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Transforming Surgical Education: Evaluating the Adoption and Effectiveness of Arthroscopic Anatomic Glenoid Reconstruction Technique Using Virtual Training Methods

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Disclosures

Dr. Makena Mbogori & Ms. Sarah Remedios: Nothing to disclose.

Dr. Ivan Wong discloses:

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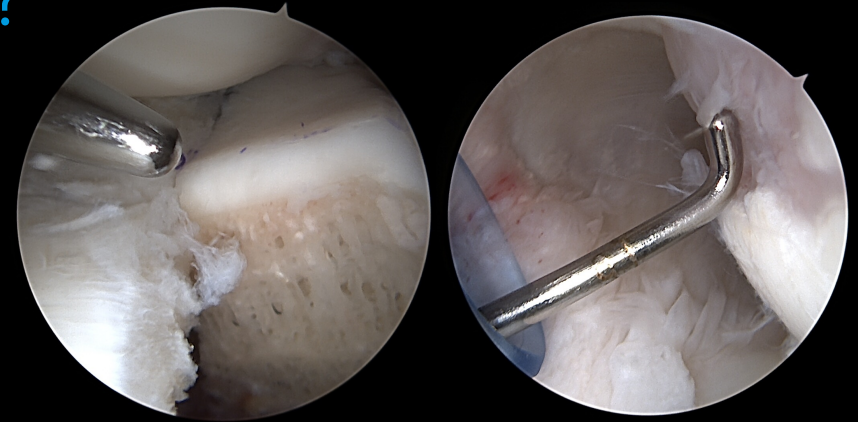
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Arthroscopic Anatomic Glenoid Reconstruction (AAGR) is a novel surgical technique

- Treats anterior shoulder instability using a distal tibial allograft¹
- Demonstrates an excellent safety profile and clinical outcomes with minimal complications^{2,3}

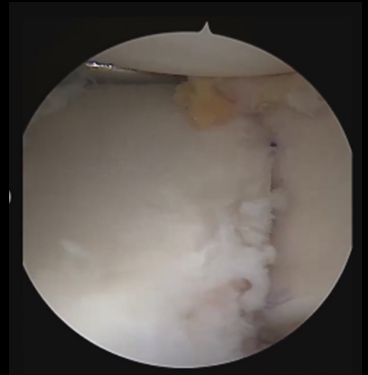
How can we **teach** this novel technique?

- Acquisition of new surgical skills involves:
 - Direct training in the operating room (OR)
 - Cadaveric surgical courses
 - Virtual or simulation training

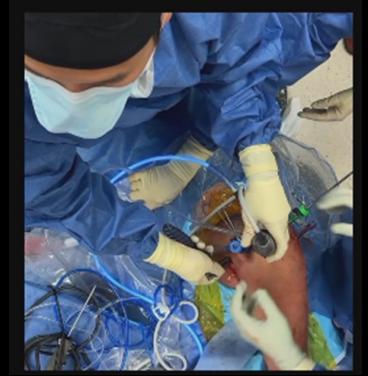


Telesurgery Mentorship

- Virtual Preceptorship
 - Distant surgeon engagement in OR and/or cadaveric lab
 - One-on-one, multiple camera views
 - Real-time visual and audio interactions
- Augmented reality (AR) and mixed reality (MR) interfaces incorporated for improved three-dimensional visualization
- Remote preceptorship of live surgical demonstration and remote cadaveric proctorship training for AAGR technique



INTRA-ARTICULAR VIEW



OVERHEAD VIEW



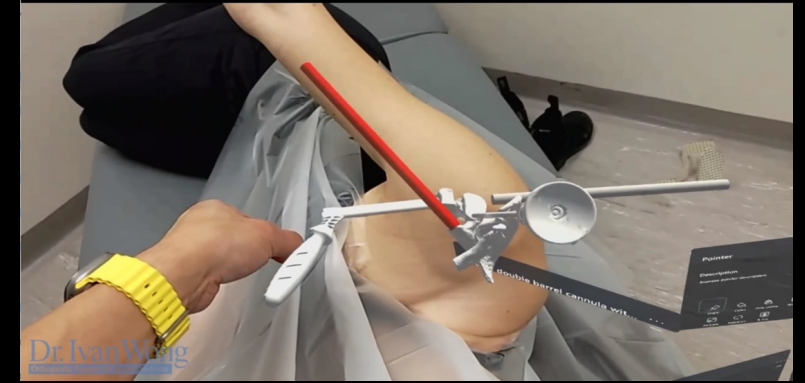
SIDE VIEW

Purpose

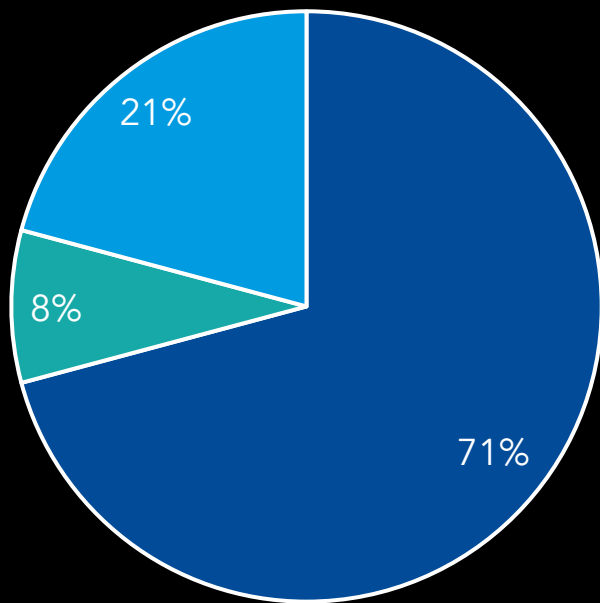
To evaluate the effectiveness of a virtual tele-mentoring training model for the adoption and utilization of the AAGR technique

Methodology

- **Participants:** Distance learners (arthroscopic shoulder surgeons) from any location
- **Interventions (Telesurgery Mentorship):**
 - Live Surgery Broadcast (Virtual Preceptorship)
 - and/or Cadaveric Lab Proctorship
- **Data Collection:** Post tele-mentoring questionnaire (one-year follow-up)
- **Outcomes:**
 - Adoption and utilization of AAGR within clinical practice
 - Change in comfort level and efficiency of key AAGR steps; complications
 - Barriers and facilitators to adoption of AAGR technique in clinical practice

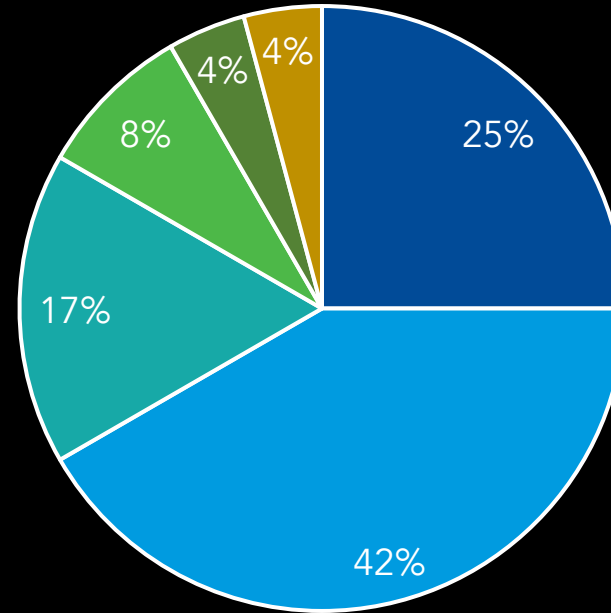


Participant Characteristics



Tele-Mentoring Learning Style

- Virtual Preceptorship (Broadcast) Only
- Virtual Proctorship (Lab) Only
- Virtual Preceptorship + Proctorship



Surgeon's Practice Type

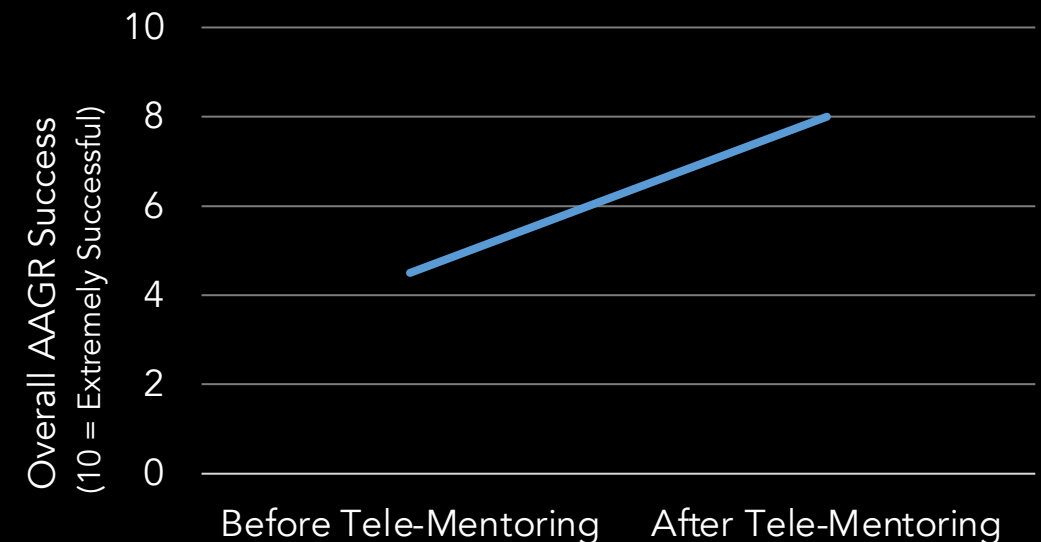
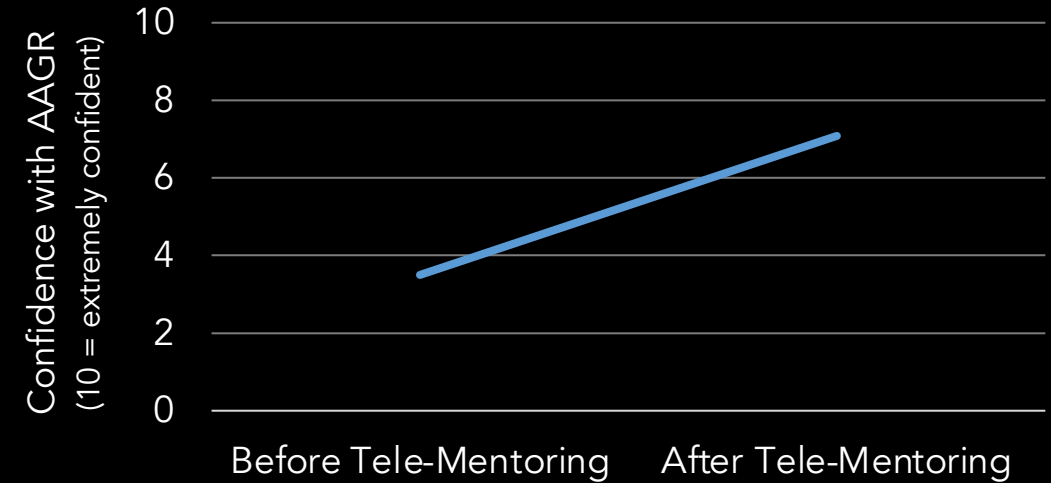
- Academic Centre
- Private Practice
- Community Hospital
- Community + Private
- Community + Academic
- Private + Academic

- On average, surgeons had 9.73 (SD=8.17) years of experience (range: 0 – 25 years)
- 92% of participants had not completed an AAGR case before tele-mentorship

Tele-mentorship increased AAGR confidence and success

Following tele-mentorship:

- **46%** of surgeons had implemented AAGR in practice
- **79%** of surgeons had not encountered any AAGR complications
- Complications included:
 - Graft malpositioning (7% of cases)
 - Nerve injury (3% of cases)
 - Shoulder stiffness (3% of cases)



What factors influenced AAGR uptake in practice?

Barrier (highest to lowest)	Average Barrier Contribution (1 = No Barrier; 5 = Extreme Barrier)	Facilitator (highest to lowest)	Average Facilitator Contribution (1 = Not a Facilitator; 5 = Extreme Facilitator)
Patient Indication	3.09	Industry Support	3.52
Procedure Cost	2.32	Additional Training	3.38
Training Availability	1.95	Patient Indication	3.00
Hospital Administration	1.67	Hospital Administration	1.95
Industry Support	1.57	Procedure Cost	1.75

- **Barriers** were most often patient- or surgery-level factors
- **Facilitators** were most often system-level factors

Virtual training is effective for AAGR

- Tele-mentoring effectively demonstrated the AAGR technique
 - Real-time interactive presence technology using AR is a safe, efficient, and effective teaching tool for arthroscopic surgery^{4,5}
- Nearly half of participants quickly incorporated AAGR into practice
 - Surgeons reported enhanced confidence and success with the AAGR technique
- Some complications persisted, particularly graft malpositioning
 - Low overall complication rate following AAGR³
 - Underscores the need for continued practice and technique refinement, and may align with previous AAGR learning curve data⁶

Conclusion



- Virtual preceptorship and/or lab proctorship successfully teach the AAGR technique, overcoming logistical challenges of in-person training
- Virtual training can play a key role in surgeon education worldwide
- **Strengths:** Wide geographic distribution (across North America) and level of experience across the included participants
- **Limitations:** Cross-sectional survey with a single follow-up time point; findings may be limited by response bias
- **Future Directions:** Efforts should aim to reduce procedural costs and address administrative barriers for broader adoption of AAGR

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