Pediatric Abdominal Wall Defects

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September 24, 2015
Case Presentation

• HPI: 37.6 week gestational age female born via C-section

• Maternal Hx: 21yo G0110, GBS+, no prior medical problems

• Prenatal care: diagnosed with Gastroschisis at 12 weeks gestation, monitored via serial US
Case Presentation

- Birth: 2410g, APGAR 9/9
- Defect - 4.5cm abdominal wall defect involving stomach, small bowel, rectosigmoid colon, bladder, internal genitalia
- No other abnormalities appreciated - patent anus
- Vitals 98.0F  69/35  172  40  100%

16.2 | 14.4 | 396
45.9 | 367
4.0  | 19   | 0.8
5.4  | 31   | 39
3.2  | 16   | 0.6
Case Presentation

• Isolation bag with saline, NPO, IV hydration, Ampicillin/Gentamycin

• Echocardiogram 8/12 - patent foramen ovale, slight mitral regurgitation
Day of Life 1

- Intubation, OG tube placement
- Extension of abdominal wall defect and reduction of contents
- Respiratory depression – O2 sat to 40%
- 7.5cm silo application
Day of Life 6

- Indication: ill-fitting of silo
- Lysis of adhesions, re-application of silo
Day of Life 9

- Indication: Open abdomen, inability to reduce bowel
- Skin flap creation to flanks
- 8x5 inch Goretex mesh application
- Skin closed over
Day of Life 22

- Indication: Central skin necrosis
- Excision of necrotic skin and Goretex graft
- Attempted primary closure with noted mottling of lower extremities
- Application of 6.4cm Ventralex mesh
Day of Life 29

- Indication: Abdominal wall closure, skin dehiscence
- Mesh removal
- Approximation of fascia and abdominal wall
Today - doing well!
Questions?
Pediatric Abdominal Wall Defects
Outline

• Embryologic development of abdominal wall

• Gastroschisis

• Omphalocele

• Prenatal care

• Neonatal care

• Surgical options

• Post-operative concerns
Weeks 3-5
Abdominal Wall Development

- Folding of embryo in 4 planes → ventral ring (future umbilicus)
  - cranial
  - caudal
  - left and right lateral
Week 6
Physiologic Midgut Hernia

- Rapid growth of intra-abdominal contents → protrusion of midgut
- via ventral ring
Week 10
Reduction of Hernia

• 270 degree counterclockwise midgut rotation around SMA

• Return of abdominal contents into abdominal cavity
Gastroschisis
Gastroschisis

- Incidence – 1-2/10,000

- Etiology - vascular accident
  - involution of umbilical vein → full thickness defect of abdominal wall
  - premature involution of right vitalline artery

- Risk Factors
  - smoking
  - young maternal age <20yo
  - maternal medications - vasoactive medications - pseudoephedrine, aspirin
Gastroschisis - Hernia

- 2-5cm defect
- right>left of umbilicus
- Contents - small and large bowel, rarely liver
- NO SAC - freely protruding contents
- Appears thickened, dry and matted intestines
Gastroschisis

- Associations
  - prematurity
  - cryptorchidism 30%
  - GERD 16%
  - intestinal atresia 10%
- Mortality <5%
Omphalocele
Omphalocele

- Incidence – 1/10,000

- Etiology
  - failure of midgut regression
  - incomplete lateral body wall fold - larger defect involving liver
Omphalocele - hernia

- 1-15cm defect
- Umbilical defect
- Contents - normal appearing small bowel, spleen, liver
- SAC - covered by peritoneal/amniotic sac - can rupture
Omphalocele

- Associated malformations 60%
  - pulmonary hypoplasia
  - cardiac - VSD is most common
  - renal, limb, facial abnormalities
  - Pentalogy of Cantrell
  - Beckwith-Wiedemann Syndrome
  - trisomy 13,14,15,18
  - smaller defect without liver has higher risk of chromosomal abnormalities
- Mortality 25% - due to chromosomal abnormalities
Pentalogy of Cantrell

- Omphalocele
- Anterior diaphragmatic hernia defects
- Sternal cleft
- Ectopia cordis
- Intracardiac defect - VSD
Beckwith-Wiedemann Syndrome

- Macroglossia
- Macrosomia
- Ear creases or ear pits
- Neonatal hypoglycemia
- Midline abdominal wall defects - omphalocele, umbilical hernia, rectus diastasis
## High Yield

<table>
<thead>
<tr>
<th>Feature</th>
<th>Gastrochisis</th>
<th>Omphalocele</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>size</strong></td>
<td>small</td>
<td>small or large</td>
</tr>
<tr>
<td><strong>location</strong></td>
<td>periumbilical (right&gt;left)</td>
<td>umbilical</td>
</tr>
<tr>
<td><strong>contents</strong></td>
<td>midgut, bladder</td>
<td>midgut, stomach, spleen, liver</td>
</tr>
<tr>
<td></td>
<td>none</td>
<td>2 layers of amniotic peritoneal membrane</td>
</tr>
<tr>
<td><strong>bowel appearance</strong></td>
<td>matted, edematous</td>
<td>normal</td>
</tr>
<tr>
<td><strong>associated conditions</strong></td>
<td>intestinal atresia, prematurity, GERD, cryptorchidism</td>
<td>cardiac anomalies, renal defects, limb defects, pentalogy of cantrell, BWS, trisomies</td>
</tr>
</tbody>
</table>
Prenatal Testing

- Ultrasound
- Elevated maternal and amniotic alpha-fetoprotein levels
- Polyhydramnios
- Amniotic karyotyping if omphalocele
Delivery

- Involve obstetrics, NICU, pediatric surgery teams
- Vaginal delivery versus C-section - no difference
- Spontaneous labor versus induction
Neonatal Care

- Fluid management
- Nutritional support
- Identify and treat associated anomalies
- Bowel status
- Cosmetic and safe closure of abdominal wall defect

Fig. 11-23 Gastrochisis encased in a silo pouch; the bowel is covered with povidone-iodine (Betadine)-soaked gauze and plastic film. Also note infant’s gray color, indicating shock, and placement of tape to measure abdominal circumference without disturbing neonate.

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Neonatal Care

- Fluid management
- Nutritional support
- Identify and treat associated anomalies
- Bowel status
- Cosmetic and safe closure of abdominal wall defect

- Saline gauze dressing and bowel bag - minimize heat loss
- IV fluids - resuscitative versus maintenance
Neonatal Care

- Fluid management
- Nutritional support
  - Identify and treat associated anomalies
- Bowel status
- Cosmetic and safe closure of abdominal wall defect
  - IV fluids
  - Albumin
  - TPN
Neonatal Care

- Fluid management
- Nutritional support
- Identify and treat associated anomalies
- Bowel status
- Cosmetic and safe closure of abdominal wall defect

- Non-ruptured Omphalocele
- Chest X-ray
- Echocardiogram
- Renal US
Neonatal Care

- Fluid management
- Nutritional support
- Identify and treat associated anomalies
- Bowel status
- Cosmetic and safe closure of abdominal wall defect

- 10-15% intestinal injury
- Consider resection with primary anastomosis
Neonatal Care

- Fluid management
- Nutritional support
- Identify and treat associated anomalies
- Bowel status
- Cosmetic and safe closure of abdominal wall defect

- Primary closure
- Staged closure
- Delayed closure
- Sutureless closure
Primary Closure

- Reduce abdominal contents
- Circumferential dissection
- Excision and ligation of sac
- Fascial closure with mattress sutures
- Recreation of umbilicus with purse string
Primary Closure

- For larger defects
- Flap creation
- Component separation
- Mesh - bioabsorbable
- Tissue expanders
Staged Closure

- Excision of sac
- Application of Silo bag
- Slow reduction of abdominal contents - 7-10 days
- Return to OR for fascial closure
Delayed Closure

- Indication: severe congenital anomalies
- Allow for epithelialization of omphalocele sac - Silvadene or Povidone-Iodine
- Delayed ventral hernia repair
Sutureless Closure

- Leave umbilical cord long
- Reduction of hernia contents
- Umbilical cord plug with overlying adhesive dressing
A “Plastic” Sutureless Abdominal Wall Closure in Gastoschisis

By Anthony Sandler, John Lawrence, John Meehan, Laura Phearman, and Robert Soper
Iowa City, Iowa

- 10 patients - 6 primary reduction with simple “plastic” closure; 4 “plastic” closure after silo placement

- Results - 2 required bowel resection, 6 umbilical hernias managed conservatively, 1 required repair at 13mo

- Conclusion - limits abdominal compartment syndrome and sequelae, more cosmetic
Post-operative Concerns

- Short-term
  - Monitor for compartment syndrome - ventilatory pressures, urine output, limb perfusion
  - Wound care
  - Infection/Sepsis
  - Necrotizing enterocolitis
  - Nutritional support - TPN
Post-operative Concerns

- Short-term
  - Monitor for compartment syndrome - ventilatory pressures, urine output, limb perfusion
  - Wound care
  - Infection/Sepsis
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  - Nutritional support - TPN

- Long-term
  - Need for umbilicoplasty/ventral hernia repair
  - Adhesive small bowel obstruction
  - Sequelae of associated anomalies
Summary

• Embryology is complex
• Gastroschisis versus Omphalocele
• Neonatal care is important
• Multitude of surgical options
Quick Quiz

• Which of the following is NOT part of the Pentalogy of Cantrell?
  • A. Omphalocele
  • B. Ectopic cordis
  • C. Posterolateral diaphragmatic hernia
  • D. Sternal cleft
Quick Quiz

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Quick Quiz

• Which is more commonly seen with Gastroschisis than Omphalocele?
  
  • A. Pyloric stenosis
  
  • B. Chromosomal abnormalities
  
  • C. Prompt bowel function
  
  • D. Young maternal age
Quick Quiz

• Which is more commonly seen with Gastrochisis than Omphalocele?
• A. Pyloric stenosis
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• D. Young maternal age
Thank You!
References


• Rubens Figueroa, J et al. Rev Esp Cardiol, 2011; 64: 615-8, Vol 64, Num 07


• Swanson, J et al. Gastroschisis Versus Omphalocele/Exomphalos. CME credits

• Grosfeld, Pediatric Surgery 6th edition

• Pansky, B Embryonic Folding and Flexing of the Embryo. Review of Medical Embryology.

• Sandler, A et al A “Plastic” Sutureless Abdominal Wall Closure in Gastroschisis, 2004