

Artificial Intelligence Based Step Recognition of Sleeve Gastrectomy: Experience from One Tertiary Center

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MEDICAL CENTER
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Surgical
Intelligence

Data-driven insights
for quality improvement.

Theator Proprietary

Artificial Intelligence Based Step Recognition of Sleeve Gastrectomy

CONFLICT OF INTEREST DISCLOSURE

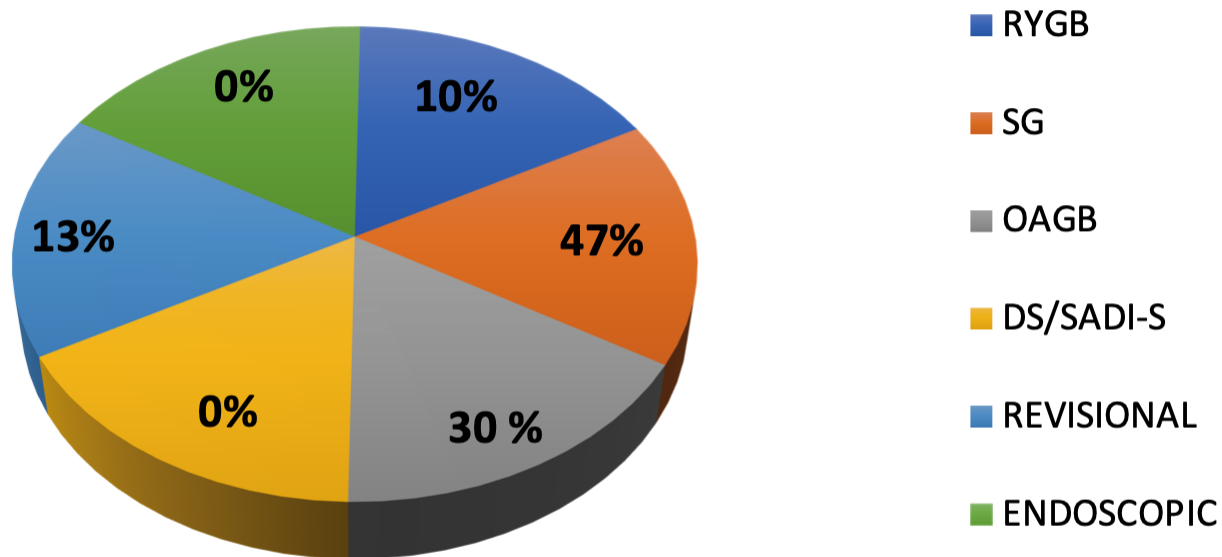
Bariatric and advanced laparoscopy surgeries

Head of the surgical division clinics, TAMC

I have no potential conflict of interest to report

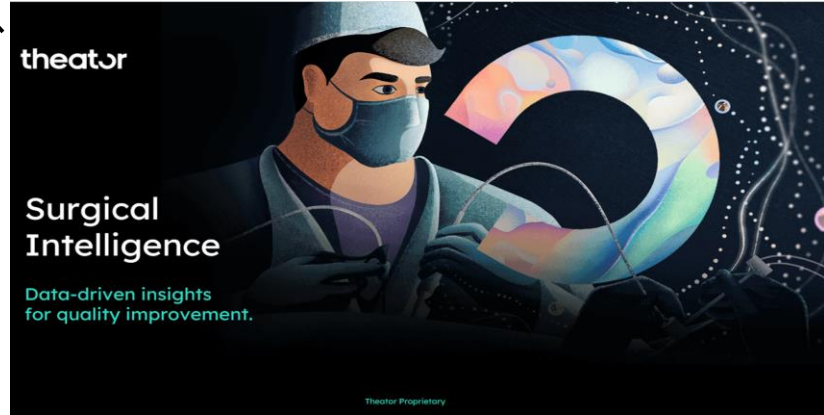
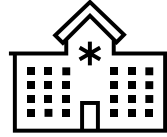


CASE MIX DISCLOSURE- 530 total



In recent years I perform mainly OAGB as both primary and revisional bariatric surgery

2022



First to use it routinely

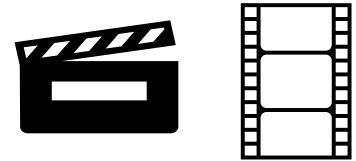
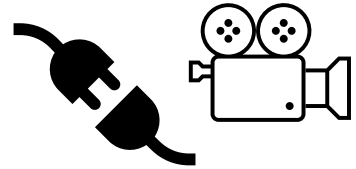




Automated-

Video capture

Data analysis



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Projects and applications of data

- ✓ Surgical quality improvement
- ✓ Surgical training and Performance assessment
- ✓ Clinical research
- ✓ *Real-time decision support

AI based step recognition of sleeve gastrectomy

experience from one tertiary center

Manually annotated videos were used to train AI algorithm to automatically identify **surgical steps** and **out-of-body**

3 phases were conducted:

Sleeve

1. Training- 8,249 videos

177

Results

95.9% accuracy
step recognition

2. Testing- 3,314 videos

73

99.6% accuracy
out-of-body recognition

3. Validation- 1,976 videos

45



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Real-time data structuring and annotations



Idle Time

Procedural
Steps

Safety
Milestones

Intra-op Events

Complexity
Scoring

Instrument
Detection

Plus more

Idle Time



No movement in the body/ scope removed / camera is blurred



When the scope is removed, the image is automatically blurred protecting the privacy of the surgical team and patient



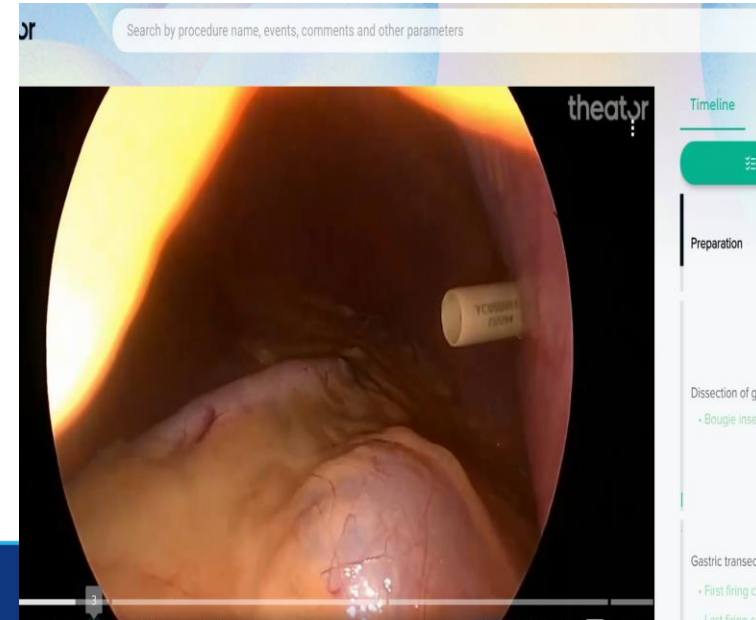
Minimizing avoidable idle time can also improve procedural efficiency and reduce OR-related costs



Theator is the *first and only platform* to detect and measure both IB and OOB



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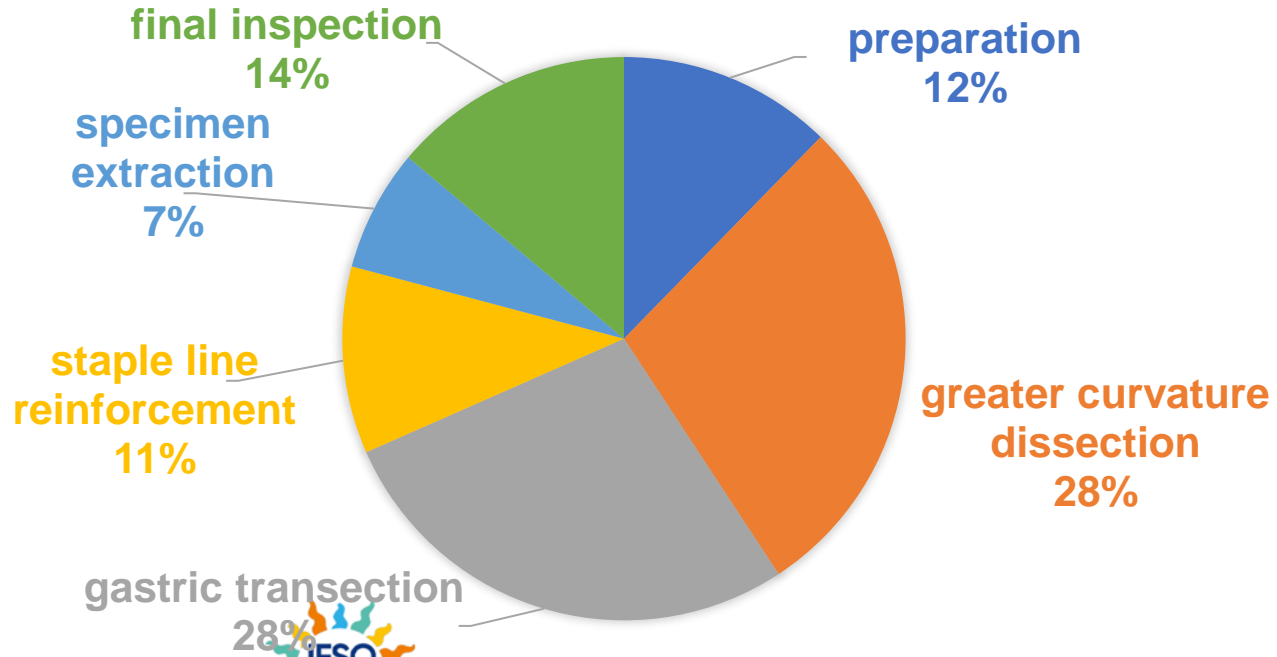
AI based step recognition of sleeve gastrectomy

experience from one tertiary center

Procedural Steps

- Preparation
- Adhesiolysis
- Dissection
- Gastric transection
- Reinforcement
- Specimen extraction
- Packaging
- Final inspection

SLEEVE GASTRECTOMY STEPS DURATION (N=49)



Procedural Steps

theator

Timeline

Debrief

☰ Ask for feedback

Preparation

Dissection of greater curvature

- Bougie insertion

Gastric transection !

- First firing control !
- Last firing control !
- Clipping of staple line

Speed x3

3

Highlights (02:30)

00:56 / 35:44



Procedural Steps

theator

Timeline

Preparation

Adhesiolysis

Preparation

Adhesiolysis

Speed x1

Highlights (04:04)

00:01 / 02:36:16

Adhesiolysis

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experience from one tertiary center

Safety Milestones

- ✓ Bougie insertion
- ✓ First firing control
- ✓ Last firing control
- ✓ Leak test -

96%

Safety Milestones

theator

Search by procedure name, events, comments and other parameters

Sleeve Gastrectomy

theator

Dissection of greater curvature

- Other
- Out of body
- Out of body
- Other
- Other
- Other
- Other
- Out of body
- Out of body
- Staple insertion
- Other
- Gastric transection 0
- First firing control 0
- Out of body
- Last firing control 0
- Clipping of staple line
- Clipping of staple line
- Reinforcement of staple line
- Clipping of staple line
- Hemostatic foam application
- Specimen extraction

Search by procedure name, events, comments and other parameters

Q

vc

V

+

Sleeve Gastrectomy

theator

Timeline

- Other
- Out of body
- Out of body
- Other
- Other
- Other
- Other
- Out of body
- Out of body
- Staple insertion
- Other
- Gastric transection 0
- First firing control 0
- Out of body
- Last firing control 0
- Clipping of staple line
- Clipping of staple line
- Reinforcement of staple line
- Clipping of staple line
- Hemostatic foam application
- Specimen extraction

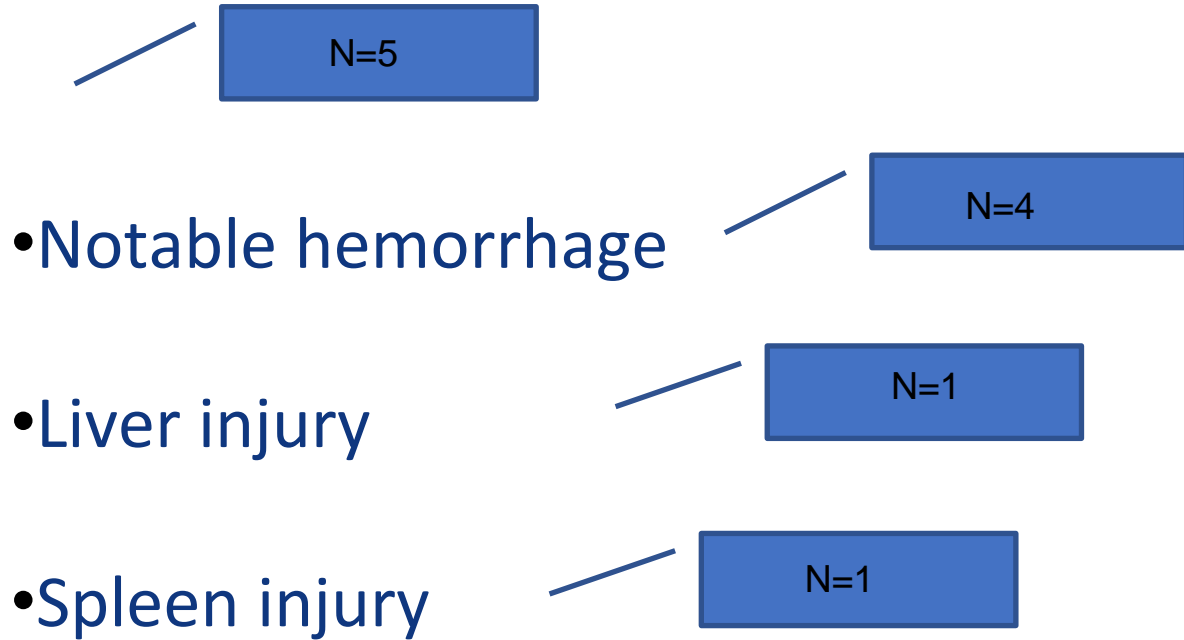
- ✓ Safety distance from pylorus
- ✓ Parallel to lesser curvature

- ✓ Safety distance from esophagus
- ✓ Fundus is mobilized

AI based step recognition of sleeve gastrectomy

experience from one tertiary center

Intra-op Events



ectomy

Intra-op Events

ter curvature

Highlights (05:27)

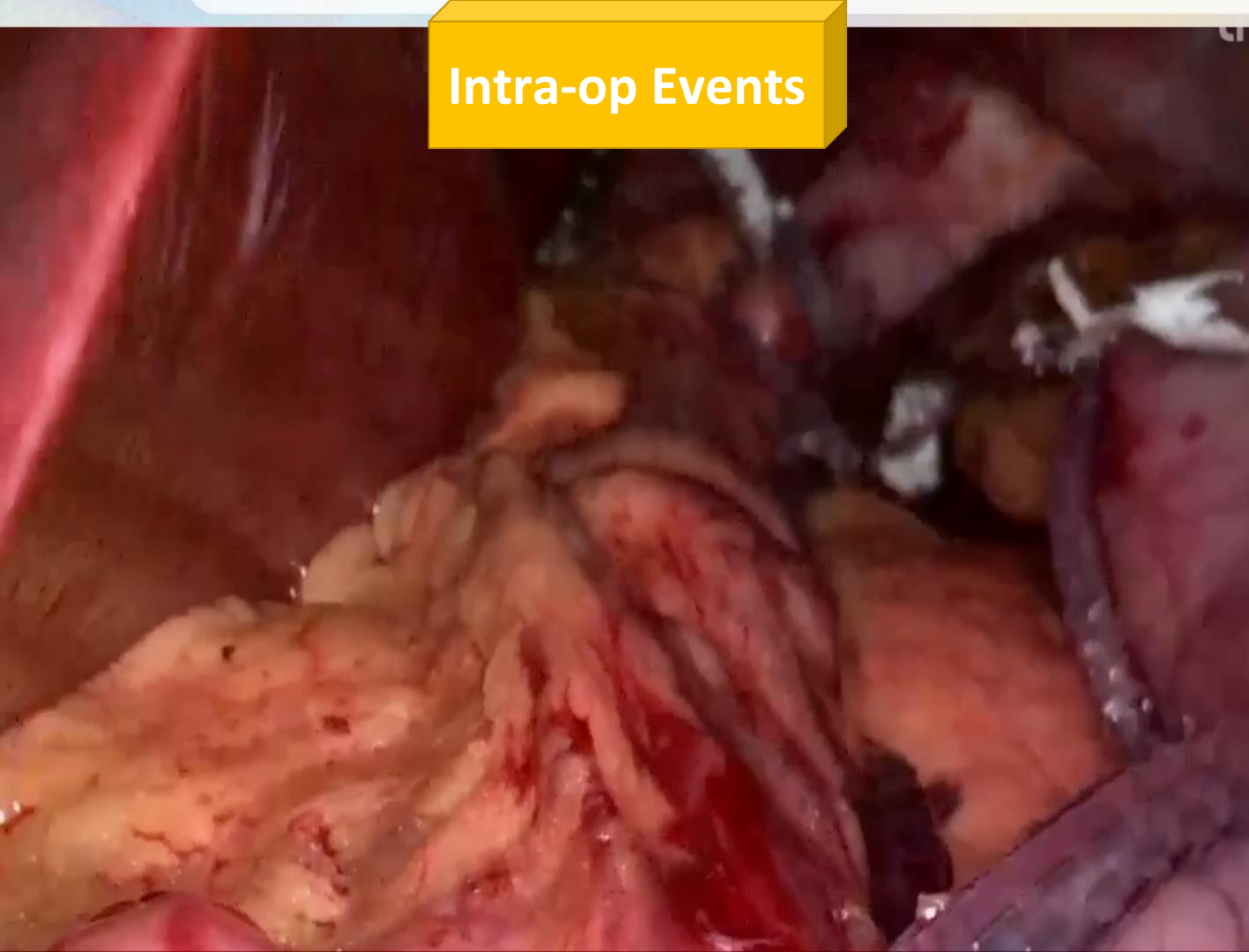
09:02 / 01:04:46



Dissection of greater curvature

- **Notable hemorrhage onset**
- Hemostatic clipping
- Hemostatic suture
- Bougie insertion

Intra-op Events



Gastric transection !

• First firing control !

• Last firing control !

• Liver injury

Final inspection

• Spleen injury

• Parenchymal injury repair

• Hemostatic material insertion

• Hemostatic material insertion

• Hemostatic material insertion

Search by procedure name, events, comments and other parameters



Butress

Preparation Plus more

Dissection of greater curvature

- Bougie insertion

Stapler with buttress material

Gastric transection

- First firing control
- Last firing control

Final inspection



No buttress

Timeline

Debr

Ask f

Preparation

Dissection of greater

- Bougie insertion

Stapler with n

Gastric transection

- First firing control
- Last firing control
- Clipping of staple

Plus more



Hemostatic foam application



Wound closure



Packaging

× Clear all

Apply

Suggested filters:

Procedure date +

sleeve gastrectomy - +

Intraoperatives events +

Surgeon +

Patient age +

Patient BMI +

Room +

Sort by Procedure date

Displaying 20 procedures of 45,1



a month ago in Gastrointestinal System

Sleeve Gastrectomy

OR: TLVMC tel aviv/ 11 (01-111r5)
Tuesday, June 6, 2023 9:09 AM

Surgeon Chief

No Intra-Op Events

Male Age: 47.4



a month ago in Gastrointestinal System

Sleeve Gastrectomy

OR: TLVMC tel aviv/ 6 (01-106r3)
Tuesday, May 30, 2023 9:18 AM

Attending Surgeon

No Intra-Op Events

Female Age: 16.2

× Clear all

Suggested filters:

Procedure date

sleeve gastrectomy

Intraoperatives events

Surgeon

Patient age

Patient BMI

Reinforcement

A hand in a blue suit jacket is shaking a silver and black robotic hand. The background is a futuristic blue digital interface with various data charts, including a gauge with '35' and a bar chart with '10%', '20%', and '30%' labels. A black rectangular box is positioned at the top center.

Future of AI

Thank you
for listening



Gastric Bypass sneak peek

Gastric bypass

theator

Adhesiolysis

Timeline

- Out of body
- Adhesiolysis
 - Out of body
 - Out of body
 - Out of body
- Preparation
- Adhesiolysis
- Preparation
- Adhesiolysis
- Dissection of greater curvature
- Bowel inspection and measurement
 - Bowel marking
 - Out of body

Speed x1.5 | Highlights (05:39) | 14:23 / 01:14:57

Procedure Information | Analytics | Outline | Snapshots | View in monitor page