What’s Old in Pediatric Surgery? A Historical Perspective of Operating on Children

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Disclosure Information
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I have no disclosures.

If you would understand anything, observe its beginning and its development.
- Aristotle
First “Atlas” of Pediatric Surgery

- 1465
- Central Anatolia
- Serafeddin Sabuncuoglu
- Written in Turkish
  - Hydrocephalus
  - Circumcision
  - Lingual frenulum
  - Inguinal hernia
  - Imperforate anus

17th Century

- Casebook of Job van Meekeren (1611-1666)
- Barber Surgeon in Amsterdam
- First drawings of omphalocele and gastroschisis

Before Ladd

- “There are no surgical problems in childhood which demand a special skill or study”
  - Dr. Charles West, 1852
- Many diseases almost universally fatal
- Outcomes “woefully inadequate” and never published
- Pyloric stenosis
  - Treated by gastroenterostomy until 1912 (Ramstedt)
  - Mortality rate 24%
- 90% mortality rate for colostomy

Infant with Hirschsprung’s Disease, 1884
Before Ladd

- M. Paul Guersant developed first pediatric surgical unit at Hôpital des Enfants-Malades
- First texts of children’s surgery translated in English in 1873: *Surgical Diseases of Infants and Children*
- On tonsillectomy: “The majority of children should be operated on by surprise. In every case, it is indispensable that the surgeon should be surrounded with assistants capable of exerting a firm hold on the patient and displaying force proportioned to that of the child”

Children’s Hospital Boston

- Opened 1869 (CHOP 1855)
- Founded by Francis H. Brown, Civil War Surgeon
- Harvard affiliated in 1903

- Tuberculosis patients
- Pott’s disease
- Empyema
  - Rib resection
- Hernia
  - Truss of yarn or leather
  - Operative repair
    - Hospitalized 10 days
    - Bedrest 4-6 weeks
    - 4-5% recurrence rate
William E. Ladd
1880-1967

- Born to a wealthy family
- Harvard College 1902
- Harvard Med School 1906
- Joined Children’s in 1908
- "Visiting" pediatric surgeon
- Maintained adult surgery and gynecology practice in downtown Boston

When Ladd graduated from Medical School...

- IV fluids did not exist
- There were no antibiotics
- Few medications existed:
  - Opiates
  - Aspirin
  - Digitalis
- Chloroform anesthesia (no monitoring)
- Surgeons viewed children as diminutive adults

William E. Ladd
1880-1967

- First paper on intussusception in 1913
- Chief of Surgery 1927-1945
- “Meticulous surgeon using fine silk suture”
  - “Conservative but could be bold”
- Fascinated with embryology
- Reported 6 cases of malrotation and surgical correction in 1932
  - Ladd procedure

- Visiting pediatric surgeon
The Halifax Explosion

- December 6, 1917
- French munition ship, S.S. Mont Blanc collided with S.S. Imo
- World’s largest non-nuclear explosion
- 2000 people killed, 9000 injuries
- Dr. Ladd led a Red Cross mission and treated many burned and injured children
- Returned to Boston and devoted entire practice to ped surgery
- Largely credited with spawning Ladd’s dedication to pediatric surgery

Actually...

As far as the effect this experience had on my selection of a specialty I would say it was nil. From 1906 I had been on the visiting staff of the Children’s Hospital, the Infants, and the Boston City Hospital.

William E. Ladd

1880-1967

- Father of Pediatric Surgery
- Started training program (“pupship”) 1937
- 75% of U.S. pediatric surgeons lineage to Ladd
- Never learned to drive
- “pups” would meet Dr. Ladd when he arrived to work to carry his briefcase (P.C.)
William E. Ladd
1880-1967

- Published text with Robert Gross (1941)
- Many chapters accurately depict diseases and treatment for the first time (BA, CDH)
- Didn’t initially advocated for pediatric surgery as a separate surgical specialty

Herbert E. Coe
1881-1968

- First “true” pediatric surgeon in the United States
- After WWI, spent time with Ladd in 1919
- Exclusive pediatric surgery practice in Seattle
- Visionary but scoffed by surgical societies
- Participated in AAP and developed surgical section (first Chairman)
Robert E. Gross
1905-1988

- Born in Baltimore
- Son of a piano maker
- Nearly blind in his right eye
- Worked on a farm in Minnesota
- Read Sir William Osler by Harvey Cushing
- Harvard med school – graduated 1931

Robert E. Gross
1905-1988

- Kicked out of the operating room by Cushing
- Letter of recommendation to Ladd re: Gross
  “Mr. Gross is somewhat above the average. He should make a satisfactory House Office”
- Not selected for surgery internship
- Studied pathology with Wolbach
- Surgery resident at Brigham
- Chosen by Ladd as chief resident in 1935

Robert E. Gross
1905-1988

- Worked out a surgical approach for PDA ligation on dogs/ human cadavers
- Ladd thought heart surgery was too risky
- Waited for Ladd to go on vacation
- Performed the first PDA ligation August, 1938
  – Lorraine Sweeney, 8
  – birth of modern cardiac surgery
- Ladd wasn’t happy when he returned
Robert E. Gross
1905-1988

- Single author textbook 1953
- Lost chapter on sacrococcygeal teratoma
- Ladd never forgave Gross for PDA surgery
- Received numerous honors and awards
- Used gold-handled instruments
- “If an operation is difficult, you are not doing it properly”

Robert E. Gross
1905-1988

- Ladd retired in 1945
- Gross named Chief in 1947
- From 1947-1968, trained 69 pediatric surgeons
- Continued to operate until 1972
Robert E. Gross
1905-1988

- Continued to make contributions to cardiac surgery
  - Repair of coarctation in 1948
  - Surgical treatment of vascular rings
- Remained friends with Lorraine Sweeney

C. Everett Koop
1916-2013

- Trained by Gross
- Children’s Hospital of Philadelphia, 1946
- Trained 38 pediatric surgeons
- Participated in development of first NICU, 1956
- “Pediatric Surgery”
- First Editor-in-chief of JPS
- Surgeon General 1981
- Controversial stance on right to life, euthanasia

H. William Clatworthy
1917-2000

- Last to be trained by Ladd and first by Gross
- Columbus Children’s, 1950
- Trained 41 pediatric surgeons
- Little patience for error
- “Big Red”
- Clatworthy Committee
- Instrumental in formalizing pediatric surgical training in US and Canada
Judah M. Folkman
1933-2008

- Son of a Rabbi
- Harvard Med School
- Worked in lab with Gross
- Trained at CHOP with Koop
- Chief at CHB 1968-1982
- Started the 2 year fellowship
- Angiogenesis Research
  - 400 manuscripts
  - 200 book chapters
  - More than 1000 labs
  - Currently, 1.2 million patients receiving anti-angiogenic drugs

W. Hardy Hendren

- Harvard Med School 1951
- Led the movement for residency match
- Trained under Gross (1960)
- 2 cases scheduled on 1st day, cancelled by Gross
- Recruited back to MGH, then returned to Childrens 1982
- Pioneer work in pediatric urology, cloacal malformations
- “Hardy Human”
- Rode a BMW 750 motorcycle

Other notable giants...

- Orvar Swenson
- Willis Potts
  - Childrens Memorial
- Oswald Wyatt
  - Minneapolis
- Thomas Santulli
  - Babies Hospital
- Judson Randolph
  - Childrens National
- Thomas Holder
  - Kansas City
History of Select Pediatric Surgical Diseases

- Hirschsprung’s Disease
- Esophageal Atresia
- Imperforate Anus
- Congenital Diaphragmatic Hernia
- Wilms’ Tumor

Hirschsprung’s Disease

Harald Hirschsprung
- Senior pediatrician in Copenhagen
- Described 2 cases of “congenital dilation of the colon”
- Both patients died (7 and 11 mo)
- Presented autopsy findings at the Pediatric Congress in 1886

Hirschsprung’s Disease

- Many theories advanced re: pathogenesis
  - Malfunction
  - Obstruction
  - Spastic theory
- Multiple attempts at surgical repair
  - Colostomy (Halsted, 1893)
  - 50% mortality with resection of dilated colon
- It took 60 years before etiology was determined
Hirschsprung’s Disease

Orvar Swenson
- 1909-2012
- Born in Sweden
- Harvard Med School 1937
- Pathology residency at Brigham
- Boston Children’s 1945
- Performed first successful operation for aganglionosis in 1948: sphincter-sparing rectosigmoidectomy
- Moved to Boston Floating in 1950 - “disagreements with Gross”
- Surgeon in Chief at Children’s Memorial 1960-1973

Hirschsprung’s Disease

Fritz Rehbein
- Bremen, Germany (1958)
- Modified low anterior resection
- 3-5 cm from anal verge
- Higher incidence of anastomotic perforation and constipation

Hirschsprung’s Disease

Bernard Duhamel
- Paris, France (1956)
- Retrorectal pullthrough sparing anterior aganglionic rectal wall
- Later modified using stapling devices
Hirschsprung’s Disease

Franco Soave

- Genoa, Italy (1963)
- Endorectal pullthrough
- Modified by Boley in 1964 – by performing an anastomosis

Hirschsprung’s Disease

Improved Mortality

- 1900 – incurable
- 1940’s – 70%
- 1970’s – 25%
- 1990’s – 6%
- 2010 – 1-2%

Esophageal Atresia/Tracheoesophageal Fistula

- First described in 1670 in a set of thoracopagus twins – Narrative of a Monstrous Birth...
- First attempt at repair in 1888 in London
- Multiple failed attempts
- Lanman reported 32 cases of attempted primary esophageal anastomosis – all patients died
Esophageal Atresia/Tracheoesophageal Fistula

• Leven (Minnesota) and Ladd reported multi-stage approach (1939)
  • Gastrostomy
  • Ligation of fistula
  • Esophagostomy
  • Creation of antethoracic esophagus (jejunum/skin tube)
  • Required long hospital stay

Cameron Haight

• Thoracic surgeon
• University of Michigan
• 1st successful primary repair using left extrapleural approach
• March 15, 1941
• Used 2-layer telescoping anastomosis
• Performed 284 TEF repairs
• Reported 52% overall survival rate (1939-1969)

Imperforate Anus

• Most patients died
• Inguinal colostomy performed 1783 (high mortality)
• Use of knife or sound to puncture membrane
  • Only effective if low IA
  • Strictures common
• Wangensteen and Rice, 1930: invertogram
**Imperforate Anus**

Alberto Peña

- Mexico City
- Spent time in Boston (1971)
- Studied anatomy of imperforate anus
- Described Posterior Sagittal Anorectoplasty (PSARP) in 1982

**Congenital Diaphragmatic Hernia**

- First described in 1752
- Most surgeons delayed repair (75% mortality)
- Ladd and Gross reported survival in 9 of 16 infants (1940)
- Gross reported first survivor less than 24 hours old (1946)
- ECMO first used in 1981

**Wilms’ Tumor**

Carl Max Wilhelm Wilms

(1867-1916)

- Initially studied pathology
- Professor of surgery in Leipzig
- Published “Die Mischgeschwülste der Niere” in 1899
- Recognized nephroblastoma arose from middle germ cell layers
- Died from diphtheria during WWI from a patient
Wilms’ Tumor

- Initial survival rates were poor
- Ladd reported 20% survival (1941)
- National Wilms Tumor Study Group started in 1969
- Added actinomycin D and vincristine
- Abdominal radiation postop
- NWTS 1-5; survival increased to 90%
- NWTS merged with COG in 2001

Evolution of Pediatric Surgery as a specialty

- Considerable resistance to specialty boards for “children’s surgery”
- “anyone who could operate on a bunny rabbit could operate on newborns” – Boston surgeon
- 1948: surgical section of American Academy of Pediatrics

Evolution of Pediatric Surgery as a specialty

- 1966: Journal of Pediatric Surgery
- 1968: American Pediatric Surgery Association
  - First meeting 1970
  - Gross elected 1st president

Stephen L. Gans
Harvey Beardmore
Robert E. Gross
1905-1988

“There have been few things in life, which have been more satisfying than to face a small child struggling for his very existence, to perform some corrective surgical maneuver and later to see the youngster thriving and healthy, starting out in life, sound in body and mind”

References


References