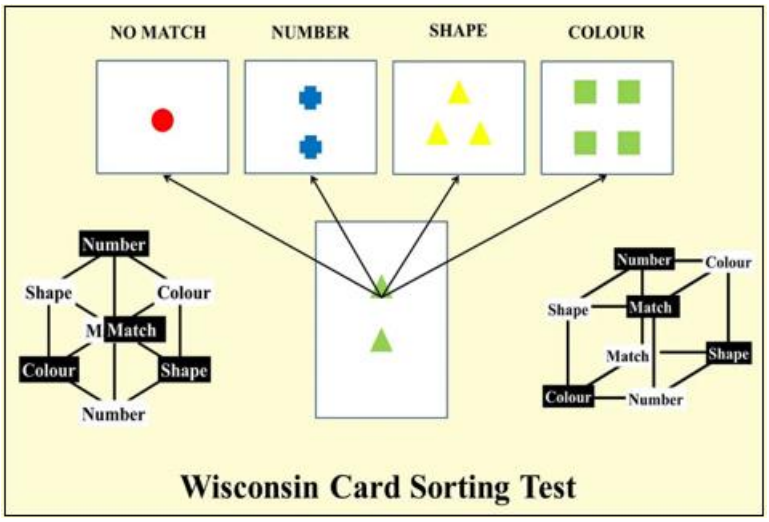
Sample Size: 100 Patients

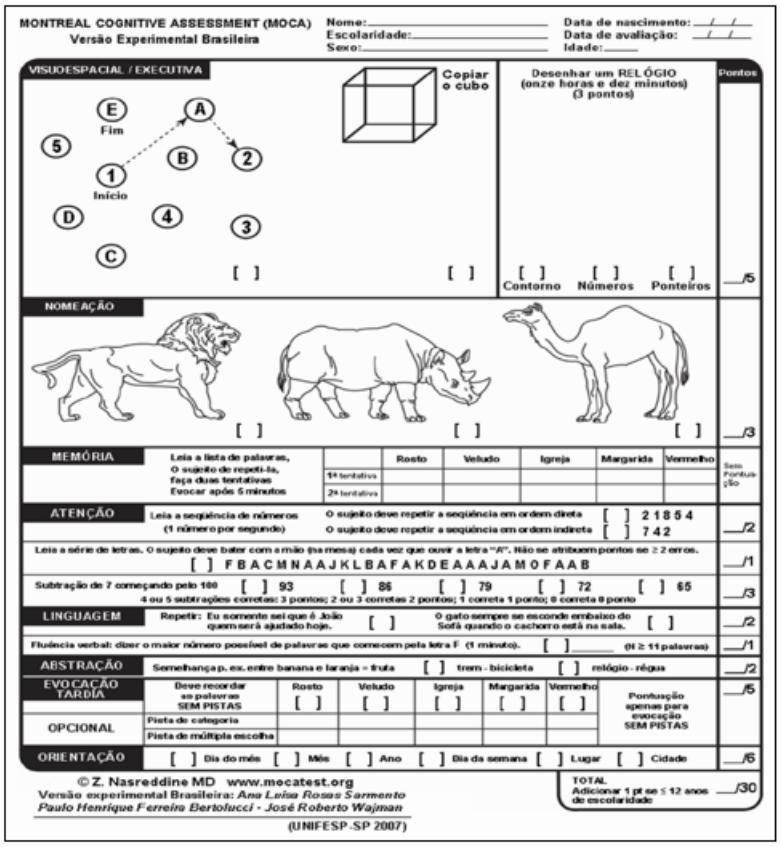
Duration: Cases operated from 2020 to 2023

3. Methodology

1) A total of 100 consecutive patients undergoing open-heart surgery at Stanley medical college is included in this retrospective, randomized study.
2) It includes patients underwent coronary artery bypass grafting, valve replacement or plasty, various other procedures.
3) Patients over 16 years undergoing elective cardiac surgery with or without cardiopulmonary bypass (CPB) were included in the study.
4) The exclusion criteria is as mentioned above.
5) Pre operative cognitive functional score is recorded using Montreal Cognitive Assessment test.
6) In case of CABG surgery was assisted by a CPB device always
7) All patients are subjected to Montreal Cognitive Assessment and Wisconin Card Scoring Test (confirmatory) post operatively at 3 days, 6 weeks and 6months after surgery.
8) Scores are tabulated and a difference of ISD in preop and post op score is considered significant.

4. Results





This retrospective study was done in patients admitted in department of cardiothoracic surgery, Stanley medical college.

Table 1: Age Distribution

Age Group	Total number of patients in the age group	At time	Incidence of POCD the of discharge	
			At 6 weeks	At 6 months
<20	10	20% (2)	0	0
21-30	13	38.5% (5)	15.3% (2)	7.6% (1)
31-40	13	61.5% (8)	23% (3)	15.3% (2)
41-50	24	45.8% (11)	25% (6)	16.6% (4)
51-60	21	57.1% (12)	28.5% (6)	19% (4)
61-70	17	52.9% (9)	35.2% (6)	17.6% (3)
>71	12	75% (9)	50% (6)	33.3% (4)
Overall	100	46%	29%	18%

Table 2: Type of Open-Heart Surgery Done

Type of Surgery	Number of Patients	Incidence of POCD at Discharge
CABG	34	52.9% (18)
Mitral valve replacement	47	44.6% (21)
Aortic valve replacement	4	50% (2)
Double valve replacement	7	42.8% (3)
Surgery for congenital heart disease	8	25% (2)
Overall	100	46%

5. Discussion

This study describes the demography of POCD among the open cardiac patients operated in the Department of Cardiothoracic surgery at Stanley Medical College, Chennai. POCD is one of the most common complications of Cardiac surgeries which is quite evident from the results of this study. From the results, it is obvious that the incidence of POCD increases with advancing age and prevails for a long term after surgery. This can be attributed to the atherosclerotic changes which are common in old age. The incidence of POCD in younger patients is comparatively lesser and is transient. Younger patients are seen to improve over a period of time and are disease free for longer time. Patient with history of alcohol abuse or mere usage have increased incidence of POCD and subsequent complications. Since the patients crowd in Stanley Medical college belongs to low socioeconomic status MoCA and WCST prove to be simple and more efficacious in assessing the Cognitive function of this particular subset of patient population. There were 8 deaths in the study group ranging between immediate postop period and 1 year after surgery due to various reasons. But a significant fraction of older patients with POCD dying within a year of surgery cannot be overlooked. Though this study gives a detailed picture of POCD in a subset of population in this part of the country, there is clearly a need of a large scale, multicentric and more comprehensive study to delineate the causes, characteristic and outcomes of POCD.

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