

Revisiting Delirium: An Important Aspect of Postoperative Care for Cardiac Surgeons

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Abstract

As cardiac surgeons (both qualified and in training), caring for post cardiac surgery patients in the ICU, we tend to focus primarily on the surgical outcomes of our surgery. Out of the many aspects of recovery, delirium is often not dealt with or understood intensively. While most of the patients recover without much short term noticeable effects, some have long lasting effects. A thorough understanding as well as early identification of this condition can improve long term outcomes as well as hospitalization costs. While there is extensive literature on this, further research is needed in predicting, identifying and treating delirium after cardiac surgery. Moreover, awareness of this situation in the early recovery phase of cardiac surgical patients can aid in the expedient recovery and hospitalization costs.

Keywords: Delirium; Cardiac Surgery; Long Term Outcome; Hospitalization Cost.

Introduction

Background

Neuropsychiatric complications following cardiac surgery are not unknown, however they continue to remain a perplexing issue with a multifactorial etiology. Delirium is a neuropsychiatric syndrome and was recognized early on in cardiac surgery with the advent of cardiopulmonary bypass and was described as post cardiectomy delirium [1]. Delirium is diagnosed and defined utilizing the criteria set out in the fifth edition of the manual of mental disorders (American Psychiatric Association) [2].

Clinically delirium can be picked up by a wide variety of features which may include all or some of the following findings of altered levels of attention, disordered cognition, altered level of consciousness and a varying onset of clinical course. It can be of mixed, hyperactive or hypoactive varieties, the latter being the most common type associated with cardiac surgery [3].

Inouye [4] showed that delirium was associated with adverse post operative events including increased mortality and also multiplied the risk of

post operative complications many fold. Adverse one-year functional status and a cognitive decline (almost equivalent to that seen in patients of Alzheimer's disease) was also seen in patients suffering from post operative delirium [5,6].

Literature shows that more than half of patients over the age of sixty years develop some kind of post operative delirium [7] and this is important from the point of view that this patient population is now slowly increasing in age as far as cardiac surgery is concerned. Thus from the cardiac surgeons' perspective it is important to prevent and recognize this problem in the ICU setting well in time hence forming an important part of a post-operative cardiac surgical care

Review

Etiology

The exact underlying physiological and pharmacodynamic mechanisms leading to delirium are not fully understood. Some well known causes include neuroinflammation, electrolyte imbalances, metabolic disorders, genetic factors as well as post operative hemodynamic changes common

in patients undergoing cardiac surgery. As far as neuroinflammation is concerned, brain injury mediated by an inflammatory response (involving chemokines, cytokines, etc) to cardiopulmonary bypass is a well established cause of delirium with ongoing research into many more specific biomarkers [8-11].

Risks and patient characteristics

Neurological and functional status: -it is hard to predict preoperatively from a neurological point of view as to which patient may develop post operative delirium. However, a previous history of prior stroke, transient ischemic attack, depression and impaired preoperative cognition (which is the most common independent risk factor according to many studies) are useful identifiable risk factors which are commonly implicated in the development of delirium post operatively [7]. Thus preoperative screening for these risk factors is useful in assessing the risk and also to form a baseline to start with. There are several standardized tests available to accomplish this. Another independent risk factor for delirium is functional status before surgery [12]. Thus, people with a marginal prior functional and neurological state would obviously be at a higher risk for development of delirium after cardiac surgery and thus assessment of the above provides stratification for risk of developing delirium and can prepare the post operative care of the patient (including surgeons) and better equip them to deal with this condition.

Laboratory tests

Abnormal preoperative hematological and biochemical parameters often are associated with underlying disease and propensity to develop delirium. As an example delirium was associated with blood urea nitrogen to creatinine ratio of greater than eighteen [13]. Thus, routine assessment of preoperative laboratory values which is generally always done before cardiac surgeries should never be missed.

Cognitive impairment and Depression: Most elderly patients have some form or the other of cognitive and fine motor impairment in the general population. Often some degree of impairment of cognition is missed or not recognized. So is the case with a history of pre-operative depression, particularly in elderly patients. These factors contribute to post-operative delirium according to many studies[14-17].

Medications and alcohol: - Drug abuse, alcoholism and neuropsychiatric medication intake before

surgery increases the risk of developing post-operative delirium. Thus, a careful review of a patient past medicine and drug intake is important in identifying any risks associated [18]. It may not be necessary for them to be heavily drinking at the time of admission for cardiac surgery.

Perioperative and postoperative factors: - inhalational anesthesia, pre-anesthetics and other intra operative agents exhibit cognitive properties as well as effect neuroelectrical transmission leading to cellular brain damage [19-20]. Although a seemingly better option, the use of local/regional anesthesia doesn't appear to decrease the chances of post operative delirium [21]. It is prudent to use analgesic medications in high risk patients with caution as many analgesics like opioids, meperidine, etc increase the chances of developing delirium particularly in high risk patients. Intraoperative factors like prolongation of aortic cross clamp time and the occurrence of atrial fibrillation have also been shown to be a risk factor for delirium according to Andrejaitene et al. [22].

Regarding post-operative care, all cardiac surgical cases are transferred imperatively to the intensive care unit which are always busy, noisy, bright lighted and a place where many things are happening at one time where patients are monitored and assessed continuously. Deprivation of sleep and unfamiliar continuous stimulant factors can lead to delirium according to recent literature [23]. Fast tracking patient transfer to step down /wards may prevent these factors from contributing to delirium.

Management

Identifying and early correction of any causative factors: -

Prevention is always better than cure and hence the first part of the management of delirium is early recognition and treating or eliminating the predisposing causes. A thorough focused history and examination stressing on neurological determinants and findings should be included in addition to a relevant panel of blood tests which should include a basic metabolic panel. It should be kept in mind that in the immediate post-operative period, patients may not be neurologically alert due to the influence of intra-operative anesthetics. The patients' previous medication charts should also be reviewed to eliminate any potential medications leading to delirium. Since delirium is multifactorial in origin, continuous review of findings should be maintained even when some factor has been ruled out. Blood investigations should be done aiming

at correction of any abnormalities. Physiotherapy services should be engaged early on and targeted at early mobilization, reorientation, effective communication and maintaining a healthy sleep cycle. These non-pharmacological methods are in fact considered the first choice of prevention of delirium [24].

Radiology

Brain imaging with computed tomography after cardiac surgery, aimed at diagnosing and treating delirium is of doubtful value, provided there are no neurological deficits. Early post-operatively after cardiopulmonary bypass the chances of tiny micro emboli being seen in computed tomography scans or even in magnetic resonance imaging is high. These micro emboli may not be necessarily associated with delirium. And hence, even with the availability of high end imaging, the value is not of proven value in the diagnosis of delirium [25].

Management of post-operative agitation

1. Prevention of pain and agitation associated with pain along with reassurance and early mobility.
2. Prevention of full bladder and bowel and the distress associated with these aids in the prevention of the risk factors cumulating in the development of delirium.
3. When pharmacological interventions are warranted then drugs like haloperidol, fentanyl and dexmedetomidine (which is a selective α -2 receptor agonist which provides sedation plus analgesia) can be used. Dexmedetomidine showed a reduction in the incidence of delirium compared to conventional antipsychotics [26]. Historically, steroids are used quite often in delirium probably due to the thought that they may prevent inflammatory brain injury, however this has not been conclusively proven (for example in dexamethasone) [27]. According to literature, usage of antipsychotics, dexmedetomidine and multicomponent intervention should be served to the patient developing delirium. [28].

Long term effects

Although still intensively studied, long term effects of delirium show that some patients have effects equal to moderate traumatic brain injury or mild Alzheimer's disease [8]. Long term

development of depressive disorder has also been shown in some studies [29] these factors alone or in combination may severely affect the quality of life on a long term [30].

Conclusion

Delirium is a known post surgical complication increased morbidity, mortality, resource utilization and ultimately increased costs of hospitalization. Several risk factors have been implicated and so have the roles of some promising biomarkers. Many of these factors may not be able to be changed. They also may not be able to be completely avoided. However, there are many management strategies for delirium with many risk factors amenable to modification and elimination. Repeated post-operative evaluation on the part of cardiac surgeons leads to timely intervention before the onset of this disorder.

References

1. Blachy PH, Starr A. Post-cardiotomy delirium. *A J Psychiatry*. 1964;121:371-5. [PubMed].
2. Association AP. *Diagnostic and Statistical Manual of Mental Disorders*. 5th Edition: DSM-5. American Psychiatric Publishing; 2013. 5th ed.
3. McPherson JA, Wagner CE, Boehm LM, et al. Delirium in the cardiovascular ICU. *Crit Care Med*. 2013;41(2):405-13.
4. Inouye SK. Delirium in older persons. *N Engl J Med*. 2006;354(11):1157-65.
5. Saczynski JS et al. Cognitive trajectories after postoperative delirium. *N Engl J Med*. 2012;367(1):30-9.
6. Pandharipande PP, Girard TD, Jackson JC, et al. Long-Term Cognitive Impairment after Critical Illness. *N Engl J Med*. 2013;369(14):1306-16. [PubMed].
7. Rudolph JL et al. Derivation and validation of a preoperative prediction rule for delirium after cardiac surgery. *Circulation*. 2009;119(2):229-36.
8. Rudolph JL et al. Chemokines are associated with delirium after cardiac surgery. *J Gerontol A BiolSci Med Sci*. 2008;63(2):184-9.
9. Caplan JP, Chang G. Refeeding syndrome as an iatrogenic cause of delirium: a retrospective pilot study. *Psychosomatics*. 2010;51(5):419-24. [PubMed].
10. Adamis D, van Munster BC, Macdonald AJ. The genetics of delirium. *Int Rev Psychiatry*. 2009;21(1):20-9. [PubMed].

11. Siepe M, Pfeiffer T, Gieringer A, et al. Increased systemic perfusion pressure during cardiopulmonary bypass is associated with less early postoperative cognitive dysfunction and delirium. *Eur J Cardiothorac Surg*. 2011;40(1):200-7. [PubMed].
 12. Marcantonio ER, Goldman L, Mangione CM, Ludwig LE, Muraca B, Haslauer CM, Donaldson MC, Whittlemore AD, Sugarbaker DJ, Poss R, Haas S, Cook EF, Orav EJ, Lee TH. A clinical prediction rule for delirium after elective noncardiac surgery. *JAMA*. 1994;271:134-9. [PubMed].
 13. Inouye SK, Viscoli CM, Horwitz RI, Hurst LD, Tinetti ME. A predictive model for delirium in hospitalized elderly medical patients based on admission characteristics. *Ann Intern Med*. 1993;19:474-81. [PubMed].
 14. Greene NH, Attix DK, Weldon BC, Smith PJ, McDonagh DL, Monk TG. Measures of executive function and depression identify patients at risk for postoperative delirium. *Anesthesiology*. 2009;110:788-95. [PMC free article] [PubMed].
 15. Smith PJ, Attix DK, Weldon BC, Greene NH, Monk TG. Executive function and depression as independent risk factors for postoperative delirium. *Anesthesiology*. 2009;110:781-7. [PMC free article] [PubMed].
 16. Kazmierski J, Kowman M, Banach M, Pawelczyk T, Okonski P, Iwaszkiewicz A, Zaslonka J, Sobow T, Kloszewska I. Preoperative predictors of delirium after cardiac surgery: a preliminary study. *Gen Hosp Psychiatry*. 2006;28:536-8. [PubMed].
 17. Kazmierski J, Kowman M, Banach M, Fendler W, Okonski P, Banys A, Jaszewski R, Rysz J, Mikhailidis DP, Sobow T, Kloszewska I. Incidence and predictors of delirium after cardiac surgery: Results from The IPDACS Study. *J Psychosom Res*. 2010;69:179-85. [PubMed].
 18. Tse L et al. Pharmacological risk factors for delirium after cardiac surgery: a review. *CurrNeuropharmacol*. 2012;10(3):181-96.
 19. Brown EN, Lydic R, Schiff ND. General anesthesia, sleep, and coma. *N Engl J Med*. 2010;363:2638-50. [PMC free article] [PubMed].
 20. Xie Z, Dong Y, Maeda U, Moir R, Inouye SK, Culley DJ, Crosby G, Tanzi RE. Isoflurane-induced apoptosis: a potential pathogenic link between delirium and dementia. *J Gerontol A BiolSci Med Sci*. 2006;61:1300-6. [PubMed]
 21. Bryson GL, Wyand A. Evidence-based clinical update: general anesthesia and the risk of delirium and postoperative cognitive dysfunction. *Can J Anaesth*. 2006;53:669-77. [PubMed].
 22. Andrejaitiene, E Sirvinskas E. Early post-cardiac surgery delirium risk factors. *Perfusion*. 2011;27(2) 105-112.
 23. Osse RJ, Tulen JH, Bogers AJ, Hengeveld MW. Disturbed circadian motor activity patterns in postcardiotomy delirium. *Psychiatry ClinNeurosci*. 2009;63:56-64. [PubMed].
 24. Young J et al. Diagnosis, prevention, and management of delirium: summary of NICE guidance. *BMJ*. 2010;341:c3704.
 25. Martin KK, Wigginton JB, Babikian VL, Pochay VE, Crittenden MD, Rudolph JL. Intraoperative cerebral high-intensity transient signals and postoperative cognitive function: a systematic review. *Am J Surg*. 2009;197:55-63. [PubMed].
 26. Park JB et al. Efficacy and safety of dexmedetomidine for postoperative delirium in adult cardiac surgery on cardiopulmonary bypass. *Korean J ThoracCardiovasc Surg*. 2014;47(3):249-54.
 27. Sauer AM et al. Intraoperative dexamethasone and delirium after cardiac surgery: a randomized clinical trial. *AnesthAnalg*. 2014;119(5):1046-52.
 28. Zhang H et al. Strategies for prevention of postoperative delirium: a systematic review and meta-analysis of randomized trials. *Crit Care*. 2013;17(2):R47.
 29. Smith PJ, Attix DK, Weldon BC, Greene NH, Monk TG. Executive function and depression as independent risk factors for postoperative delirium. *Anesthesiology*. 2009;110:781-7. [PubMed].
 30. Koster S, Hensens AG, Schuurmans MJ, van der Palen J. Consequences of delirium after cardiac operations. *Ann Thor Surg*. 2012;93(3):705-11. [PubMed].
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