Harnessing Video-Based Artificial Intelligence in Research: Do Procedure Times Correlate With 30-Day Postoperative Outcomes in Roux-en-Y Gastric Bypass?

Agustina A Pontecorvo, MD[1]; Enrique F. Elli, MD, FACS, FASMBS[1]

[1]Department of Surgery, Division of Advanced GI and Bariatric Surgery, Mayo Clinic Florida

OBJECTIVE OF THE TECHNOLOGY

Surgical intelligence platforms apply artificial intelligence (AI) in minimally invasive surgery to enhance procedural efficiency, support surgeon decisions, and improve patient outcomes.

In the context of clinical research, surgical intelligence provides visibility into procedures and connects intraoperative measures with patient history and outcomes data, we used a surgical intelligence platform to examine whether total procedure and step durations in Roux-en-Y gastric bypass (RYGB) procedures were associated with 30-day postoperative outcomes.

DESCRIPTION OF TECHNOLOGY

The demonstrated technology involves a surgical intelligence platform (Theator, Inc) trained to accurately and automatically recognize surgical steps and specific intraoperative events in RYGB, among other procedures.

Data regarding total and step durations are automatically uploaded into the cloud and accessible to the surgical team. This allowed us to retrospectively identify patients who underwent laparoscopic and robotic-assisted RYGB procedures between October 2023 and September 2024.

The automatically extracted data were manually integrated with additional postoperative outcomes including postoperative complications, readmissions, and reoperations within 30 days.

PRELIMINARY RESULTS

- 81 patients were included, 9 surgical steps were identified
- Mean total operative time was 142.6 min (SD: ±38.8).
- Gastric pouch formation and gastrojejunal (GJ) and jejunojejunal (JJ) anastomoses, which a mean duration of 22.8 min (SD= ±7.7), 26.4 (SD=±9.9) and 20.1(SD= ±8.6) minutes, respectively.
- Total operative was longer in Conversions to RYGB, with a mean of 17.2 (±56.7), (p=0.01). The specific steps did no show significant difference in time when compared primary and conversion cases
- A total of 7 postoperative complications occurred. No differences were observed in operative times and length of stay if compared to patients without complications.
- Longer durations of gastric pouch creation and JJ anastomosis (over 30 minutes) were significantly associated with an increased risk of postoperative complications (OR=5.42; 95% CI=1.04-28.2; p=0.045).

Variables	Odds-Ratio [CI]	P-value
Total Op time >180min	2.89 [0.48 -17.16]	0.24
Pouch formation > 30 min	5.42 [1.04 - 28.2]	0.045
GJ anastomosis >30 min	1.31 [0.27 - 6.27]	0.74
JJ anastomosis >30 min	13.1 [2.2 - 79.7]	0.005

Binary logistic regression results between duration time of main steps and 30-day complications

CONCLUSIONS

In a scalable and standardized process, AI-based video analysis was applied to examine direct correlations between intraoperative factors and postoperative outcomes.

This provided insights into the procedures and an objective analysis to a clinically relevant research question. This study revealed that certain surgical steps, specifically gastric pouch formation and JJ anastomosis, may be associated with increased risks of complications when their duration exceeded a threshold of 30 minutes