

AUGMENTED REALITY IN MINIMALLY INVASIVE CARDIOTHORACIC SURGERY: EARLY EXPERIENCE IN EVH, VATS AND EMERGING APPLICATIONS IN MITRAL VALVE SURGERY

Victor Aguirre Gutierrez, Niveditha Yalamarthy, Alyssa Lu, Trevor Fayers, Homayoun Jalali.
The Prince Charles Hospital, Chermside, Australia

BACKGROUND

- AR technologies are rapidly emerging in surgery.
- Cardiothoracic-specific evidence remains minimal, particularly in EVH and minimally invasive cardiac procedures.
- Surgeons still rely on static monitors, causing ergonomic strain and workflow disruption.

THE GAP

IDEAL PERFORMANCE

Ergonomic, seamless, hands-free, integrated visualization

VS

ACTUAL PRACTICE

Head turning, poor posture, workflow disruption, monitor dependence

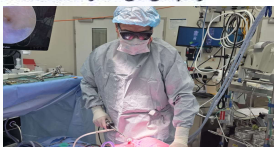
We aim to bridge this gap using AR glasses integrated into minimally invasive workflows.

PURPOSE

- Develop a proof-of-concept AR wireless system for cardiothoracic operating rooms.
- Identify benefits in ergonomics, visualization, team communication and training.
- Document adverse events or complications.
- Provide locally relevant Australian data to guide future implementation and research.

CLINICAL APPLICATIONS – EARLY EXPERIENCE

- EVH (CABG)
- VATS (Thoracic)
- Minimally Invasive Mitral Valve Surgery
- Coronary Angiography



EVH (CABG) with AR Glasses



Coronary Angiography with AR Glasses

METHODS

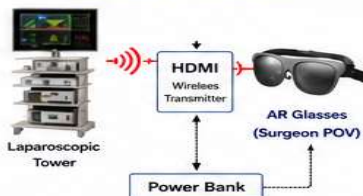
- Proof-of-concept AR wireless system used in >10 cardiothoracic and related procedures.
- Predominantly EVH for CABG, VATS for lung procedures and coronary angiography; early feasibility explored in MIMVS.
- Real-time imaging via wireless HDMI integration with laparoscopic towers.
- Data collected: setup time, ergonomic impact (subjective), image stability, workflow observations, team feedback, device-related complications.

TECHNOLOGY OVERVIEW

AR GLASSES



WIRELESS INTEGRATION



KEY FEATURES

- Hands-free
- >40% peripheral transparency
- Real-time image, vitals and auxiliary displays
- Rapid setup (2–3 minutes)

WORKFLOW INTEGRATION



- Wireless HDMI transmitter connected to laparoscopic tower (main or auxiliary output).

CONCLUSIONS

- AR glasses are a feasible and ergonomic adjunct in minimally invasive cardiothoracic surgery.
- Benefits include improved ergonomics, enhanced visualization, workflow efficiency and team communication.
- Early experience in EVH and VATS is encouraging, with the technology showing promise in MIMVS.
- The paucity of cardiothoracic-specific evidence highlights the need for focused clinical studies.
- Prospective studies evaluating objective ergonomic metrics and operative performance are underway.

RESULTS (EARLY EXPERIENCE)

MEAN TASK TIME REDUCTION

15–20%
vs baseline

SETUP TIME

2–3
minutes

CASES

>10
procedures

SAFETY

No device-related complications observed

ERGONOMIC IMPACT (SUBJECTIVE ASSESSMENT)

Neck Flexion / Extension

-65%

Head Rotation

-55%

Visual Continuity

+60%

Workflow Disruption

-45%

Team Communication

+50%

LITERATURE GAP – SYSTEMATIC REVIEW (CARDIOTHORACIC SURGERY)

SPECIALTY	AR LITERATURE (Relative Volume)	CARDIOTHORACIC FOCUS
Neurosurgery	●●●●●	High
Orthopaedics	●●●●●	Moderate
General Surgery	●●●●●	Moderate
Cardiothoracic Surgery	●	Minimal

A Video with the use of our application has been submitted to be presented during the meeting.

CONTACT

Dr Victor Aguirre Gutierrez
The Prince Charles Hospital
Chermside, QLD, Australia

✉ dravaguirre01@gmail.com

☎ +61 421 047 532

🌐 www.surgeonview.com.au

REFERENCES

1. Bajura M, Fuchs H, Okubo R. Merging virtual objects with the real world: seeing ultrasound imagery within the patient. SIGGRAPH Comput Graph. 1992;26(2):203–210.
2. Azuma R. A Survey of Augmented Reality. Presence: Teleoperators and Virtual Environments. 1997.
3. Denner C, Bauer DE, Scheibler AG, et al. Augmented reality in the operating room: a clinical feasibility study. BMC Musculoskelet Disord. 2021;22(1):451.
4. Dille J, Camara M, Omar I, et al. Evaluating the impact of image guidance in the surgical setting: a systematic review. Surg Endosc. 2019;33(9):2785–2793.
5. Lim AK, Ryu J, Yoon HM, Yang HC, Kim SK. Ergonomic effects of medical augmented reality glasses in video-assisted surgery. Surg Endosc. 2022;36(2):988–998.