Cardiothoracic Surgery Resident Perspective on Training in Robotic Cardiac Surgery Utilizing Simulation Team Approach

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Objective

Minimally Invasive (robot-assisted) cardiac surgery has evolved as a method to perform cardiac procedures without a median sternotomy. As patient interest in minimally invasive cardiac procedures become more prevalent, cardiothoracic surgery trainees benefit from earlier exposure to robot-assisted cardiac surgery.

Involvement of cardiothoracic surgery **trainees** in robotic modules and structured simulation platforms to complete steps of robotic cardiac surgery procedures and developing non-technical skills prior to performing live cases is crucial to learning and to ensure successful outcomes.

We aim to evaluate the role of a structured simulation platform with integrated robotic console modules in achieving competency in robotic cardiac surgery for cardiothoracic surgery trainees.

Methods

Robotic system representatives provided on-site training on the robotic console and bedside assisting for cardiothoracic surgery trainees. A robotic simulator console was available to complete all basic and advanced training modules. Trainees completed all standard basic and advanced robotic simulator console modules.

Subsequently, the residents were involved in team simulation cases using a surgical robot and thoracic cage model (**Fig 1**) and completed critical steps of robotic cardiac surgery procedures.

Following successful completion of simulation tasks, the residents graduated to live case tasks.

Results

Following completion of module training, robotic cardiac surgery specific tasks were completed in a collaborative team setting during **33 simulation cases** of robotic mitral valve repair/ annuloplasty including port placement, docking, instrument exchange, atriotomy, valvuloplasty, annuloplasty, and atriotomy closure. Duration of simulated valvuloplasty and annuloplasty are shown in **Fig 2**.

Upon completion of simulation cases, trainees participated in live cardiac surgery robotic cases (**Fig 3**) and were involved in bedside tasks including cannulation, thoracotomy, port placement, knot tying, and subsequently progressed to robotic console tasks.

Non-technical skills including team communication and leadership were also emphasized.

Conclusion

Completing standard robotic console modules and simulated robotic cardiac surgery specific tasks in a team setting improved the comfort and competency of cardiothoracic surgery residents in performing robotic cardiac surgery procedures prior to live cases. It enabled trainees to understand the disease process, anatomy, surgical technique, and develop non-technical skills as part of a collaborative team approach. Through the simulation and live case training, residents will also be able to obtain robotic equivalency certification at the completion of residency.

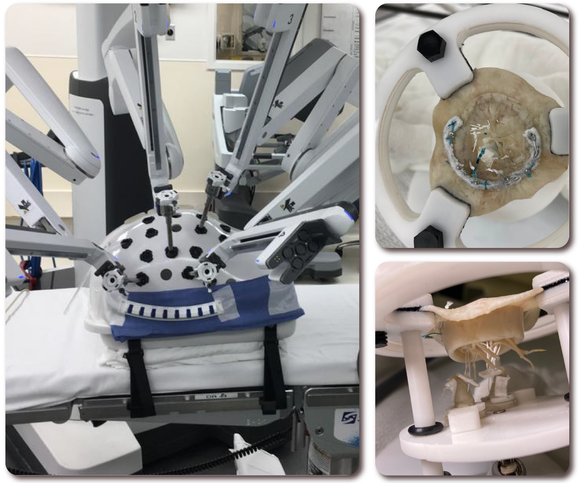
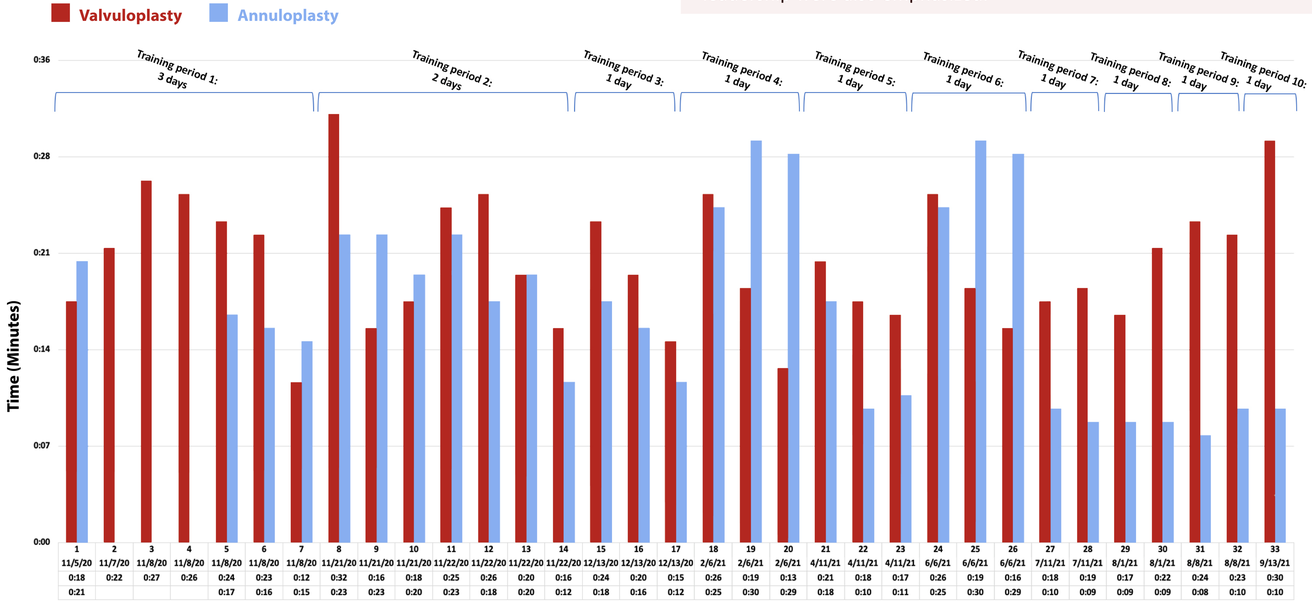


Figure 1. Simulation with Thoracic Cage Model; Mitral Valve Model



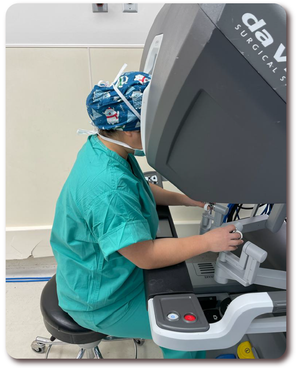
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Figure 2. Analysis of Simulated Key Procedural Steps (Valvuloplasty and Annuloplasty)

Over course of training, overall **decreased** times in:

- ❑ Docking
- ❑ Annuloplasty
- ❑ Valvuloplasty
- ❑ Atriotomy closure

As trainees became more confident/comfortable



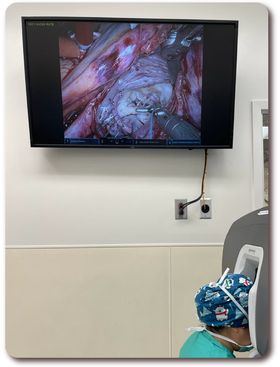


Figure 3. Trainee Participation in Live Robotic Cardiac Cases