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Commentary

Robotics in Cardiovascular Surgery

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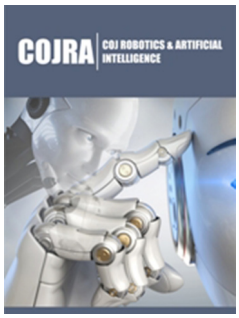
ISSN: 2832-4463



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Submission: May 24, 2021

Published: February 16, 2022

Volume 1 - Issue 5

How to cite this article: Sherin Saheera*, Robotics in Cardiovascular Surgery. COJ Rob Artificial Intel. 1(5). COJRA. 000521. 2022.
DOI: 10.31031/COJRA.2022.01.000521

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The surgery involved in cardiovascular diseases is technically challenging and is often performed in patients with co-morbidities. The sternotomy approach, a versatile incision in surgeries, includes longer incision, post-operative sternal precautions, longer hospitalizations, and recovery as the drawbacks. Hence it is imperative to implement minimally invasive surgeries to reduce such complications. The use of minimally invasive cardiac surgery was introduced in 1995 and the use of robotic systems gained popularity since then. The robotics is used mainly in single and double vessel Coronary Artery Bypass Graft (CABG), mitral valve replacement, resection of left atrial tumors, and atrial septal defects [1]. A growing number of surgeons are adopting robotic systems for assistance in cardiac surgeries. The use of robotic systems in cardiovascular surgeries has significantly reduced complications and mortality in patients compared with the patients undergoing non-robotic surgeries [2].

Following the first successful robotic-assisted surgery in CABG and its promising results have increased the use of minimally invasive techniques for coronary artery revascularization. Based on the studies by Society of Thoracic Surgeons Adult Cardiac Surgery Database, no significant difference was observed in mortality rate between robotic and non-robotic CABG [3]. Also, they found an increase in the number of patients undergoing robotically assisted CABG. Robotic assistance has been employed in arrested heart endoscopic coronary artery bypass surgery as well as in beating heart. The success and safety rates were 80% and 95% respectively [4]. A meta-analysis study reported a 30-day mortality rate of 0.3% in patients undergoing robotic CABG [5]. The study observed that adopting robotics in CABG does not induce adverse cardiac and cerebrovascular events. Other benefits include a low rate of wound infection and the need for re-intervention is reduced.

Robotically assisted MV replacement is far and widely employed, and national databases and studies have established the efficacy and feasibility of this procedure. For instance, a study performed in Cleveland clinic in patients undergoing robotic primary MV surgery observed a MV repair rate of 99.5%, the post-operative mortality rate was 0.1%, and the stroke rate was 1.4% [6]. Another study done in a large cohort in Atlanta with patients having greater comorbidity also observed similar observations like MV repair rate was 93%, other complications had a rate less than 1% and a significantly greater survival rate [7]. Figure 1 is the schematic representation of robotic cardiac surgery.

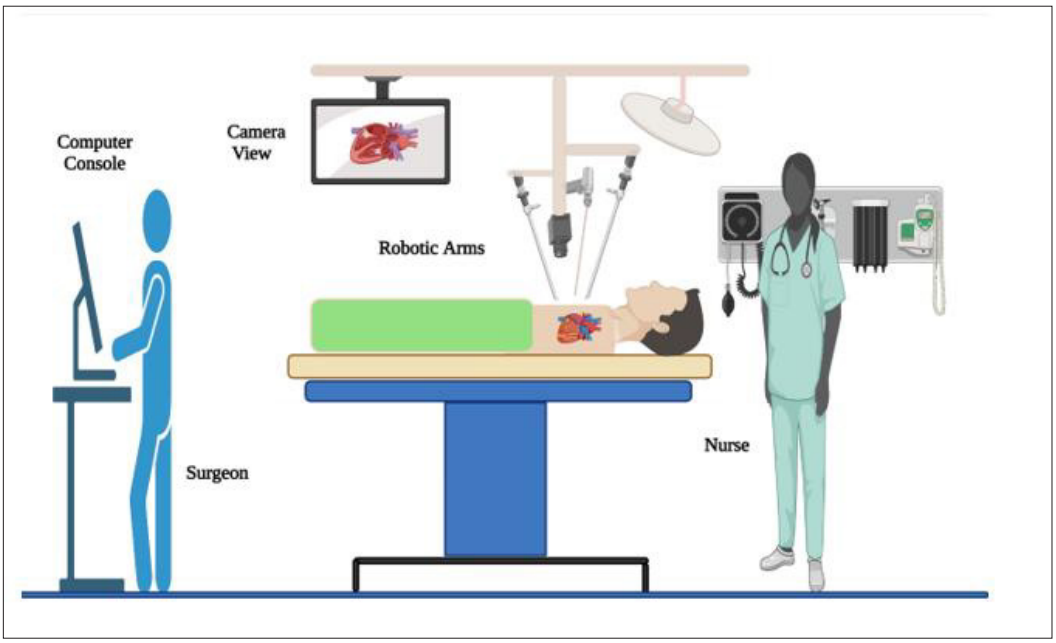

Figure 1: Robotic cardiac surgery.

The application of robotic-assisted surgeries for MV repair and CABG is associated with low mortality and morbidity. The benefits of using robotics have increased the use of this technology in cardiac surgery. Employing robotic surgery provides technical advantages–improves dexterity, avoids tremor and ambidexterity, high-definition imaging improves visualization. Though robotic technology is an exciting alternative to conventional surgery, it still requires proving its efficacy concerning short- and long-term outcomes using clinical trials. A minimally invasive approach utilizing robotic technology will be taking our medical fields forward.

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