

# The Origin and Evolution of the Ileal Ureter

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MEDICINE *of* THE HIGHEST ORDER



# Disclosures

**We have no financial conflicts to disclose**

# Introduction

**Long ureteral strictures require complex reconstructive techniques to repair**  
**Current surgical techniques for long strictures**

- Buccal graft ureteroplasty, appendiceal interposition
- Transureteroureterostomy
- Autotransplantation
- Ureteral substitution with bowel

**Ureteral replacement with ileum**

- The first documented techniques date back to late 19th century

# Methodology

**A comprehensive literature review was performed in conjunction with the University of Rochester's History of Medicine librarian (LH)**

## Literature Review

- PubMed, ILLiad, Urological textbooks

# First Proposed Uses of Bowel in Ureteral Replacement

## 1888 – Guido Tizzoni and Alfonzo Poggi

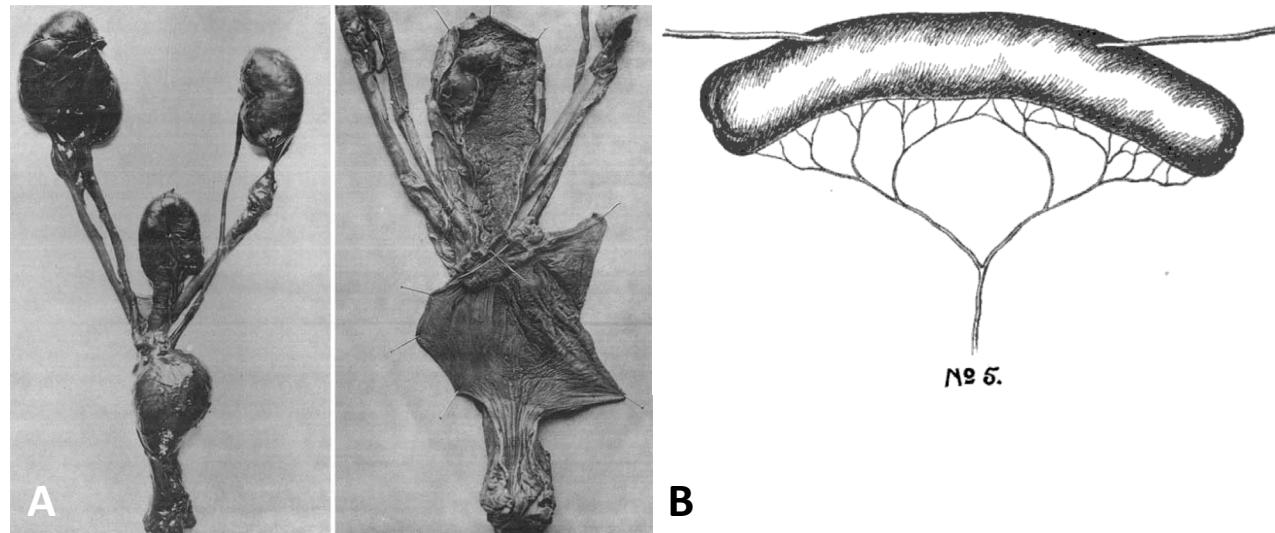
- Surgeons from the University of Bologna in Italy
- Reported a two-staged canine model

## 1893 – Christian Fenger and Joseph Bacon

- Surgeons from Chicago, Illinois
- First proposed the use of bowel in humans
- Later published by Dr. Joseph Bacon

## 1909 – George Shoemaker

- An American surgeon
- First successful surgery in a young female with tuberculosis and a solitary kidney
- Performed using a two-staged technique

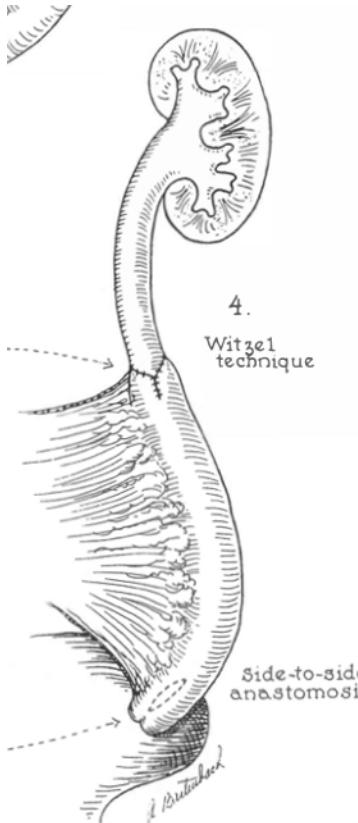


**A) Canine model of ureteral replacement (Tizzoni and Poggi. 1888.)**

# Subsequent Developments of the Ileal Ureter

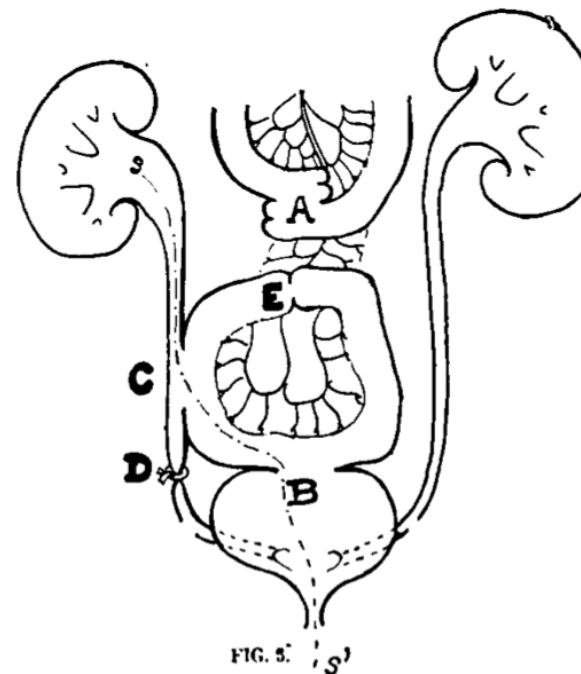
**Rudolf Nissen**

Istanbul University - 1940



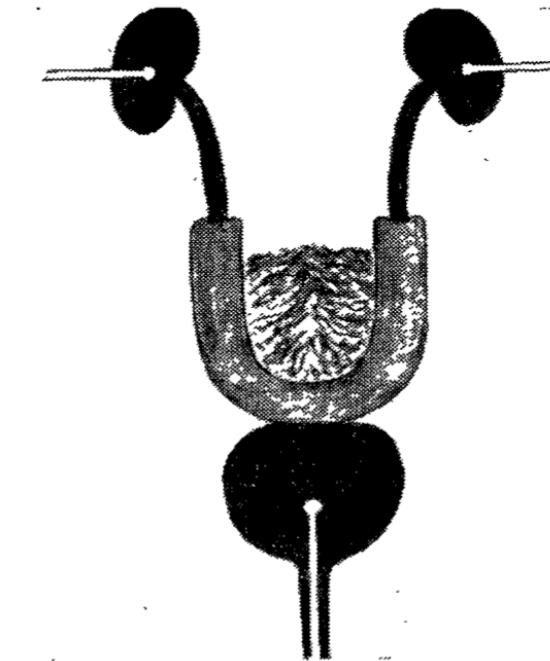
**Yves-Jacques Longuet**

Republic of Haiti - 1944



**Foret and Heusghem**

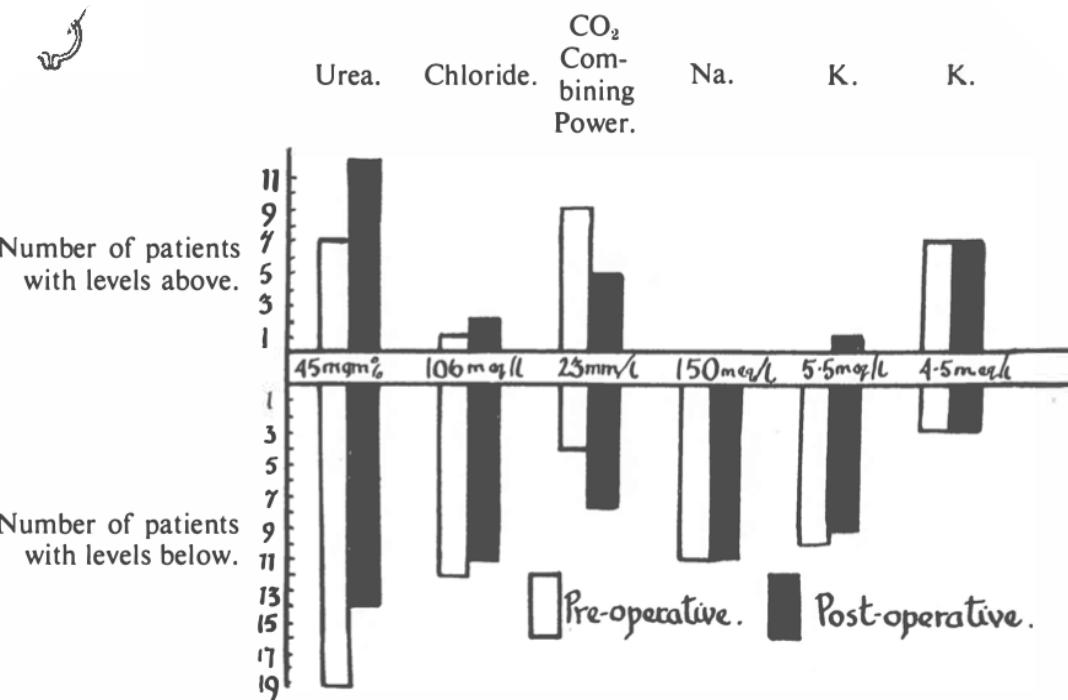
University of Liège - 1953



# Challenges of the Ileal Ureter

## Metabolic Derangements

- In 1956, Charles Wells (University of Liverpool) created the first large cohort study identifying electrolyte imbalances
- In 1985, Michael Koch (Dartmouth University) and Scott McDougal (Vanderbilt University) found that patients with preexisting renal impairment and bladder dysfunction developed worse metabolic derangements
- Increased risk of metabolic acidosis due to the resorptive property of bowel



Pre- and post-operative metabolic characteristics following ileal ureter reconstruction. *Wells. 1956.*

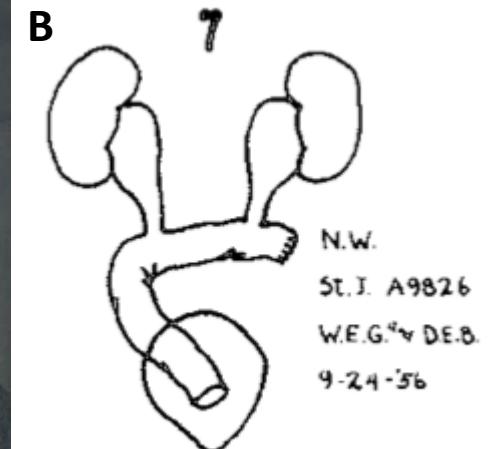
# Additional Challenges of the Ileal Ureter

## Ileal-Ureteral Reflux

- First described by Willard Goodwin (UCLA) in 1959
- Found to occur in 89% of patients without impact on renal function

## Mucous Plugging

- Leads to UTIs and calculus formation
- Proposed alternative techniques using sero- and sub-mucosal layers have led to worse inflammation and stricturing
- Patients must be educated about risk of mucosal plugging



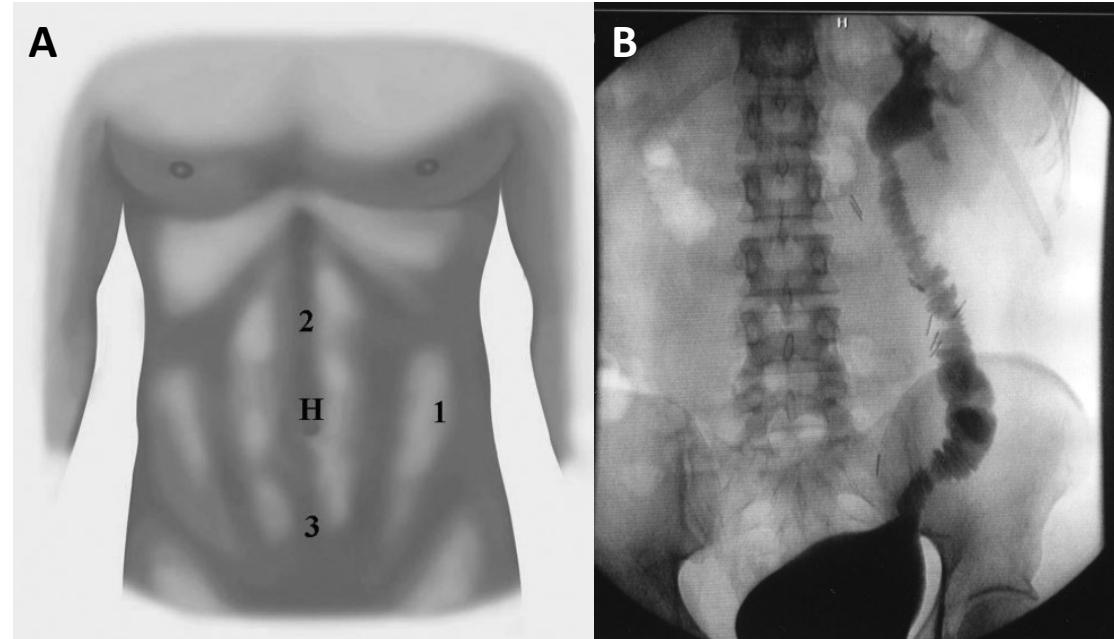
A) Willard Goodwin, MD and B) ileal ureter technique proposed by Dr. Goodwin. *Goodwin et al. 1959.*

# Advancements of Minimally Invasive Techniques

**2000** – Inderbir Gill and associates (Cleveland Clinic Foundation) published the first laparoscopic technique used for the ileal ureter.

**2008** – Joseph Wagner and associates (University of Connecticut) were the first to use a robotic-assisted ileal ureter.

**2014** – Luis Brandao and associates (Cleveland Clinic Foundation) reported the first completely intracorporeal robotic technique.



A) Robotic port placement for ileal ureter and B) post-operative cystogram of ileal ureter anastomosis. *Wagner et al. 2008.*

# Conclusions

**The ileal ureter provides a surgical option for long, complicated ureteral strictures.**

**The modern ileal ureter reflects similar techniques as described over a century ago.**

**The continued challenges associated with this procedure have led to novel surgical advances and continue to evolve.**