CLARIS: an AI-Driven Solution for Enhancing Visual Clarity and Reducing Smoke Obstruction in Minimally Invasive Surgery (MIS)

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Amy Lorincz, MSc[1],* Dicken S. C. Ko, MD, FRCSC[2], M. Carmen Mir, MD, PhD[3] , Timothée Bernard, MEng[1], Rachel Cohen, MEng[1], Usmaan Hameed, MD[4] , Sukesh Adiga, PhD[1]

1. Dept. of R&D, Vope Medical, 2. Dept. of Surgery, Warren Alpert Medical School, Brown University, 3. Dept. of Urology, Hospital Universitario La Ribera. 4. Dept. of Surg., North York Gen.

*Presenter: amy@vope.ai

Background

- Lens obstruction is common in MIS, leading to impaired visibility and interruptions in surgical workflow
- This results in frequent surgical pauses to clean the lens, impacting efficiency of the surgery
- To address this, we utilized CLARIS, an AI-powered software developed by Vope Medical, designed to enhance vision in real time during MIS

Methods

- 3 laparoscopic-cholecystectomy clips (1134 frames) were enhanced with CLARIS
- The mean of Dark Channel Prior (DCP) and Fog Aware Density Evaluator (FADE), standard metrics for quantifying fog/smoke, were calculated on the frame before and after CLARIS processing
- Mean DCP and FADE scores were compared to evaluate smoke removal effectiveness

Results

- The mean DCP score was 65.63 (±16.8) before and 36.52 (±13.8) after CLARIS processing. The mean FADE values were 0.81 (± 0.27) and 0.512 (± 0.19).
- CLARIS reduces the DCP score by 44.3% and FADE value by 36.9% ($p<0.01$)

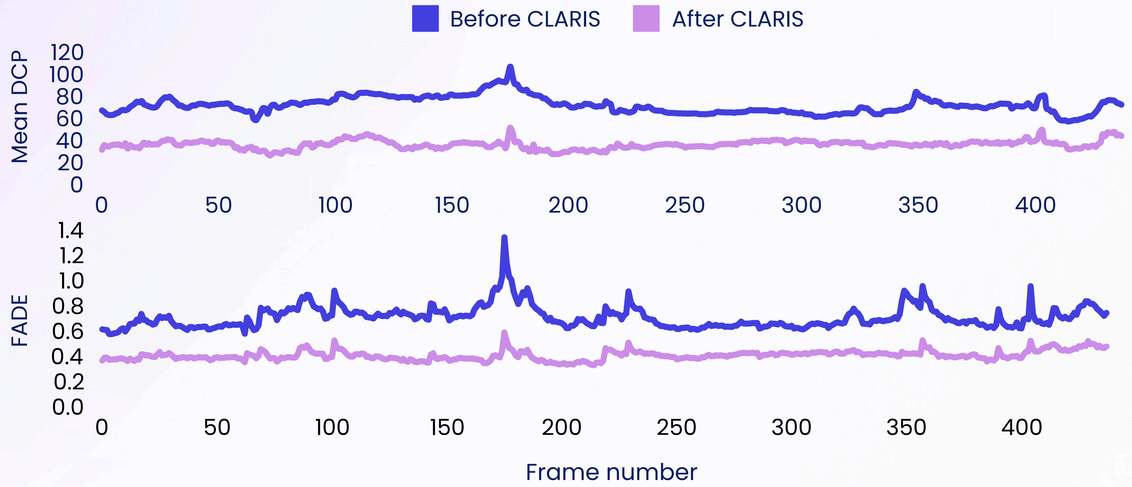


Figure 1: Comparison of DCP before and after CLARIS processing. A lower DCP means an improved smoke level

Conclusion

- Preliminary results show that CLARIS improves visibility by reducing smoke during cholecystectomy, making it a promising technology to enhance vision in MIS
- Future work will explore CLARIS' effectiveness in other MIS procedures and evaluate time savings

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