

State of the Art and the Future of Robotic Metabolic Bariatric Endoscopy

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NEW THERAPEUTIC PARADIGM

THE GUT IS A DISEASE-MODIFYING TARGET

Intervening in gut biology can reshape the systemic drivers of metabolic disease—not simply manage downstream consequences.

NUTRIENT SENSING • ENDOCRINE • IMMUNE • NEURAL

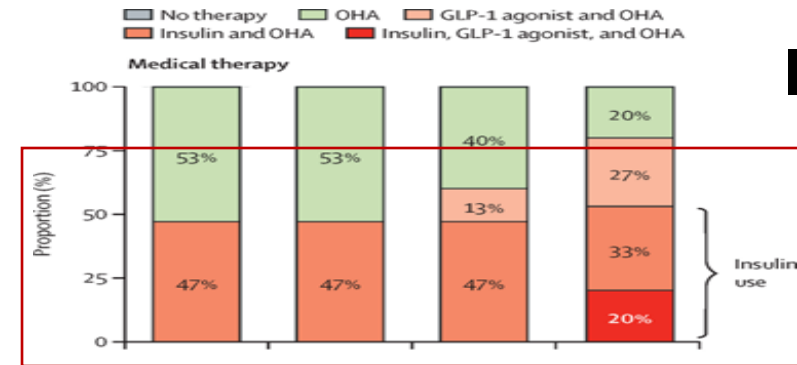
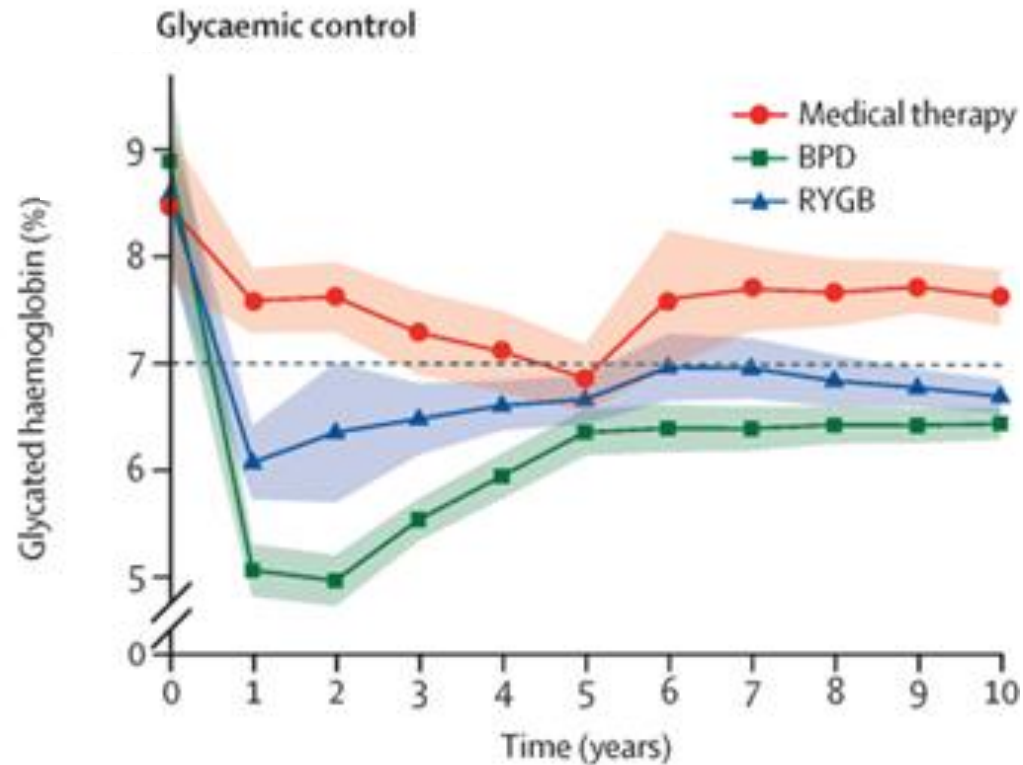
LIVER • PANCREAS • ADIPOSE TISSUE • BRAIN



THE LANCET

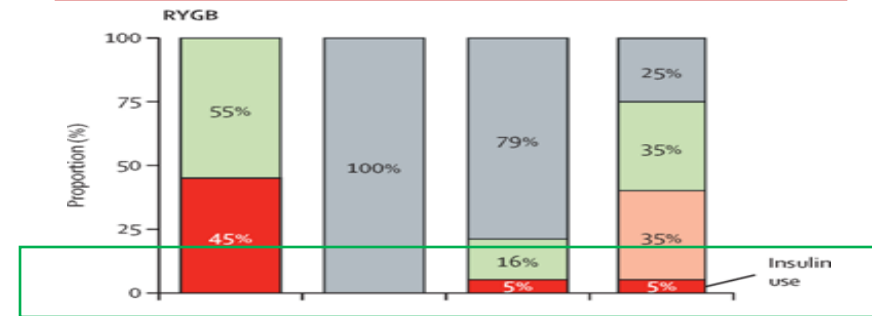
Metabolic surgery versus conventional medical therapy in patients with type 2 diabetes: 10-year follow-up of an open-label, single-centre, randomised controlled trial

The Lancet Volume 397 Issue 10271 Pages 293-304 (January 2021)

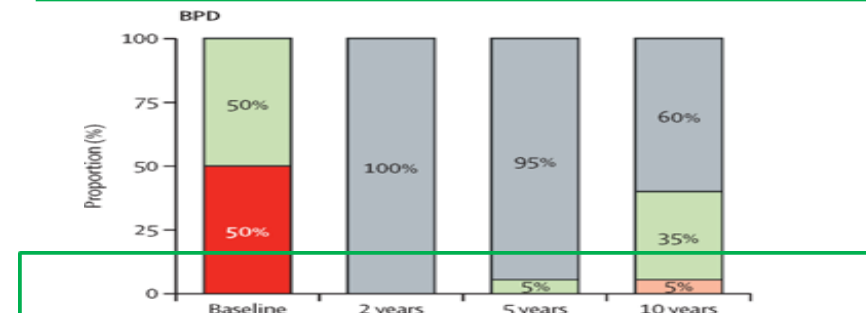


Insulin Use

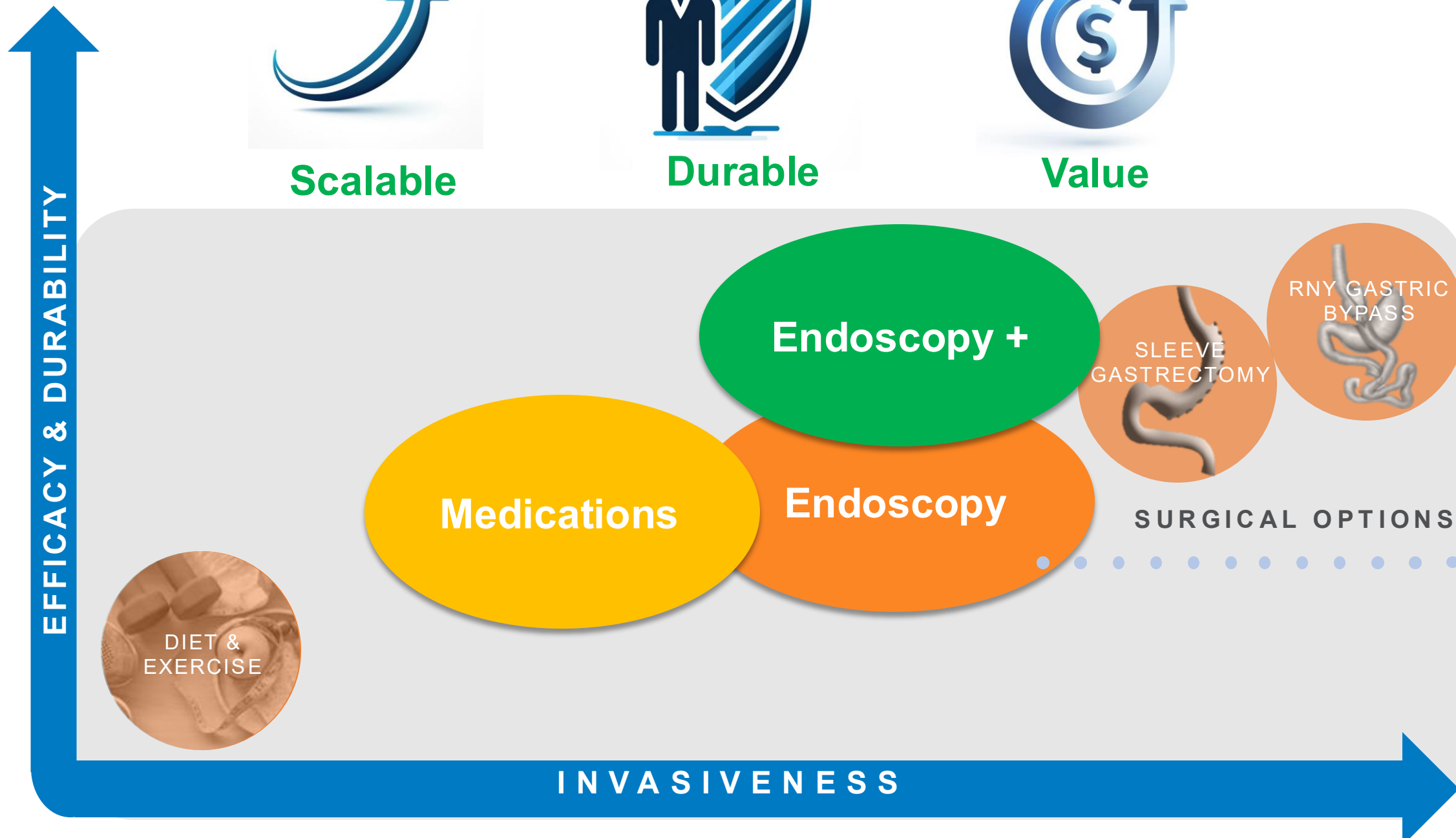
50%



5%



0%

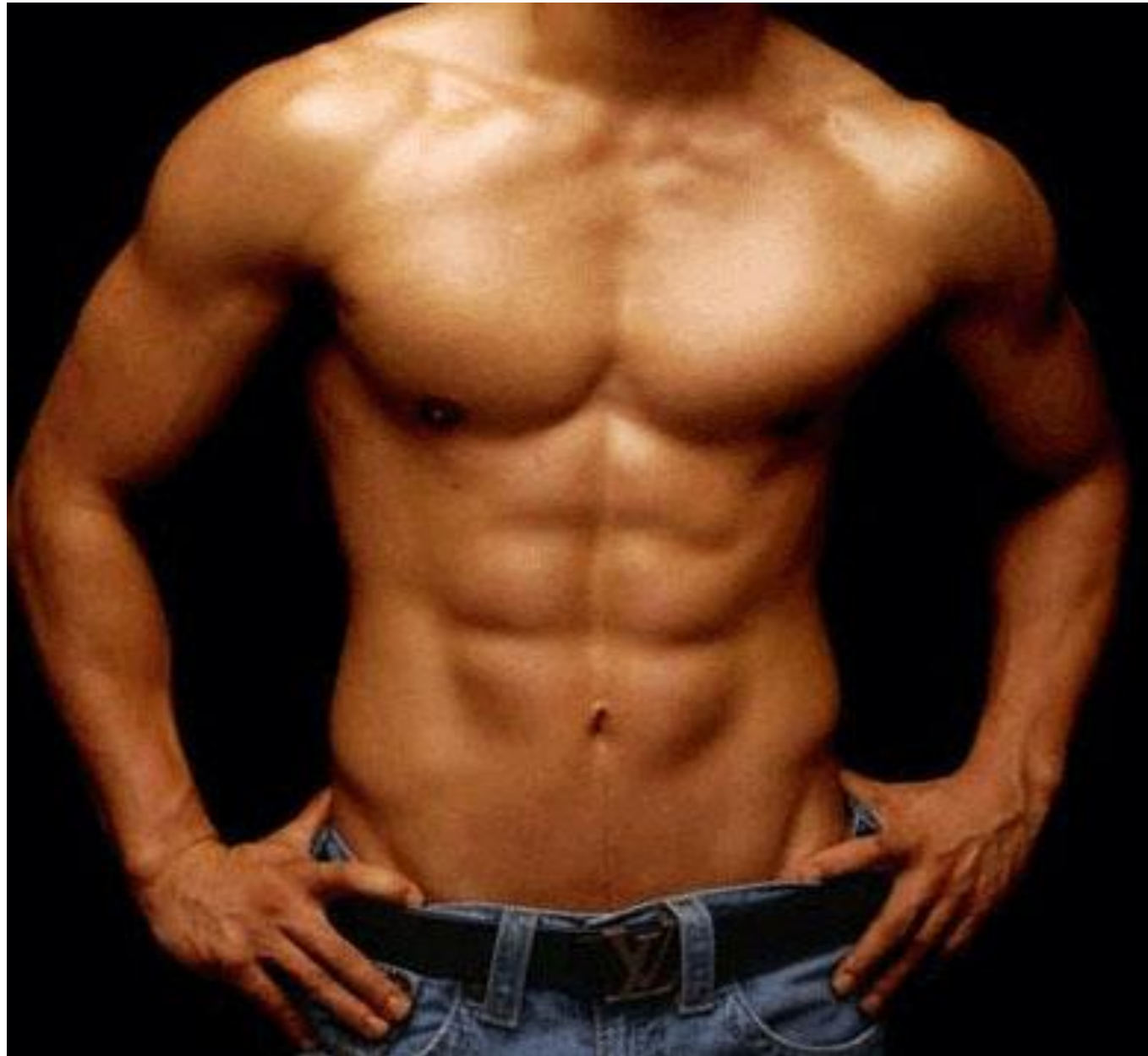




Open



Laparoscopic



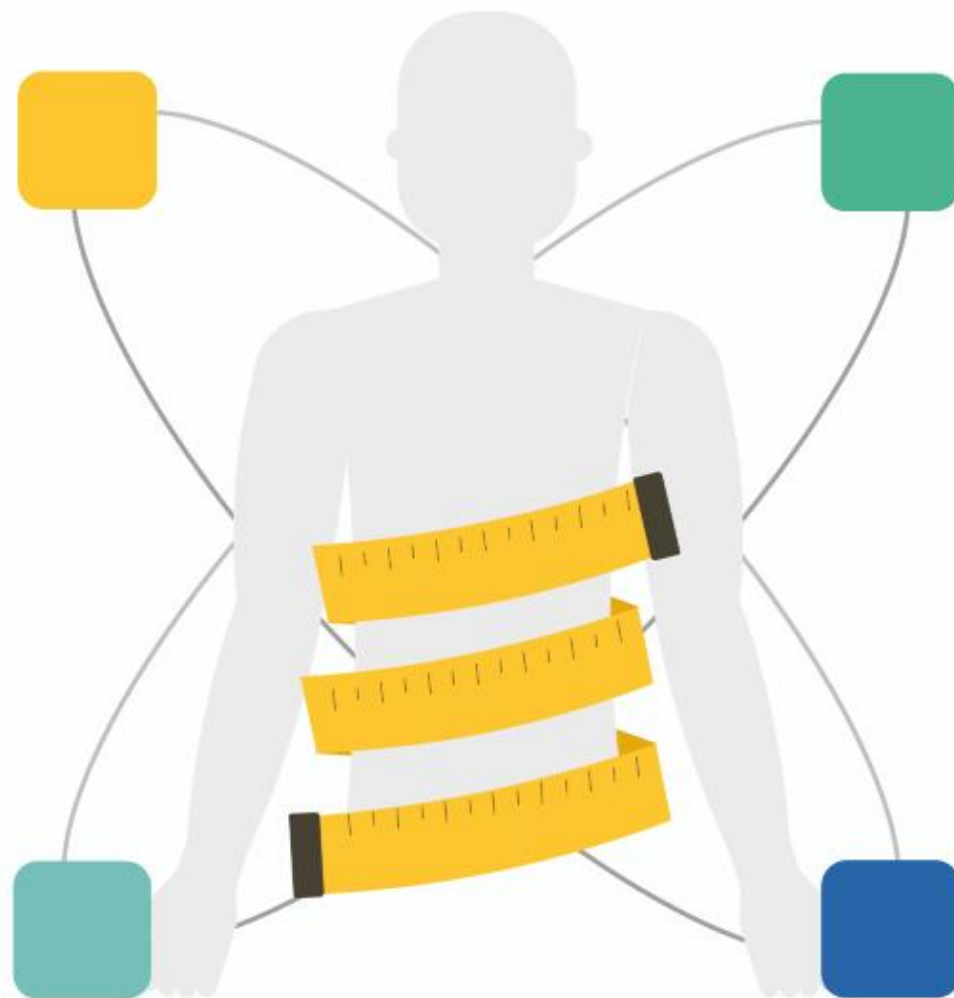
Endoscopic

**Organ
Sparing**

**Safe
Effective**

**No Long-Term
Consequences**

**Minimal
Disruption**



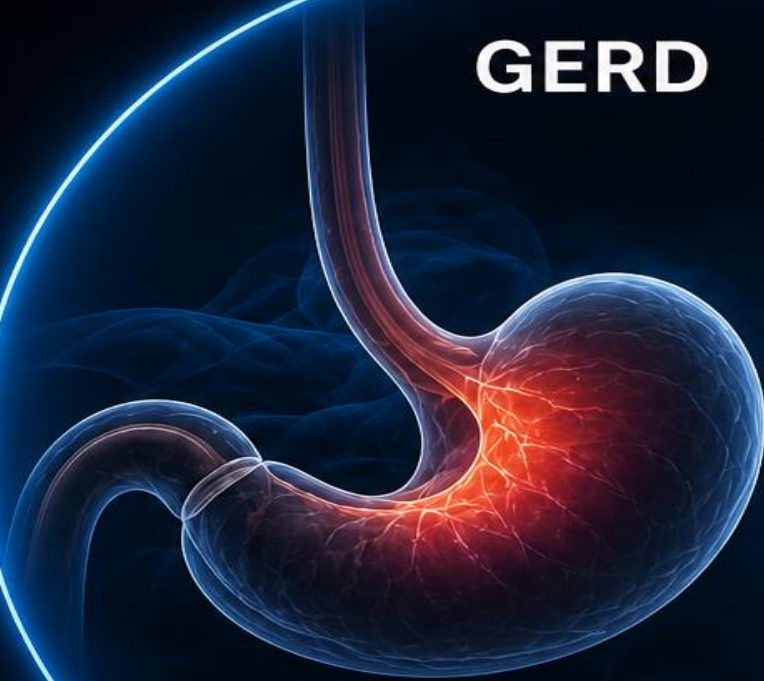
INNOVATION & NEW BOUNDARIES



UNMET NEED

OVERLAP OF GERD AND OBESITY REQUIRES HYBRID INTERVENTION

GERD



OBESITY



HYBRID APPROACH



ENHANCED
VISUALIZATION



PRECISE
THERAPY



COMPLEMENTARY
STRENGTHS



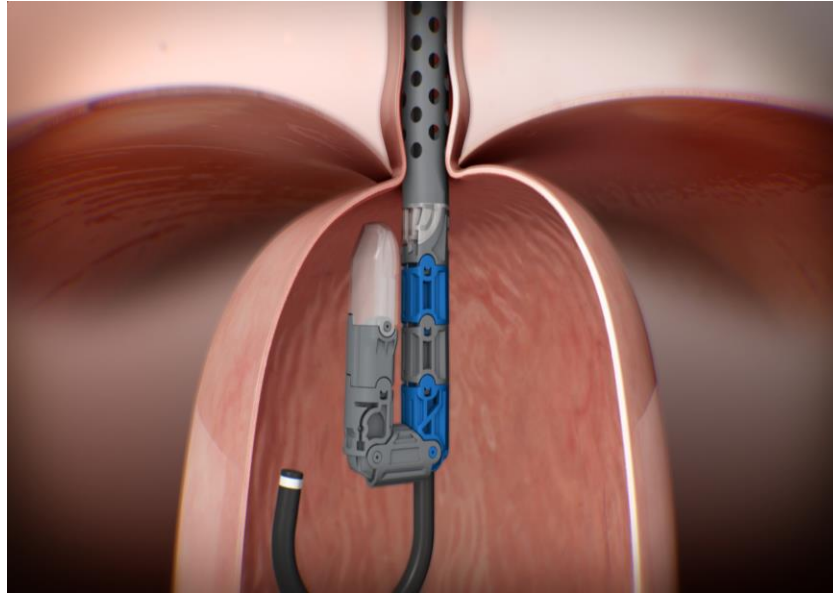
PERSONALIZED
CARE



BETTER
OUTCOMES

GERD + Obesity

GERD
Obesity



TIF



ESG

Digital Inelegance + Robotics

ENDOSURGERY

BRINGING LAPAROSCOPIC PRINCIPLES TO ENDOLUMINAL SURGERY

TRADITIONAL ENDOSCOPY



-  2D VIEW
-  LIMITED DEXTERITY
-  OPERATOR DEPENDENT

HYBRID ENDOSURGICAL PLATFORM



-  ARTICULATED CONTROL
-  MULTI-LUMEN ACCESS
-  SHAPE-LOCK STABILITY

ROBOTIC ENDOSCOPY



-  ARTICULATED DEXTERITY
-  3D VISUALIZATION
-  PRECISE CONTROL

ENDOSCOPY

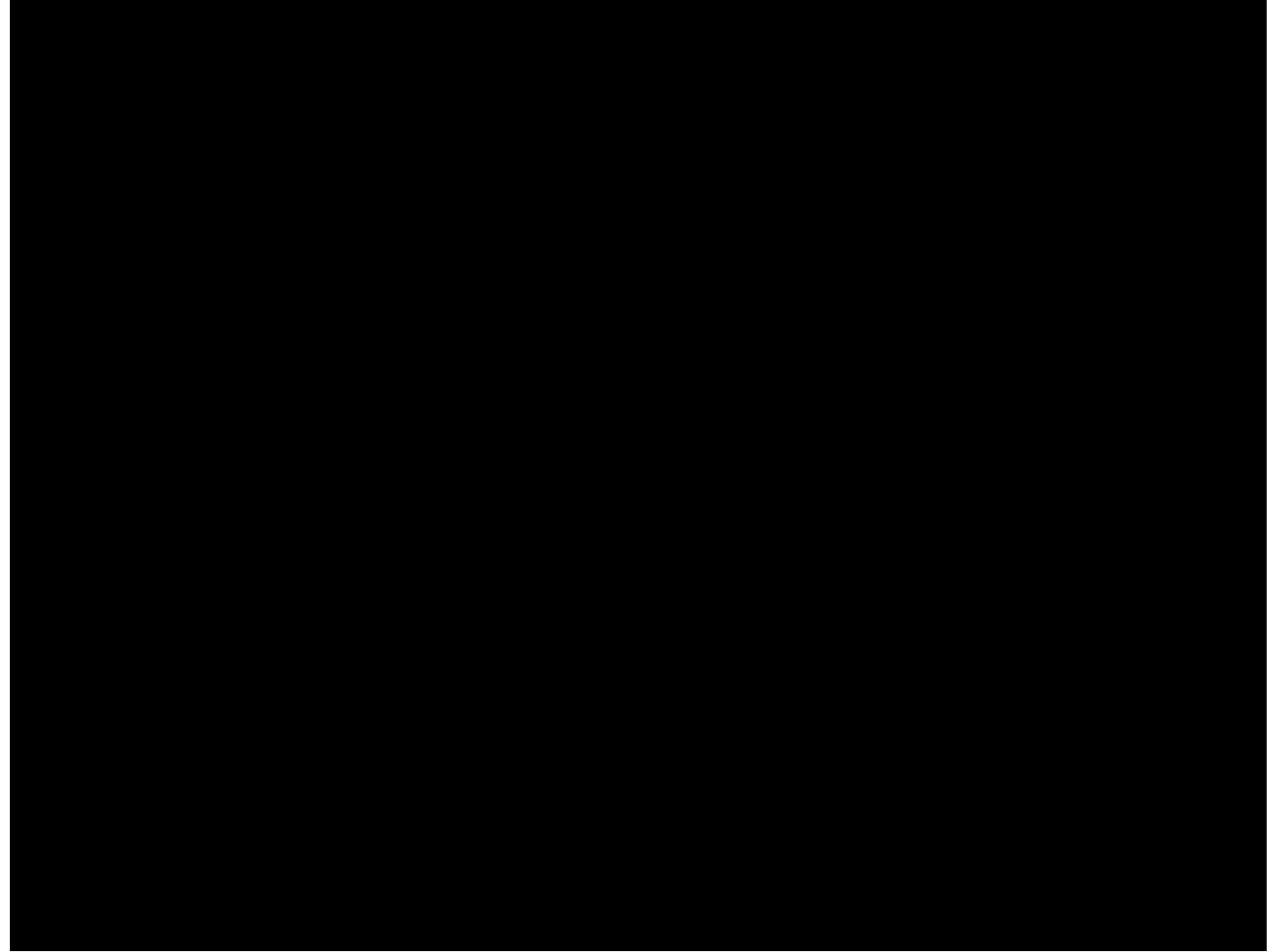
+

LAPAROSCOPIC PRINCIPLES

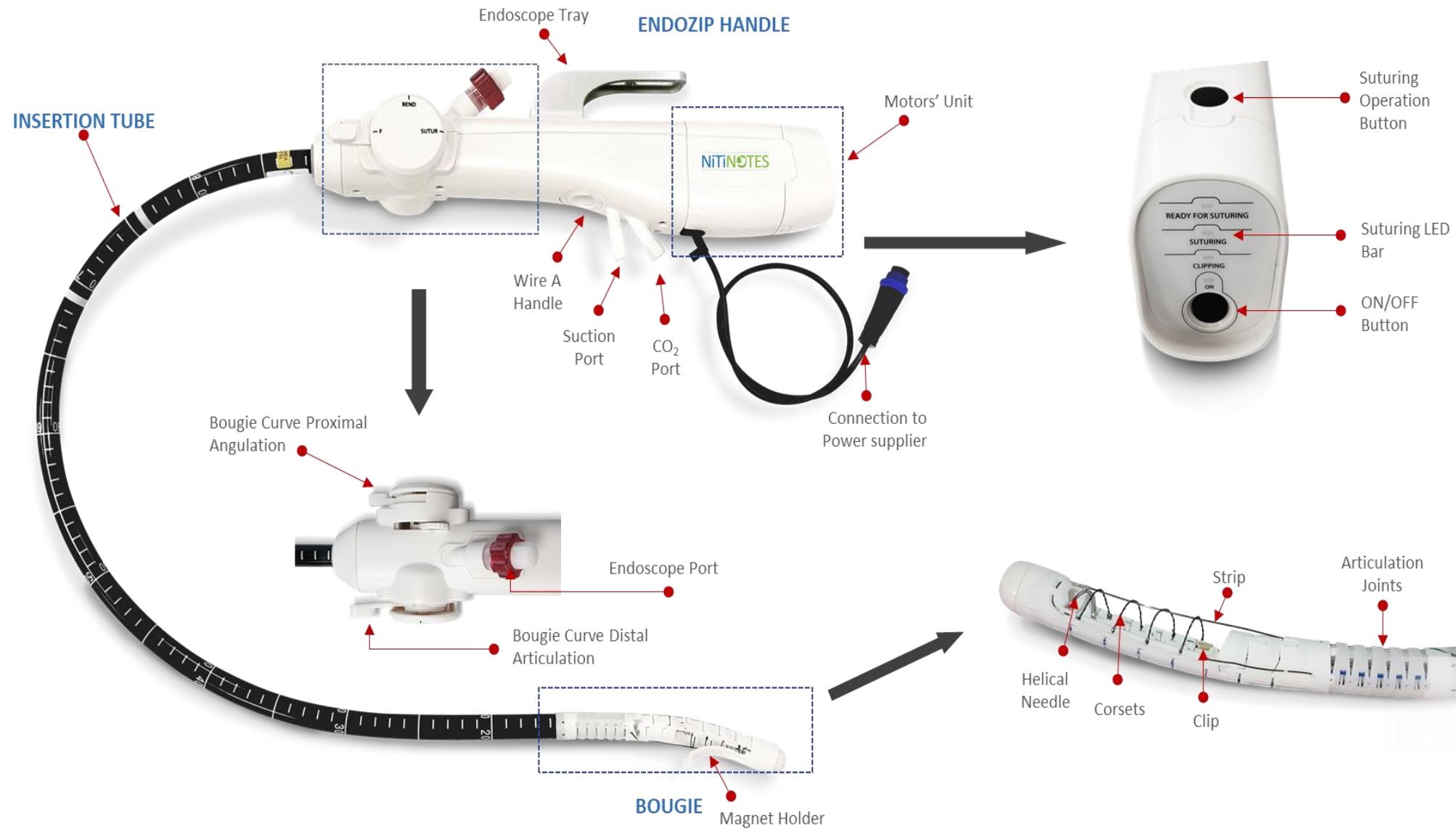
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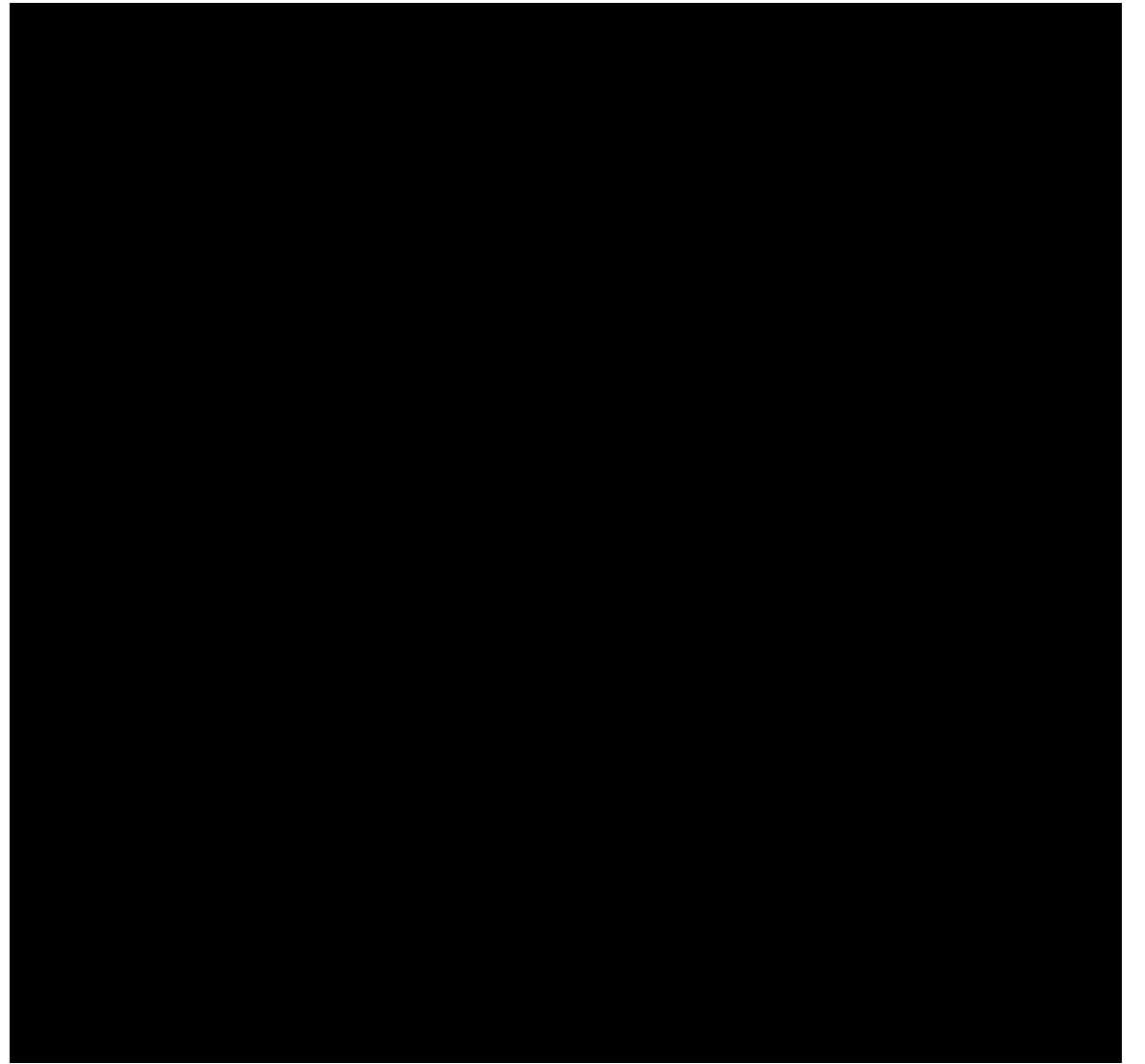
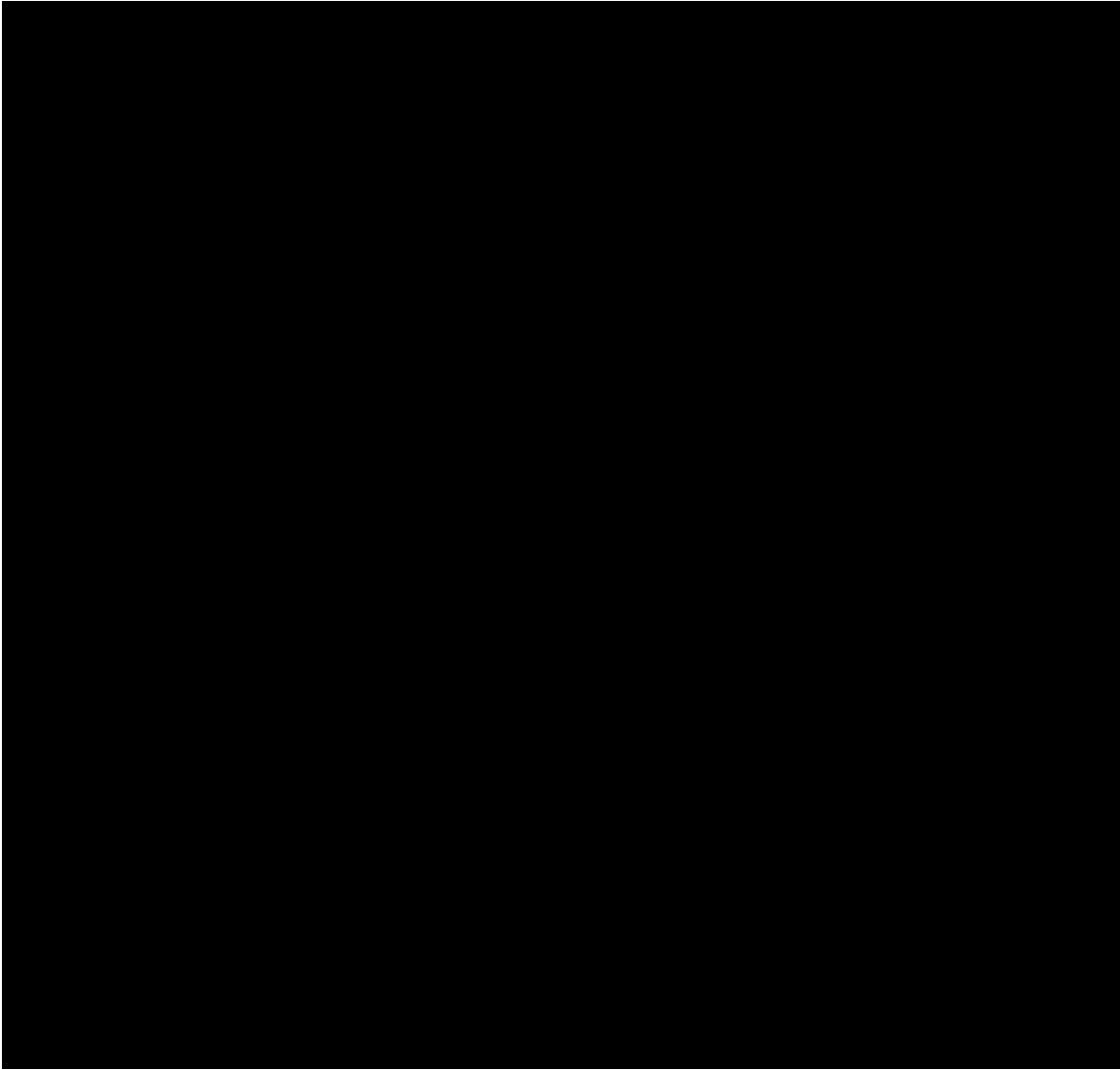
ENDOSURGERY

ENDOSCOPY EVOLVES TO SURGICAL CAPABILITY



Endozip™ – Automated Suturing Device





Courtesy of Ivo Boskoski

Robotic ESG



Translating natural movements with OperaAir Controllers



Reprogram the Biology

The phenotype called “T2D” conceals divergent biology and risk

589M

adults living with diabetes worldwide
(2024 estimate)

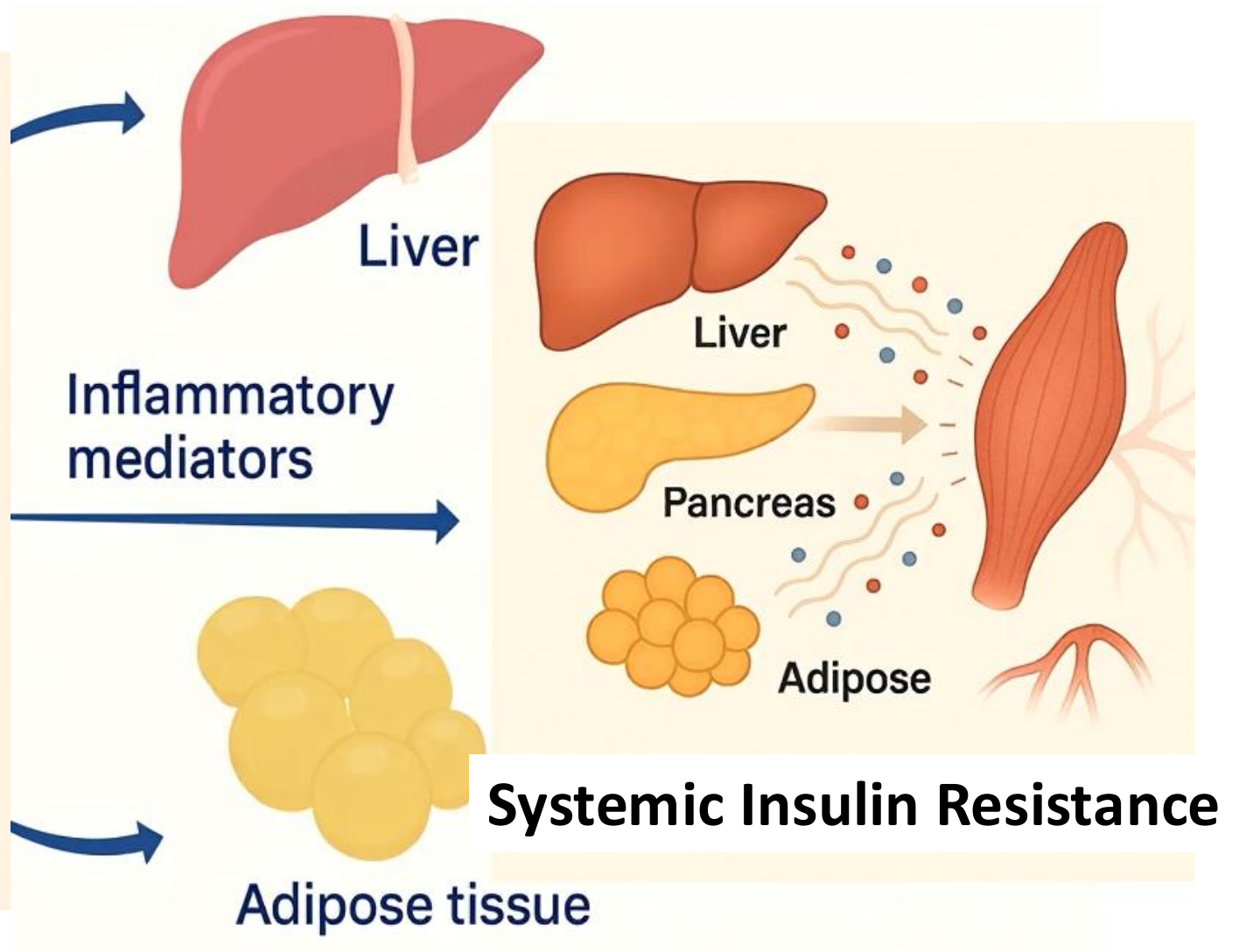
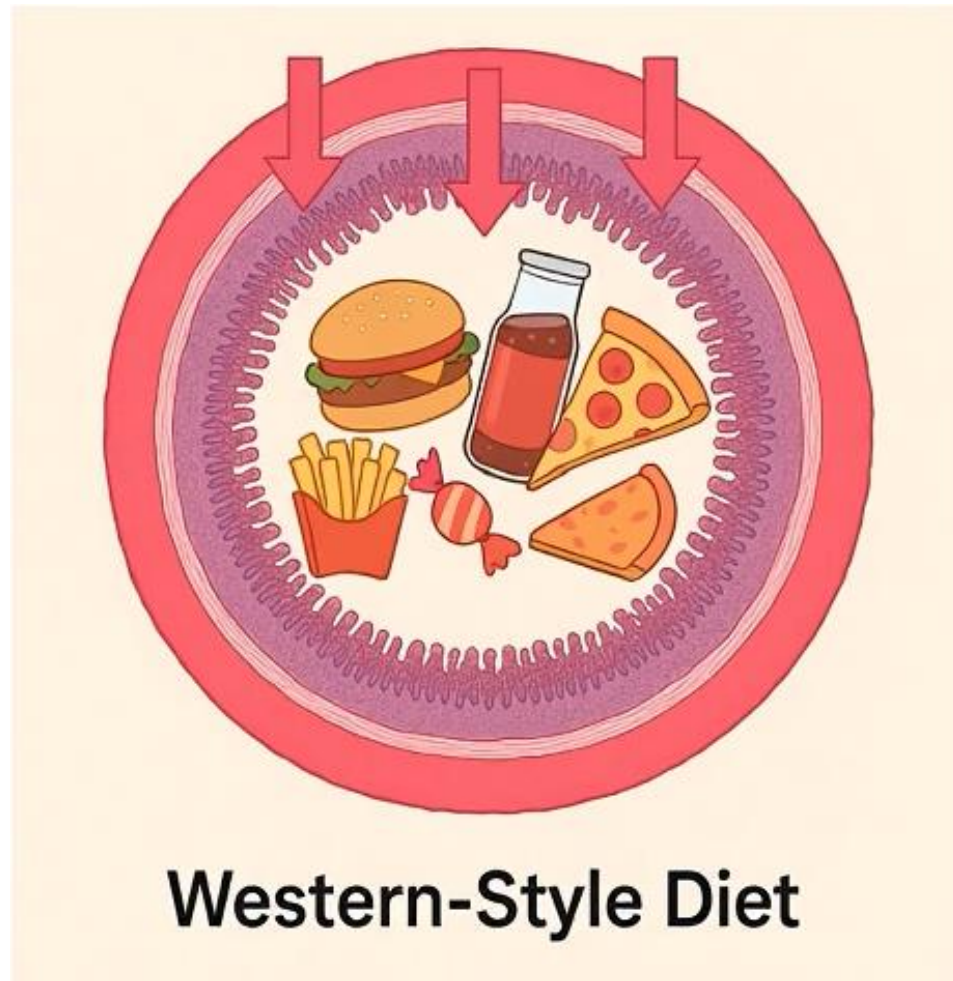
1 in 4

develops macrovascular
complications

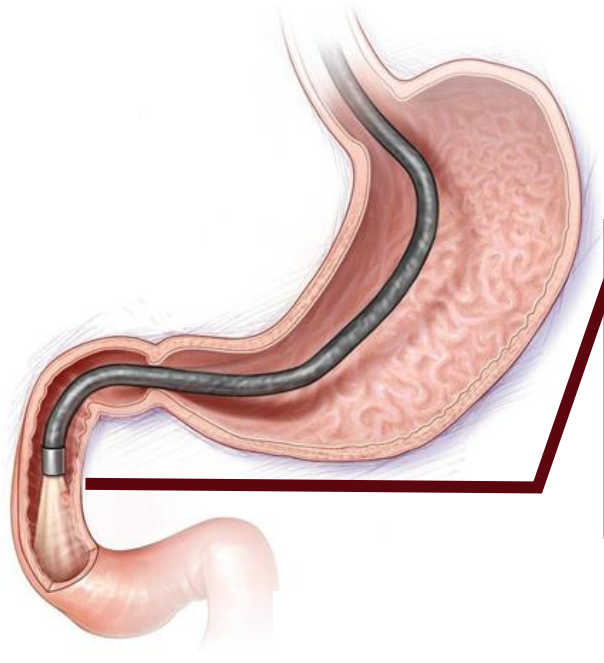
≈1 in 2

develops microvascular complications

We intensify glycemic therapy using a largely uniform disease label, while vascular, renal and mortality trajectories separate early.

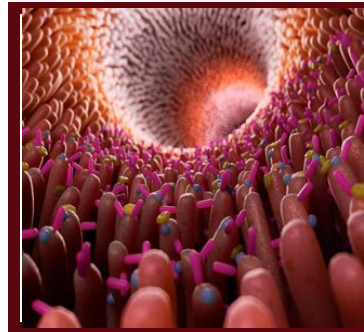


Metabolic Duodenopathy



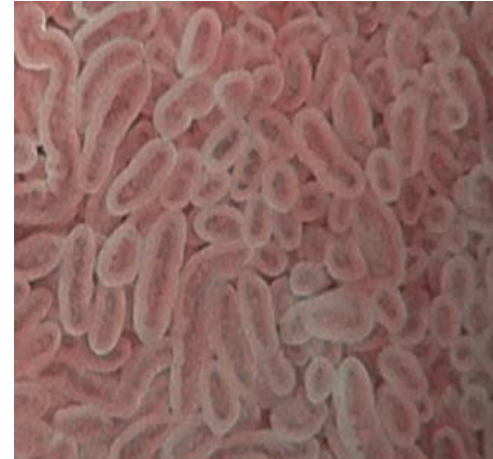
Non-Diabetic

Duodenum

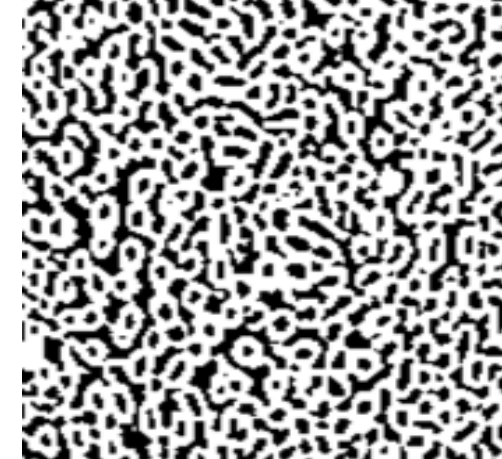


Type II Diabetes

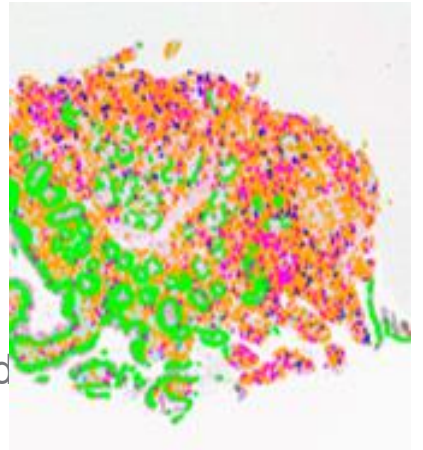
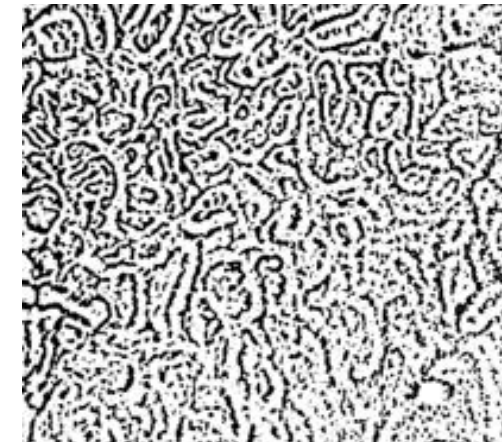
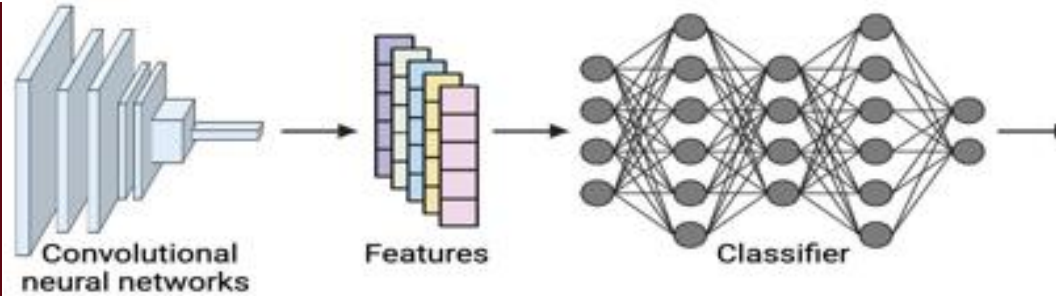
Endoscopy



AI Fingerprinting Analysis

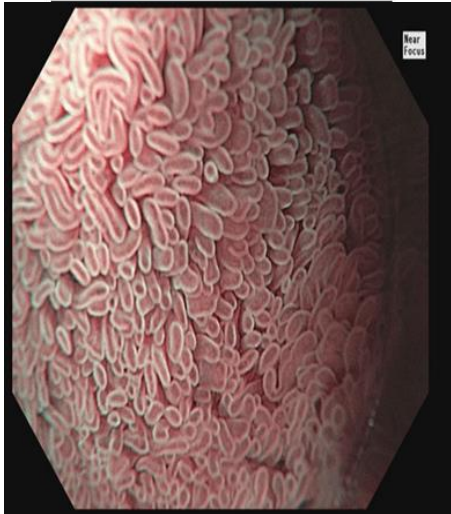


AI Cellular / Molecular

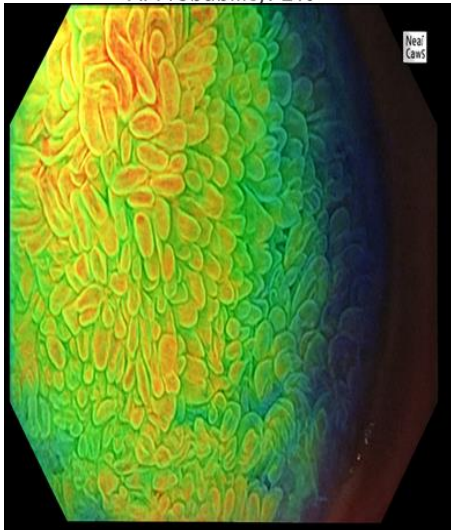


Raw NBI Images (Top) and AI Heatmaps (Bottom)

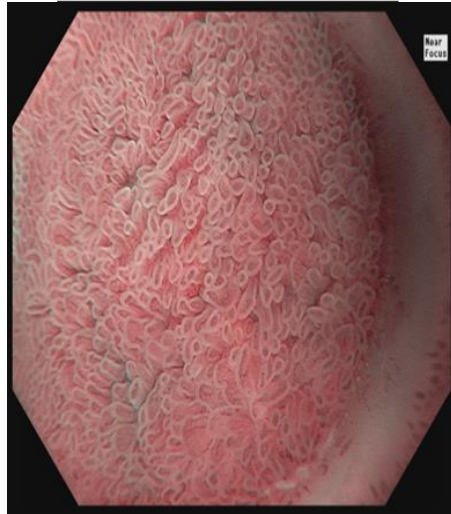
Normal



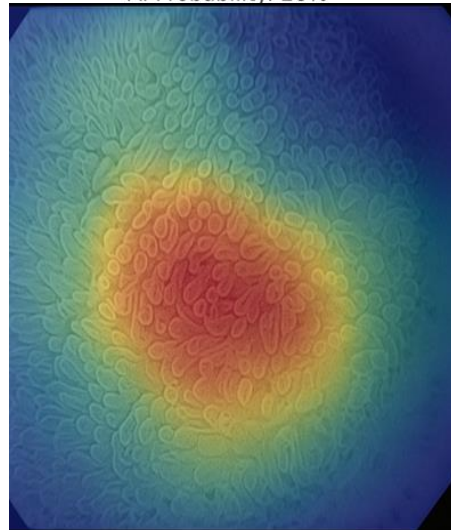
AI Probability: 2%



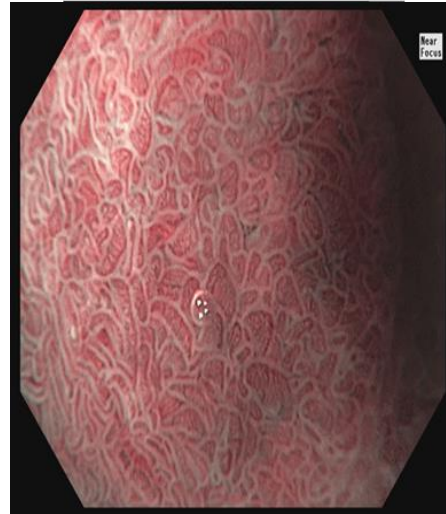
Mild



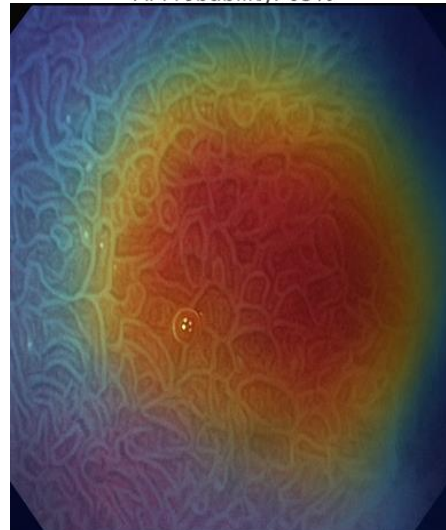
AI Probability: 28%



Moderate



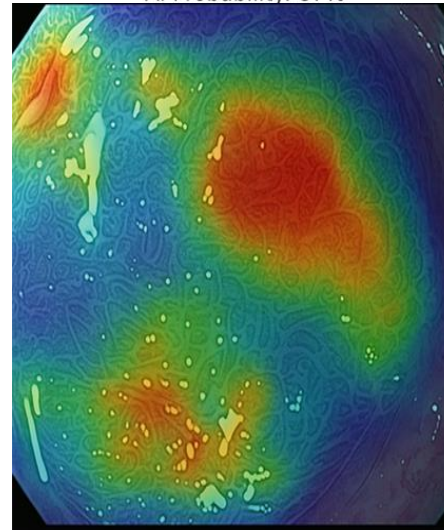
AI Probability: 65%



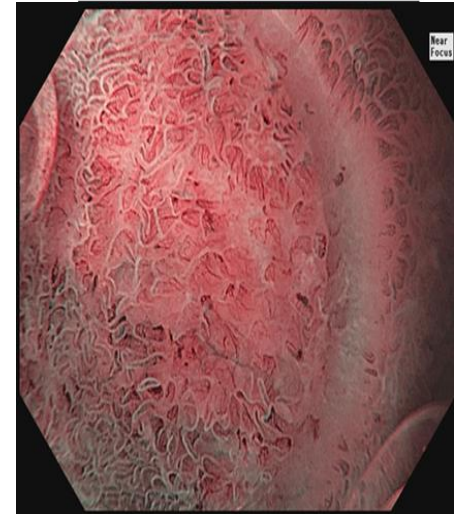
Advanced



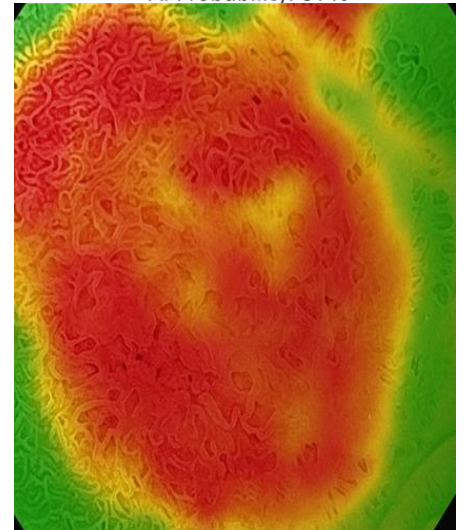
AI Probability: 87%



Severe

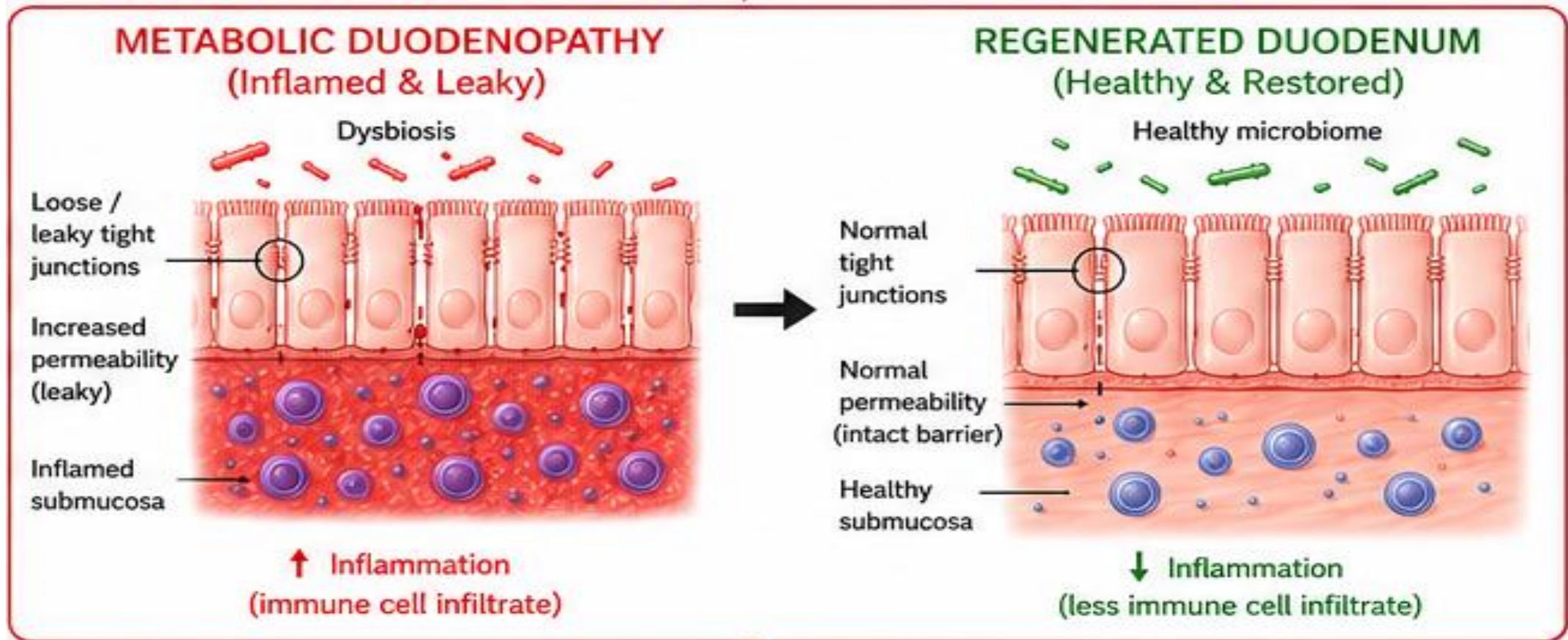


AI Probability: 97%



Spectrum of Metabolic Disease-Associated Duodenopathy

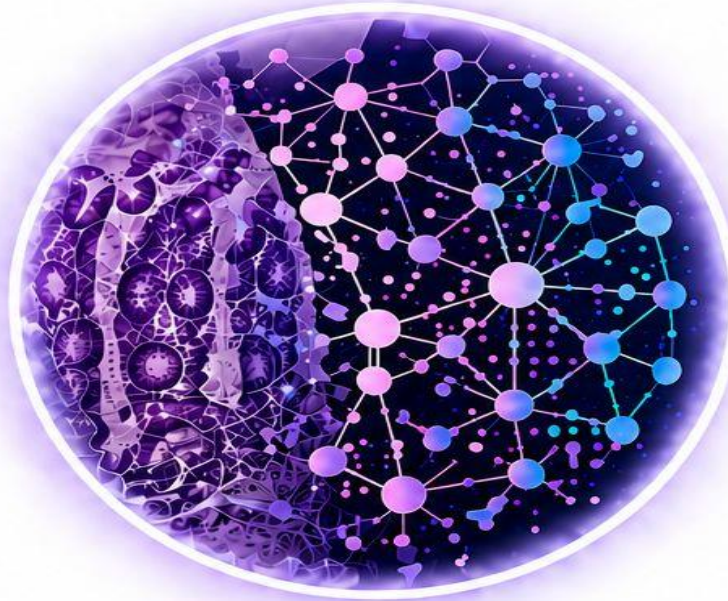
Reprogrammable Disease Modification Target



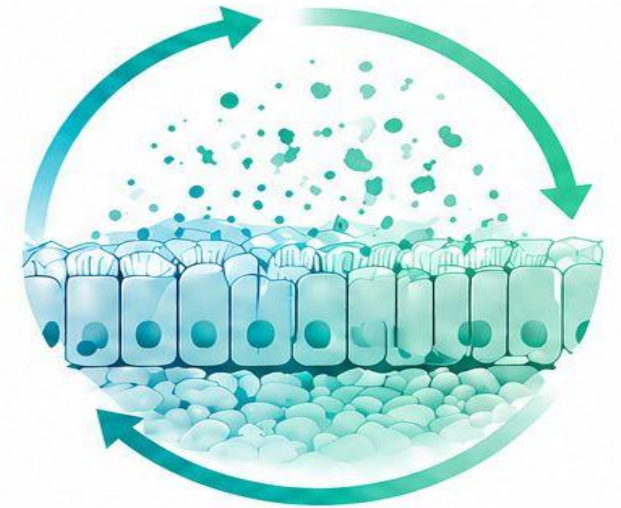
Could type 2 diabetes represent a reprogrammable, tissue-based disease?



GLUCOSE-CENTRIC
MODEL



AI-POWERED
MOLECULAR MAPPING
TISSUE-LEVEL DIAGNOSIS

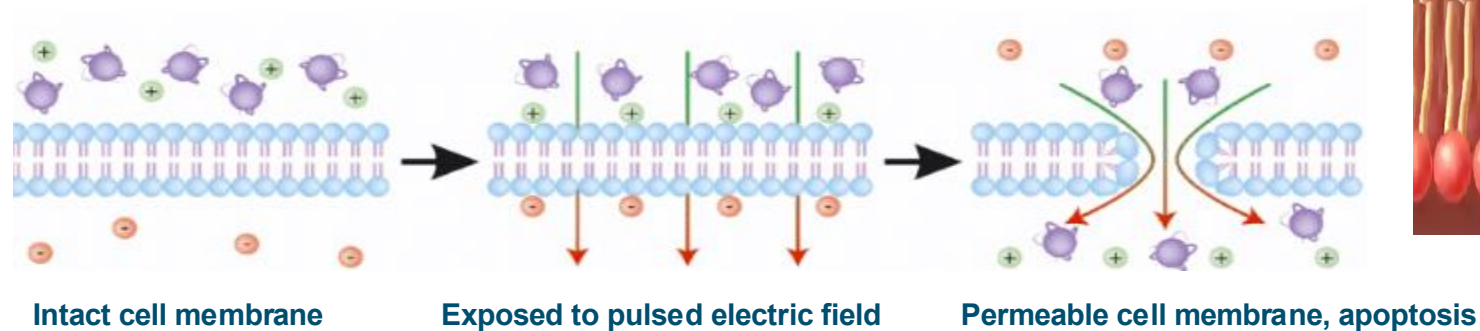
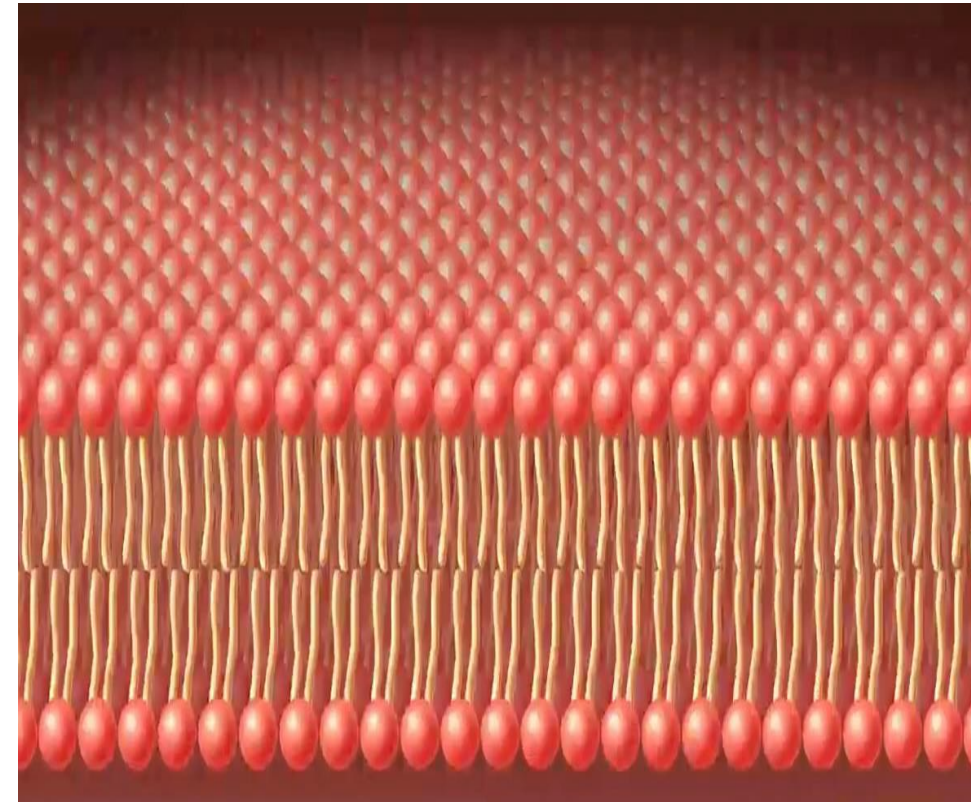


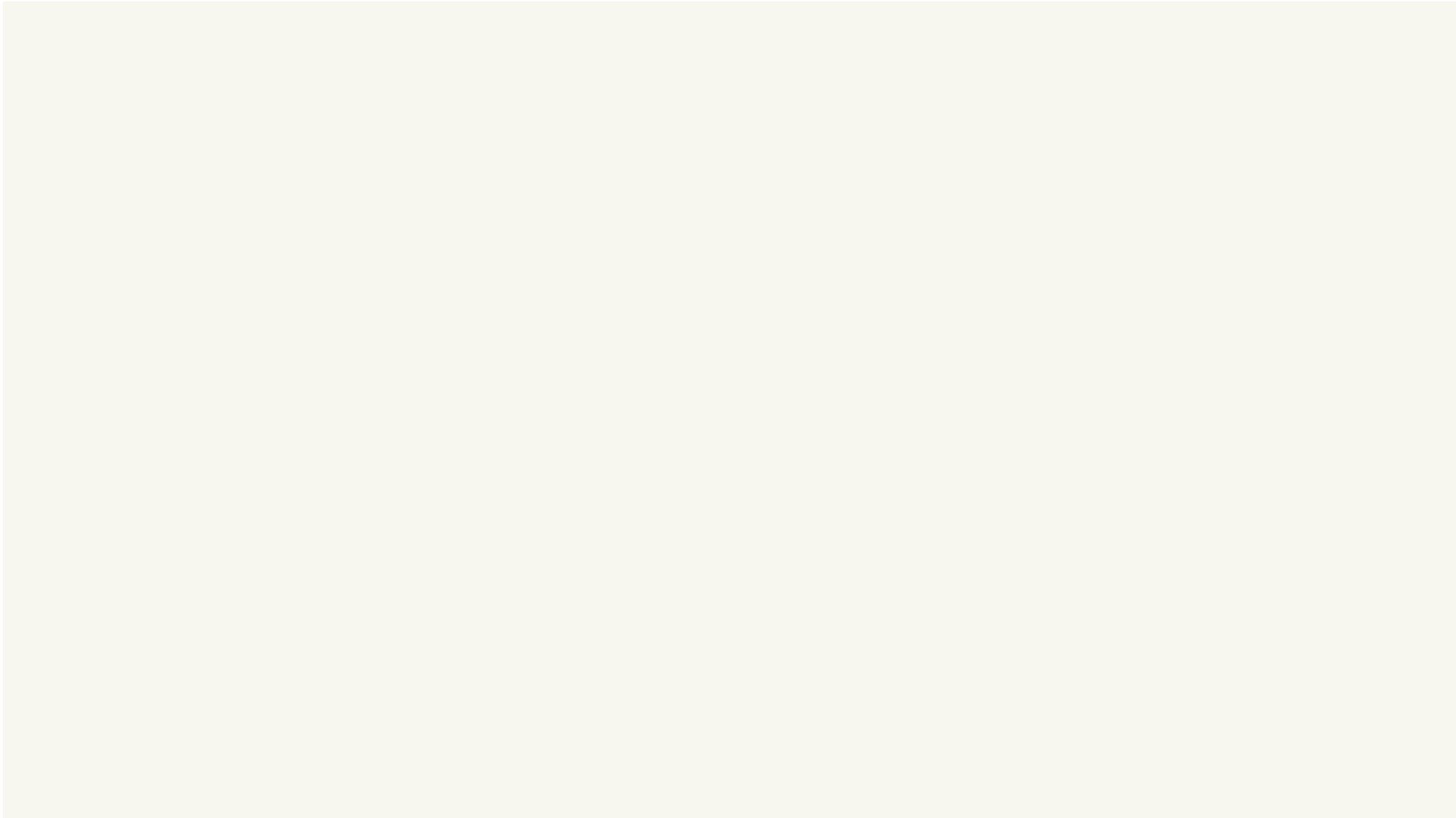
TISSUE REGENERATION
REPROGRAM. RESTORE. RENEW.

FROM GLYCEMIC CONTROL TO BIOLOGICAL REPROGRAMMING

Electroporation or Pulsed Electric Field: The Era of None Thermal Depth Ablation

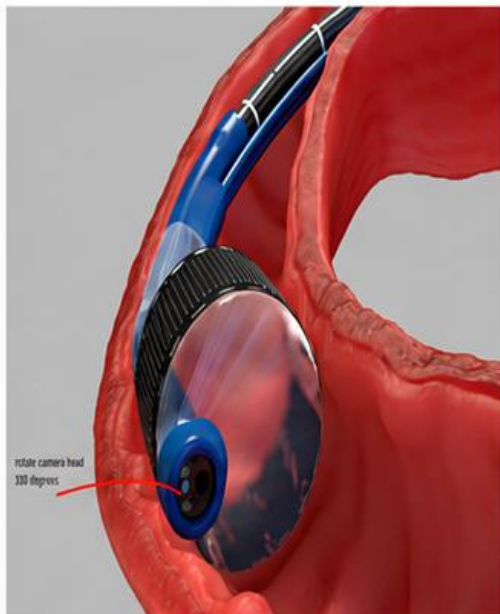
- High voltage, ultra short pulsed electric field
- Increases cell permeability resulting in cellular apoptosis
- Preserves extracellular matrix and myocytes
- Rapid re-epithelialization due to preserved tissue architecture
- Non-thermal ($< 4^{\circ}\text{C}$ average increase in probe temperature)
- Controlled depth of penetration (mucosa and submucosa)





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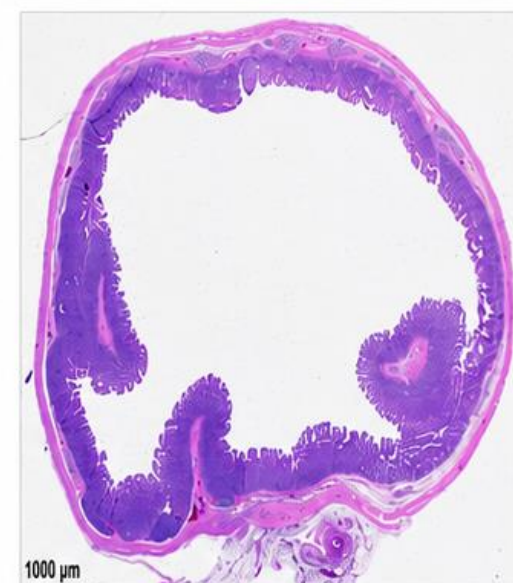
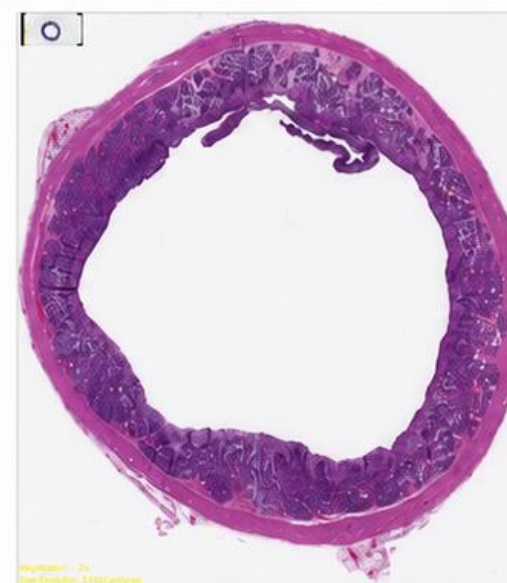
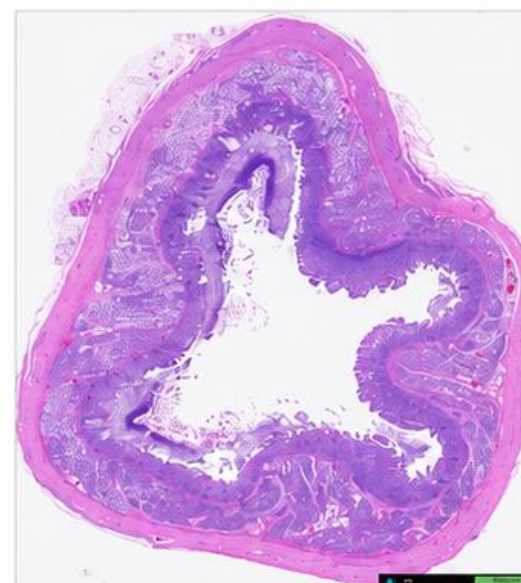




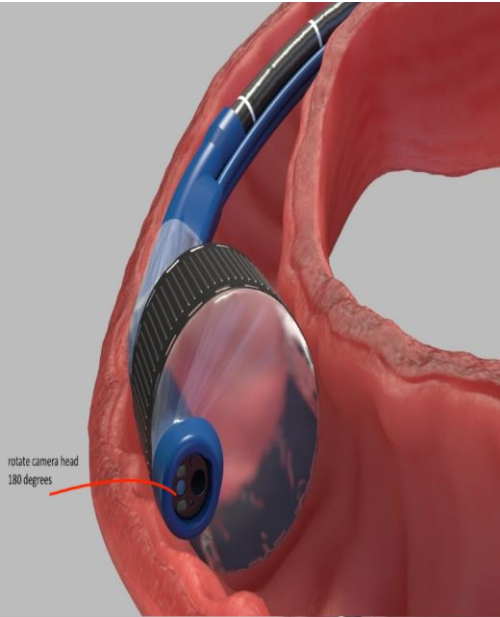
Untreated
Control



Treated

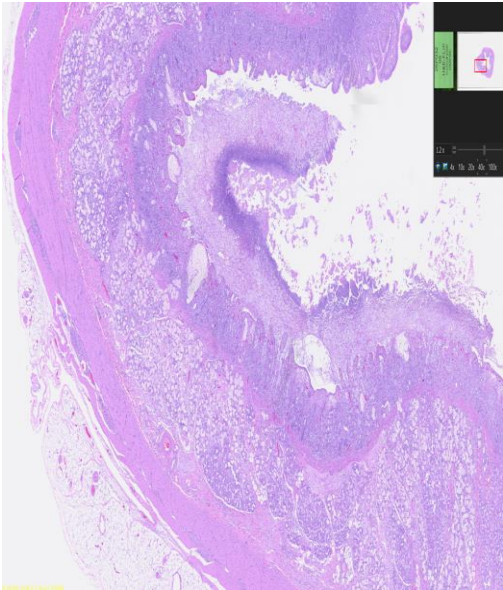
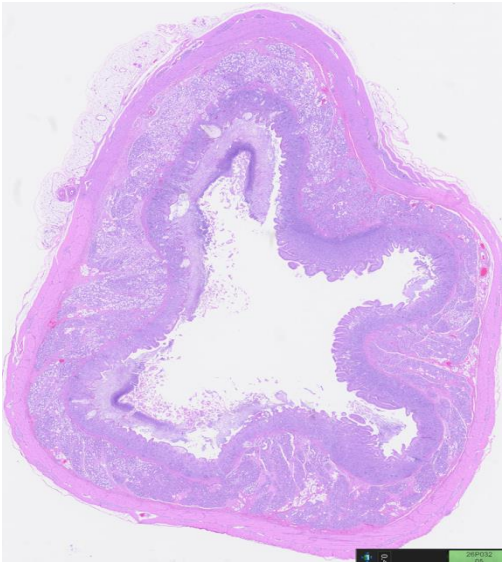


Gen 4 Catheter Histology

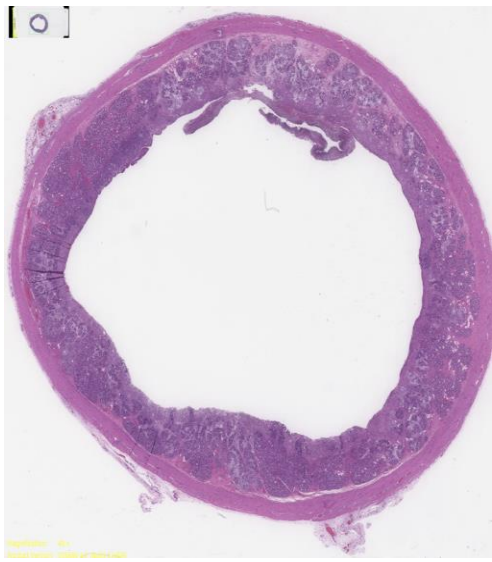


Regeneration
Sequence of
Mucosa and
Submucosa

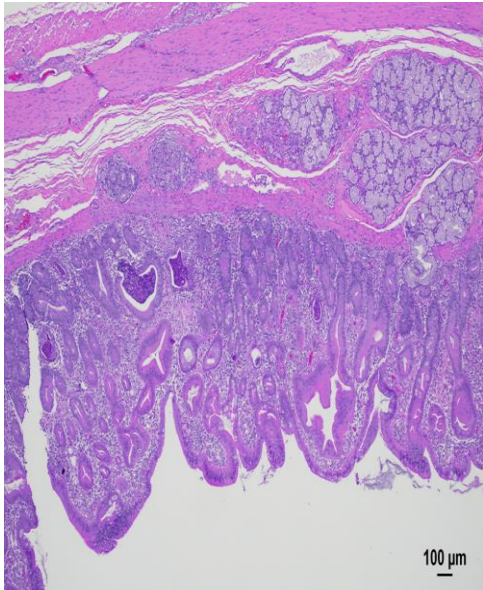
24hr



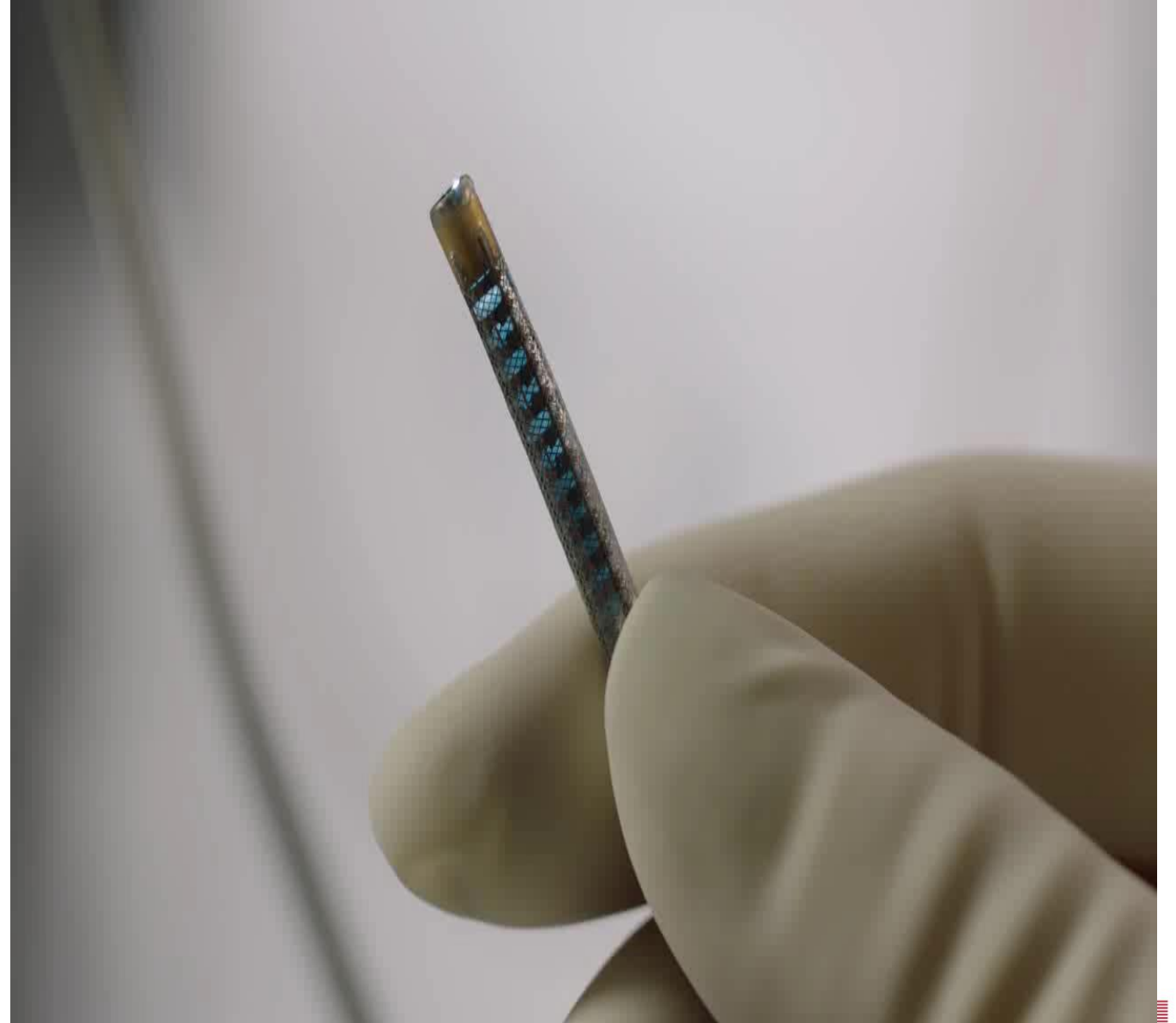
3 Days



5 Days



Digital Elegance translating to Navigational Stability and Therapeutic Capabilities

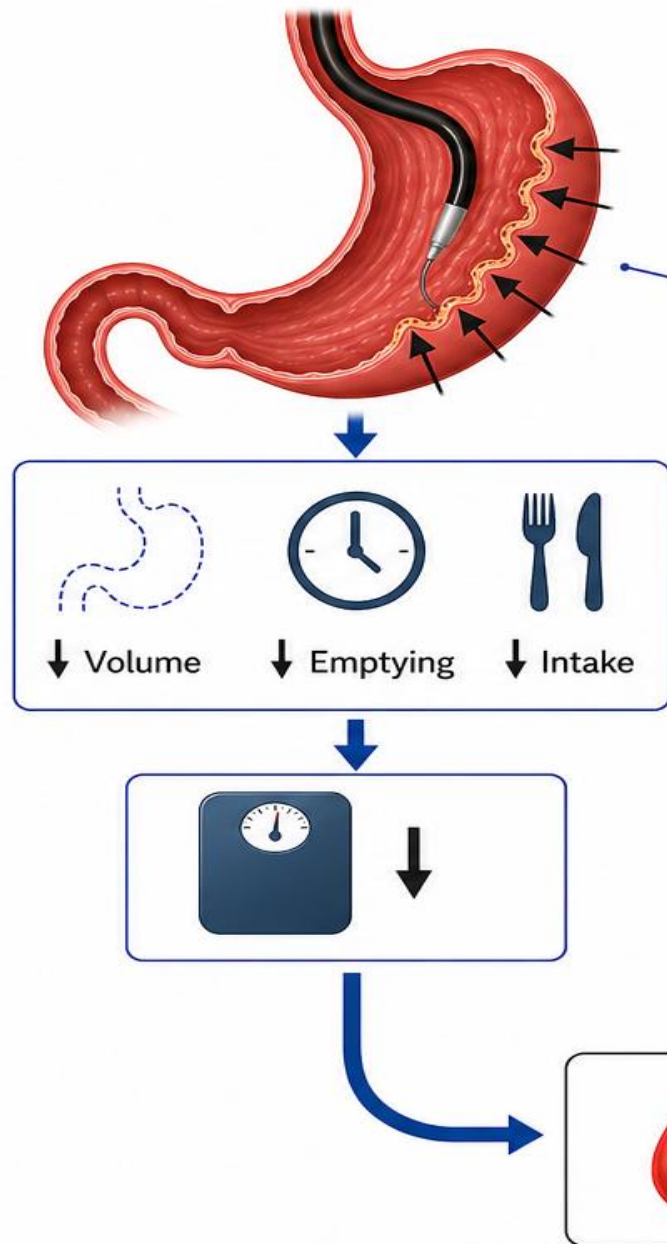




Combinations

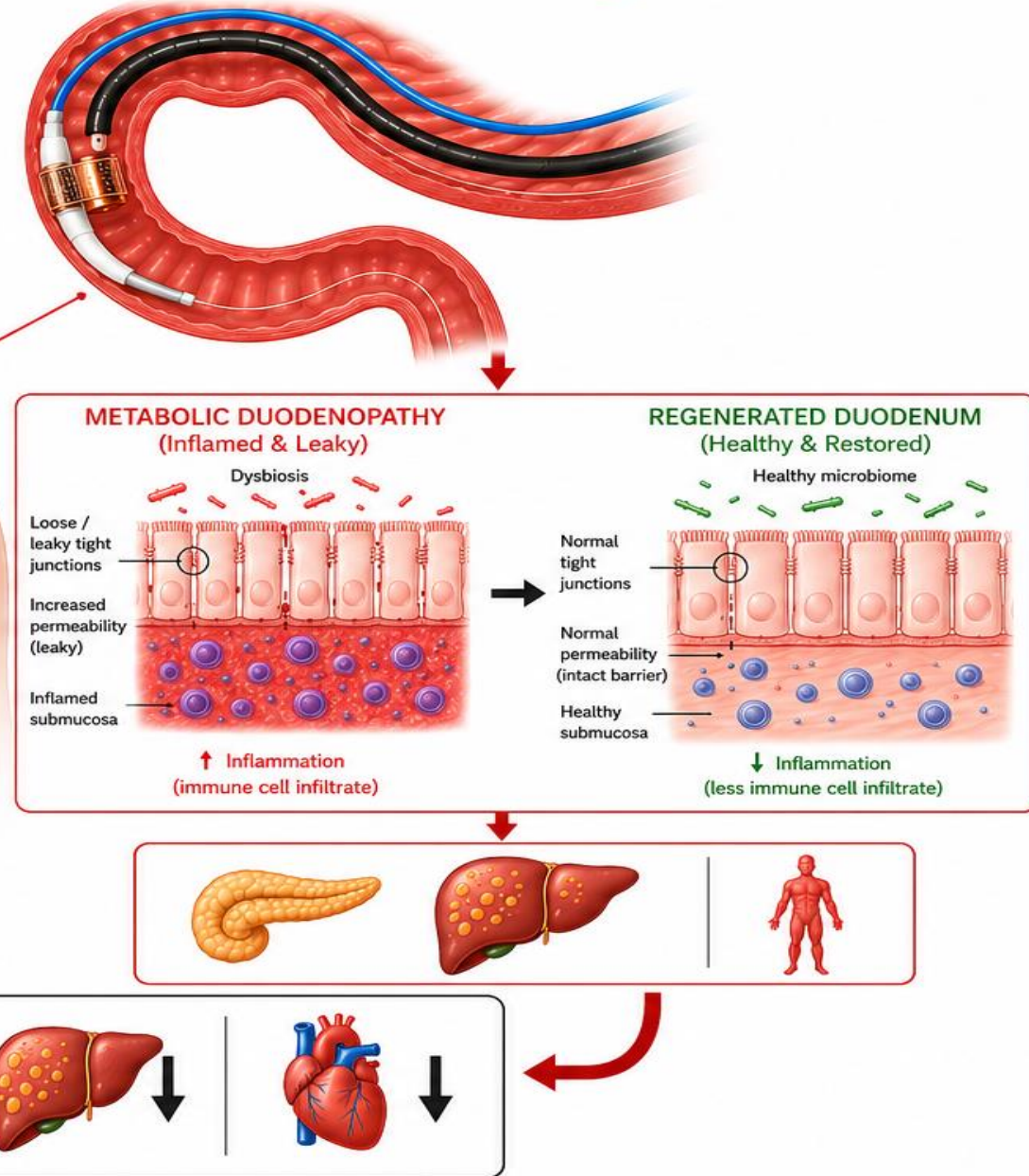
WEIGHT-DEPENDENT PATHWAY

ESG (Stomach Remodeling)



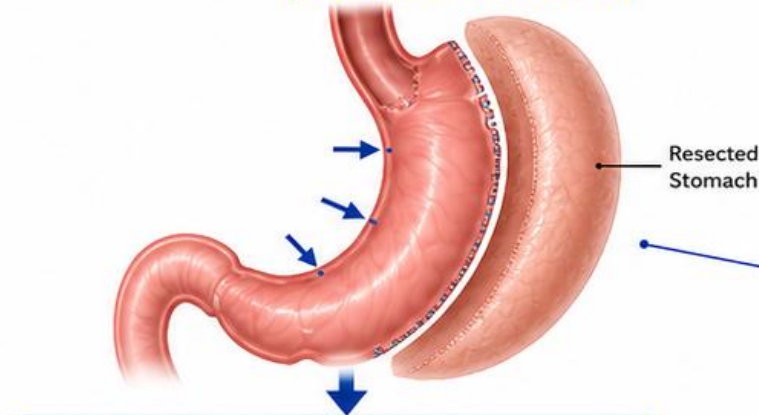
WEIGHT-INDEPENDENT PATHWAY

Duodenal PEF (Duodenal Regeneration)

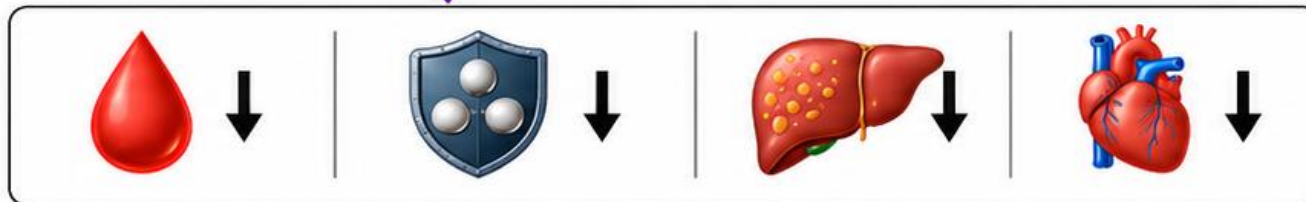


WEIGHT-DEPENDENT PATHWAY

SLEEVE GASTRECTOMY (Surgical) (Stomach Removal)

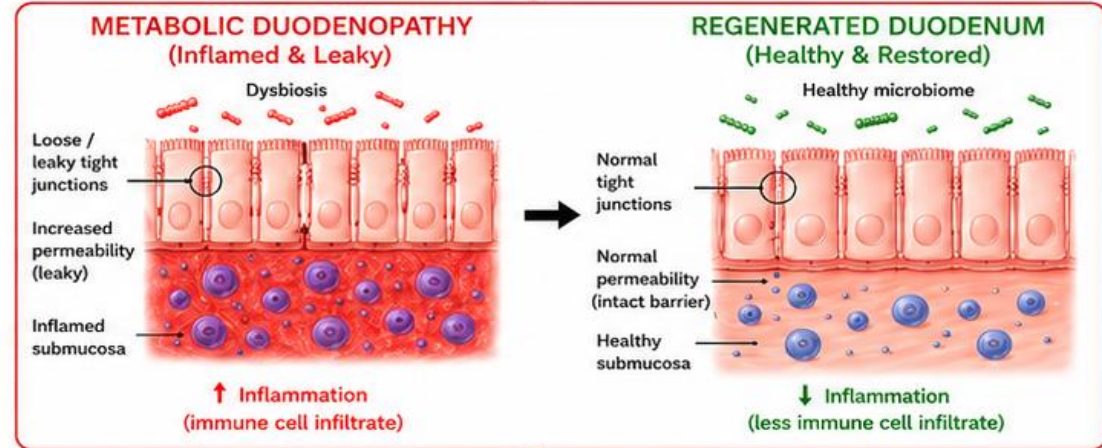
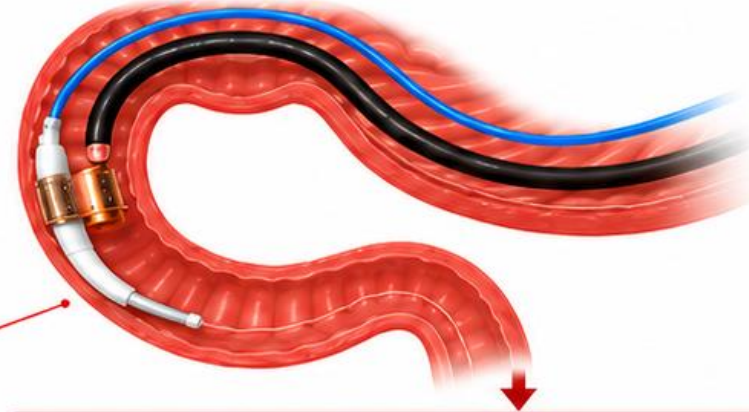


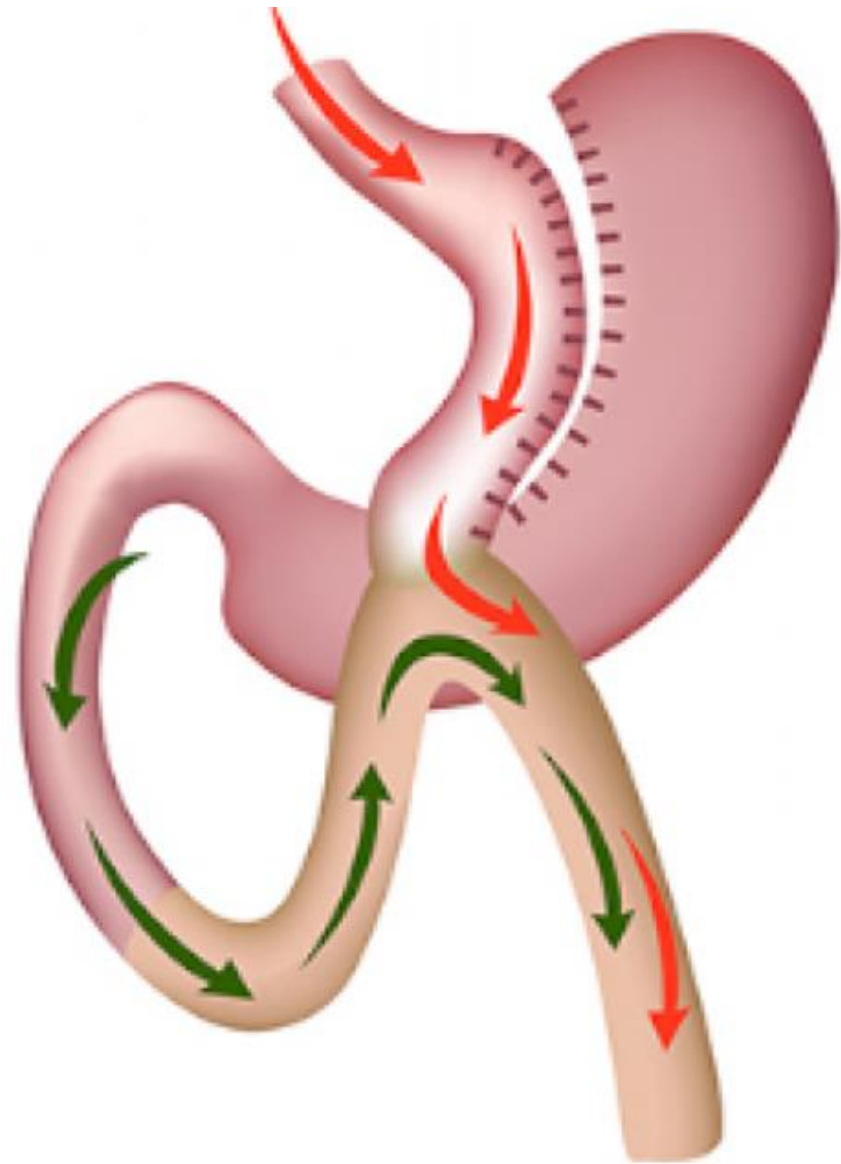
COMBINATION THERAPY OPTION SLEEVE GASTRECTOMY + DUODENAL PEF



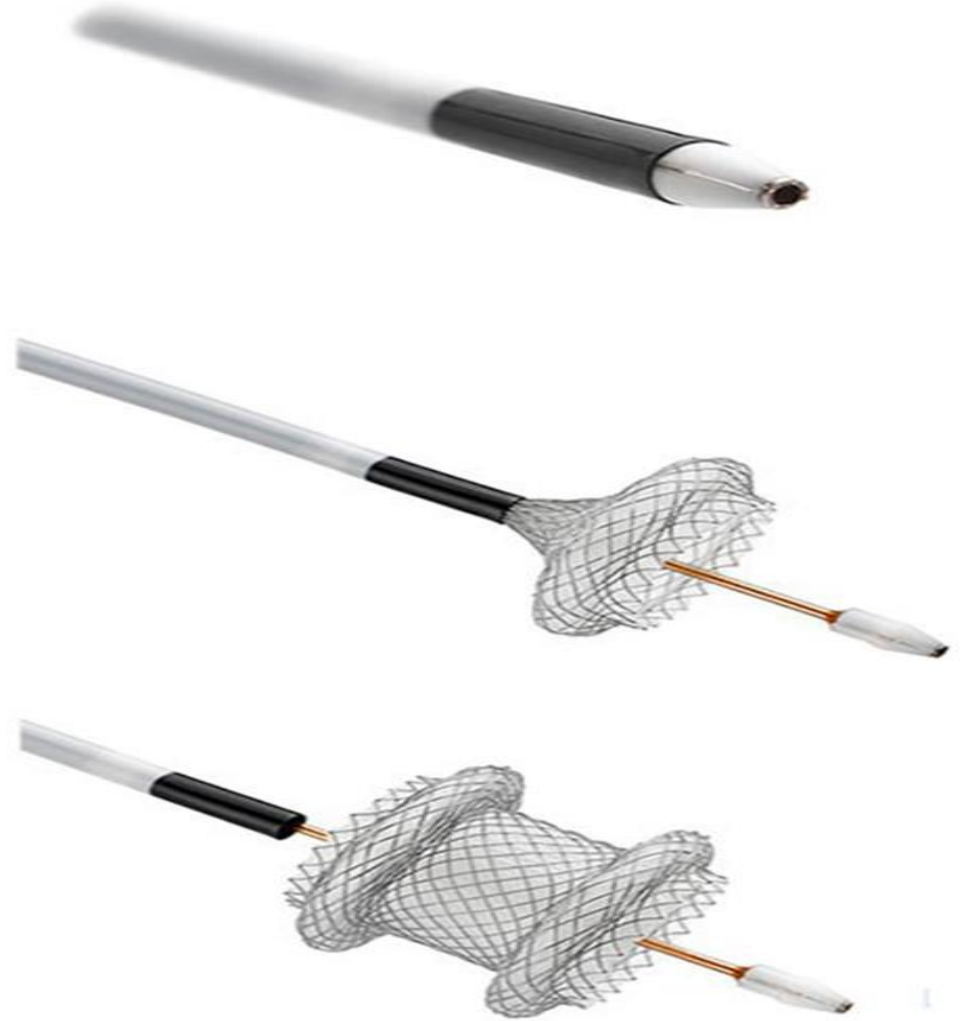
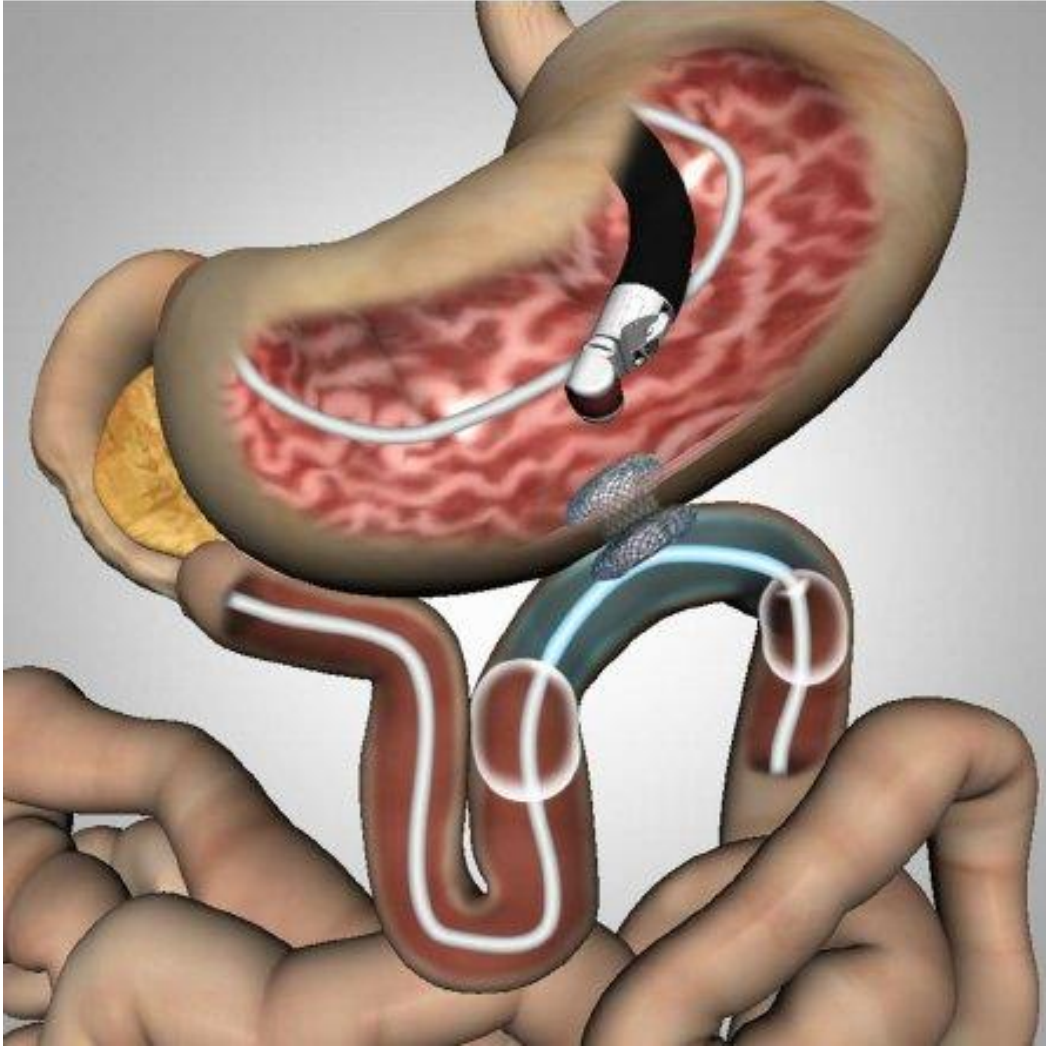
WEIGHT-INDEPENDENT PATHWAY

Duodenal PEF (Duodenal Regeneration)

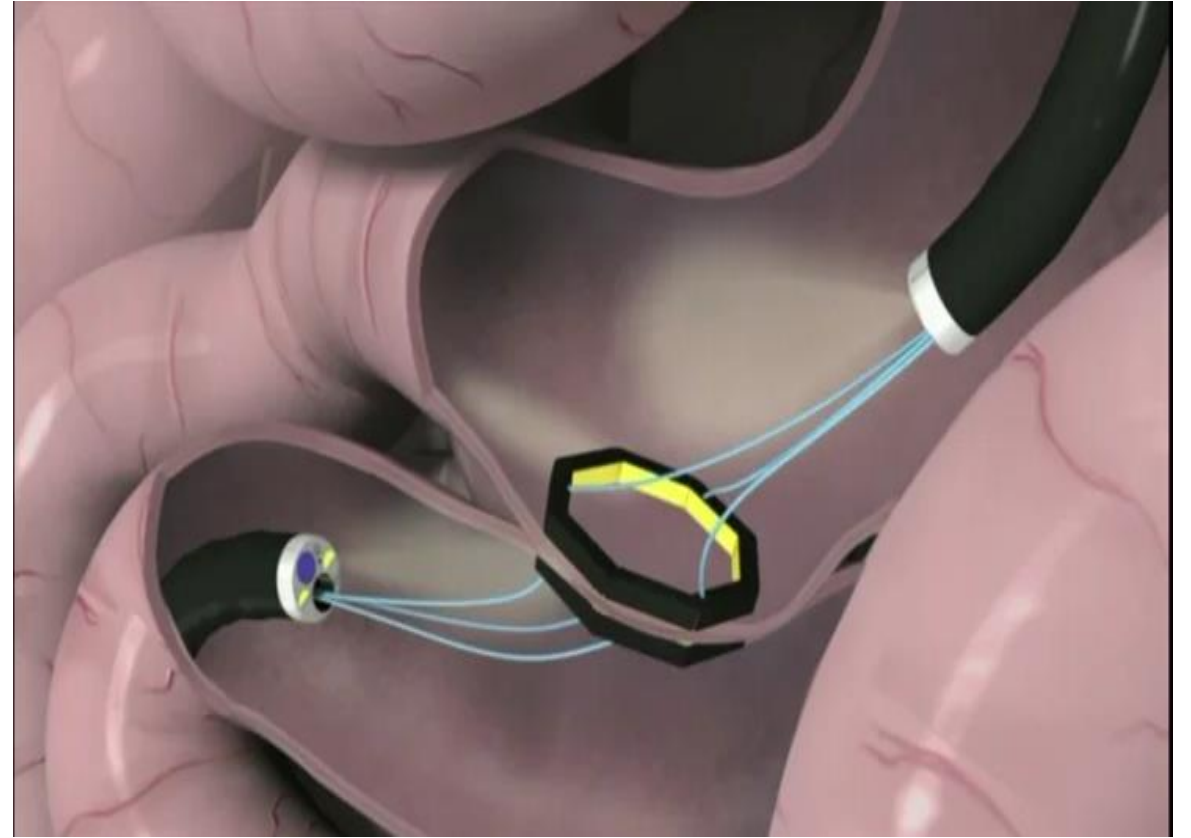




EUS GJ



Magnets



Boston Scientific

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Questions

