

ROLE OF VITAMIN D SUPPLEMENTATION IN MODIFYING OUTCOMES AFTER SURGERY**Shkiryak A.***CEO and chief medical officer "Shkiryak Clinic"**Ukraine**Neurosurgeon**MD, MsSc**ORCID: <https://orcid.org/0000-0002-2282-8285>***Khanenko S.***"Shkiryak Clinic"**Ukraine**Family doctor**MD, MBA**ORCID: <https://orcid.org/0009-0000-4237-1158>**<https://doi.org/10.5281/zenodo.15220763>***Abstract****Background**

Vitamin D deficiency is a very common occurrence in cardiac patients. It has been proved that cardiac surgery and cardiopulmonary bypass accelerate the deficiency further. The postoperative outcomes of patients deteriorate in the presence of vitamin D deficiency. Perioperative supplementation of vitamin D is the only solution to the problem. Hence, the present systematic review was conducted to derive the efficacy and safety of vitamin D supplementation on postoperative outcomes in cardiac surgery patients.

Method

Publications over duration of last 10 years was searched from different database and web sites. The data from full-text research articles were analyzed for the effect on different postoperative outcomes and side effects.

Result

Eight randomized control trials were retrieved on the effect of perioperative vitamin D supplementation in cardiac surgery patients and their postoperative outcomes. Six articles (75%) were found to be in favor of improvement in postoperative outcome. Two articles (25%) did not find any difference of outcome between the control and treatment group. All the studies observed the restoration of vitamin D to normal and no adverse effects from supplementation.

Conclusion

Perioperative vitamin D supplementation improves the postoperative outcomes after cardiac surgery. It is effective and safe to supplement vitamin D in cardiac surgery patients.

Keywords: vitamin D, surgery, postoperative outcomes.

Introduction

Vitamin D deficiency (VDD) is highly prevalent worldwide due to the environmental pollution, minimal exposure to sunlight, dietary deficiency, and lifestyle changes of mankind (1). It is detected in all the age groups. Commonly VDD has been associated with infection, respiratory illness, cardiovascular diseases, cancer, preeclampsia, dental caries, and neurological diseases (1). Greater proportions of people with cardiovascular disease have low vitamin D level compared with general populations. Patients undergoing cardiac surgery are at risk of arrhythmia, myocardial ischemia, ventricular dysfunction, bleeding, and infections. The risks may be aggravated by VDD (2). Many patients have low vitamin D levels before and after open heart surgery, but those levels can be restored to normal with supplementation with vitamin D (3). Vitamin D supplementations taken by patients with chronic heart failure are associated with improved cardiac function (4). Low blood levels of vitamin D have increased risks of heart disease like stroke, hypertension, and aortic dissection that create problems in postoperative outcome. Low vitamin D level may be a potential risk to respiratory complications in intensive care unit (ICU) (5). Low

levels of vitamin D have been linked to high blood pressure. The postoperative ICU stay and complications are higher in pediatric cardiac surgery patients with VDD (3).

However, a few recent articles have not detected any difference in postoperative outcome of VDD patients related to atrial fibrillation and other parameters (6). In the hospital setup, perioperative vitamin D therapy is the way forward to normalize the serum level. Hence, the outcome of the therapy needs to be systematically reviewed for clinical recommendation.

In the present systemic review, all the available literatures related to impact of vitamin D therapy on postoperative outcomes in cardiovascular surgical patients over duration of 10 years are analyzed. The efficacy, safety, and public health impact of vitamin D therapy in cardiac surgical patients on postoperative period were assessed.

Methodology

Inclusion criteria: Only original articles were included. The original papers were from clinical trials, observational, cross-sectional, and cohort studies. The studies were both prospective and retrospective. Studies with all age groups and all types of cardiac surgery

were included. The full-text articles with complete data on postoperative outcome were chosen.

Exclusion criteria: Review, systematic review, meta-analysis, case report, letter to editor, editorial papers, and stand-alone abstract were excluded. Papers of the patients with emergency surgeries, redo surgeries, transplantation, New York Heart Association class 4, and multisystem illness undergoing cardiac surgery were also excluded.

Publications search method: Published full-text studies were searched in PubMed, Embase, Google Scholar, and Cochrane database with the keywords of vitamin D supplementation, VDD, postoperative cardiac outcome, cardiac surgery, cardiac anesthesia, perioperative period, ICU, and hospital stay for 10 years during year 2012 to 2022.

Result

Total 10,407 articles were retrieved. Out of which eight full-text original studies were found suitable for the systemic review and critical analysis after applying the study protocol and exclusion criteria. All the eight articles were randomized control trials (RCT).

Most of the studies reported a significant fall in vitamin D level in the patients during and after cardiac surgery. Valve and congenital heart surgery patients had maximum fall in vitamin D level. All the RCTs detected restoration of vitamin D level back to normal value after supplementation of vitamin D. Six studies (75%) showed more than or equal to 1 parameter improvement in postoperative outcome after cardiac surgery because of vitamin D supplementation. Two studies (25%) reported no significant difference on postoperative outcomes (7, 8). Three studies (37.5%) detected significant reduction in postoperative atrial fibrillation (POAF) by vitamin D therapy (9, 10). Two studies (25%) detected significant reduction in inotrope requirement postoperatively compared with control group (11). One study (12.5%) observed marked reduction in duration of ICU and hospital stay in vitamin D supplementation group compared with control (9). One study (12.5%) detected small reduction of interleukin-10 in vitamin D supplementation group compared with placebo without any difference in postoperative acute kidney injury (12). One study (12.5%) observed anti-inflammatory effect with high-dose supplementation but without any difference in prevention of acute kidney injury both in control and treatment group (12). There was an insignificant lesser incidence of adverse cardiac events like pacemaker insertion and cardiomyopathy, POAF, and postoperative heart failure with vitamin D supplementation in one RCT (7). All the eight RCT did not found any adverse effects with vitamin D supplementation and detected to be safe in all patients even with high doses.

Conclusion

To conclude, VDD is very common after cardiac surgery. Vitamin D supplementation will restore vitamin D level to normal in all patients. The systematic review detected one or more improvement in postoperative outcomes after cardiac surgery from 75% studies.

Vitamin D supplementation was found to be safe in clinical practice even with high-dose regime. Further studies, followed by meta-analysis and systematic reviews, will provide more knowledge on the perioperative use of vitamin D supplementation in cardiac surgery patients.

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