

The Origin and Evolution of the Ileal Ureter

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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 Alfonso Poggi

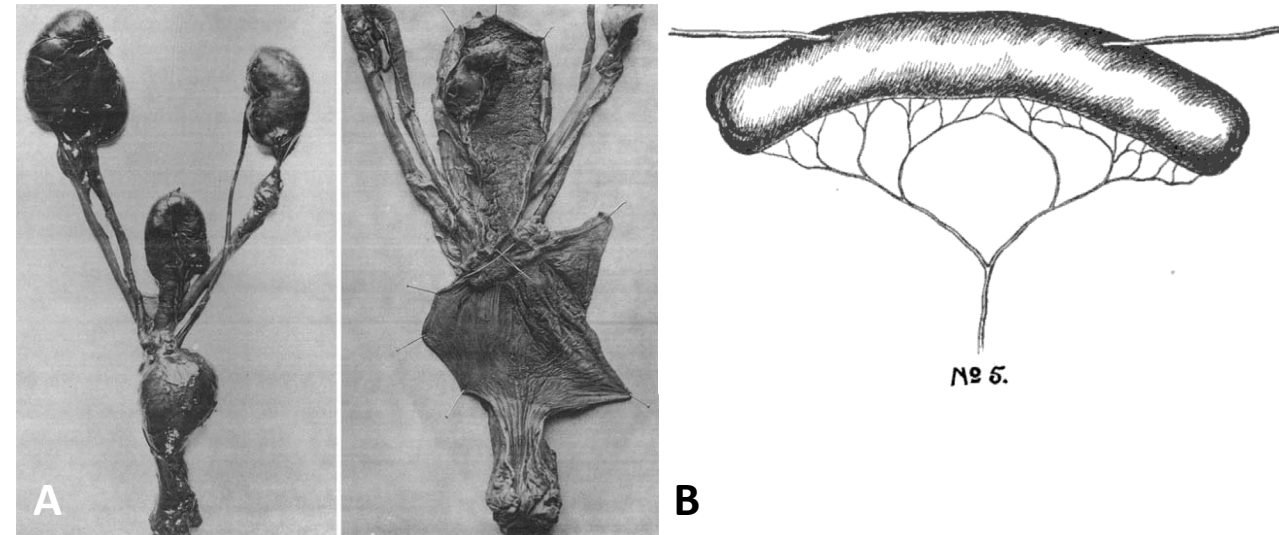
- Surgeons from the University of Bologna in Italy
- Reported a two-staged canine model

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

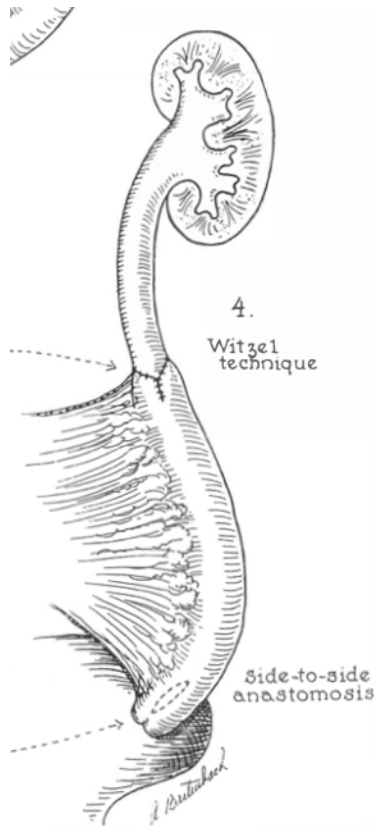


A) Canine model of ureteral replacement (Tizzoni and Poggi. 1888.)

Subsequent Developments of the Ileal Ureter

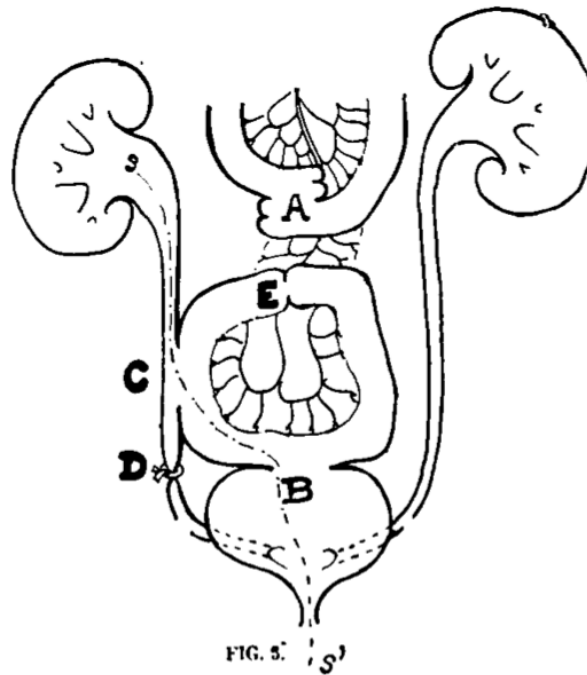
Rudolf Nissen

Istanbul University - 1940



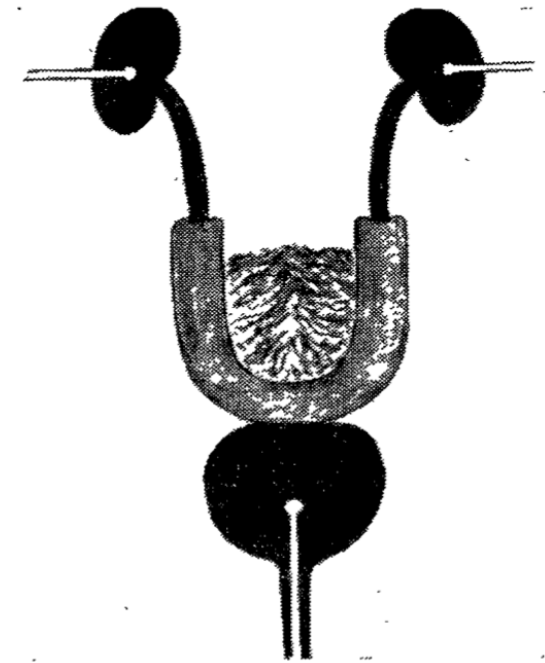
Yves-Jacques Longuet

Republic of Haiti– 1944



Foret and Heusghem

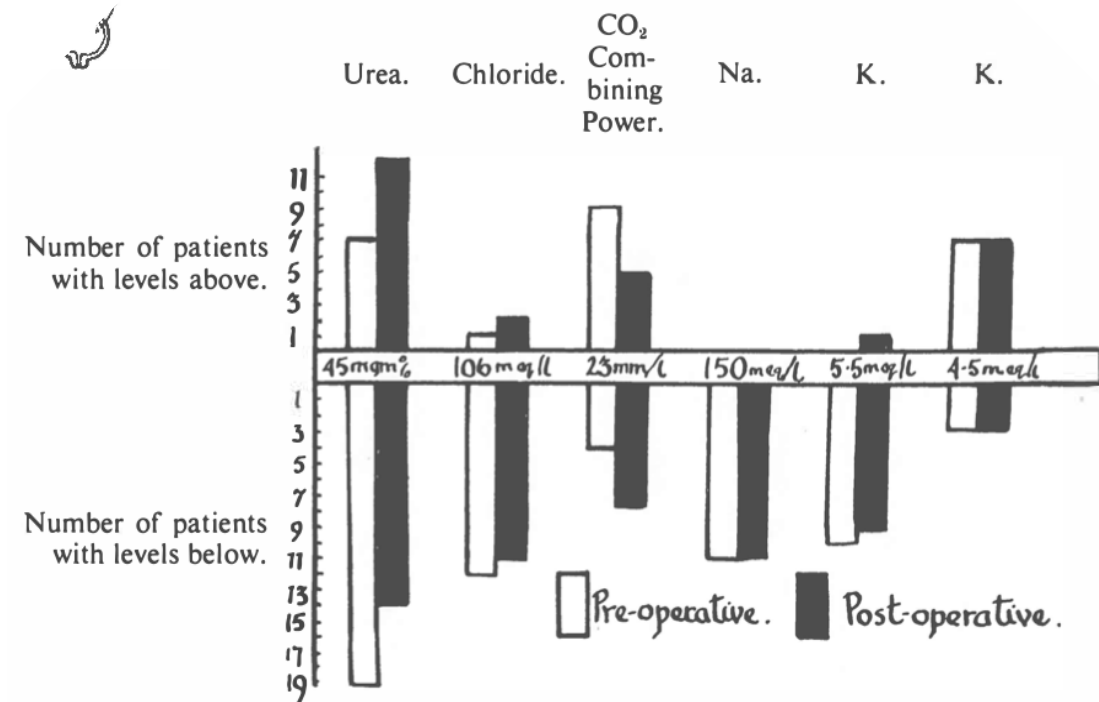
University of Liège– 1953



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.*

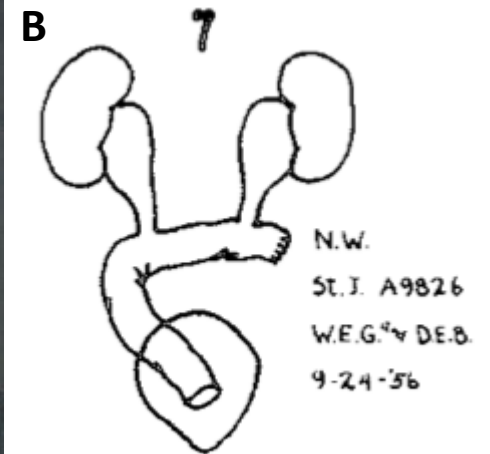
Additional Challenges of the Ileal Ureter

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



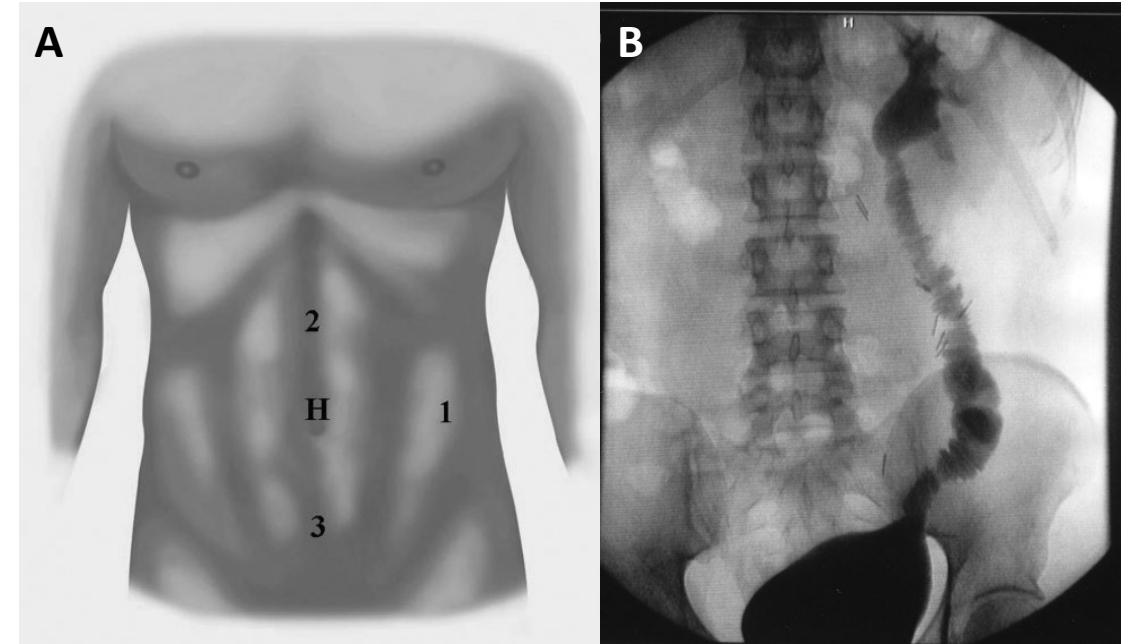
A) Willard Goodwin, MD and B) ileal ureter technique proposed by Dr. Goodwin. *Goodwin et al. 1959.*

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.