Evaluation of the Learning Curve and lessons learned for the Hugo™ Robotic Platform in Upper Gastrointestinal Surgery

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Introduction

Robotic surgery offers advantages including three-dimensional visualisation, tremor filtration, and improved surgeon ergonomics compared with conventional laparoscopy. However, robotic platforms are complex and require additional skills for both surgeons and theatre teams. The Hugo™ robotic-assisted surgery system features independently mobile arm carts and an open-console design, providing a different architecture from existing robotic platforms.

Early studies have demonstrated the feasibility and safety of Hugo™ across several specialties, including urology and gynaecology, although experience in upper gastrointestinal (UGI) surgery remains limited. Evidence suggests that skills acquired on the more widely used Da Vinci® platform may be transferable to Hugo™. Despite reports of reduced operative times after a small number of cases, learning-curve data in UGI surgery remain scarce.

This study reports a series using the Hugo™ RAS system and evaluates its early learning curve, including docking time and reasons for conversion to laparoscopy. Docking strategies, instrument options, and technical challenges are presented.

Methods

A retrospective single-surgeon case series was performed of 33 consecutive UGI procedures undertaken using the Hugo™ robotic-assisted surgery system between July 2023 and February 2026. All cases were included in the descriptive analysis of feasibility, safety, procedural characteristics, and perioperative outcomes.

Learning curves were assessed using cumulative sum (CUSUM) analysis of cut-to-close operative time and docking time in patients undergoing primary foregut surgery. Redo and multi-procedure cases were excluded. Procedure type, conversions, complications, and postoperative outcomes were recorded

descriptively. Port placement, docking strategies, and instrument configurations were refined throughout the series to facilitate surgeon learning.

Results

Thirty-three Hugo™ robotic upper gastrointestinal procedures were performed during the study period. Procedures included reflux and fundoplication procedures (n=9), primary hiatal hernia repair without fundoplication (n=6), primary hiatal hernia repair with fundoplication (n=3), redo hiatal hernia repair (n=4), post-sleeve gastrectomy hiatal surgery (n=5), and multi-procedure operations (n=6). There were no major perioperative complications. Two procedures (6.1%) required conversion to laparoscopy, including one hiatal hernia repair due to insufficient robotic instrument length and one one-anastomosis gastric bypass due to robotic system malfunction.

Sixteen single primary foregut procedures, predominantly hiatal hernia repair with or without fundoplication, were included in the learning-curve analysis. Mean and median cut-to-close operative times were 119.2 and 134.0 minutes, respectively (range 64.0–152.2 minutes). Operative-time CUSUM analysis demonstrated a peak at case 11, followed by a sustained downward trend, suggesting improved operative efficiency after approximately 11 cases.

Twelve procedures with recorded docking times were included in the docking-time CUSUM analysis. Mean docking time was 8.6 minutes (median 8.7 minutes; range 1.1–21.0 minutes). Docking-time CUSUM reached its lowest at case 8, suggesting progressive improvement in robotic setup and theatre workflow efficiency.

Conclusion

This study represents the largest hiatal hernia series using the Hugo™ robotic-assisted surgery system. CUSUM analysis demonstrated progressive improvements in operative and docking efficiency during early platform adoption, suggesting a relatively short learning curve despite variation in port positioning and fellow involvement on the robotic console. Together with favourable safety and feasibility outcomes, these findings support the integration of the Hugo™ platform into established UGI robotic programmes. Further studies with larger cohorts are required to validate these findings and better define learning-curve benchmarks.