Laparoscopic Trocar Placement in Pediatric Urology: Working in Small Spaces

Christina Kim MD, FAAP
Connecticut Children’s Medical Center
Assistant Professor of Urology
Hartford, CT
USA
Overview

**Today's Goal:** *Give you mental and physical maps for trocar placement during pediatric laparoscopic procedures*

- Trocars in Pediatric Laparoscopy
  - 5 mm *most common*
  - 3 mm *often*
  - 10-12 mm *rarely*
    - Need for a Stapler
      - i.e. teenage nephrectomy
Lecture Overview

- Accessing Pediatric Abdomens
- Common Pediatric Urologic procedures
  - Testicular
    - Orchidopexy
  - Renal
    - Nephrectomy & Partial Nephrectomy
    - Pyeloplasty
- Less Common Procedures
  - RPLND
  - Ureteral reconstruction
    - Reimplant
  - Lap Assisted Augment Procedures
Positioning

- Use of Padding is unnecessary and risky
- Increases the potential for trocar injuries
  - Lifts critical structures in harms way
    - Vessels
    - Bowel
Insufflation & Access - Adult

- Open Hasson Technique
- Veress insufflation with blind percutaneous Access

- Percutaneous under direct vision
  - Endopath-Xcel (Ethicon)
    - 5,10,11,12 mm
  - Visiport Plus (US Surgical)
    - 12 mm

*Pediatric Abdomen is Too Compliant for this ....!*
Extreme Compliance – Mouse Model
Children: Abdominal Wall Compliance
Be Aware of Epigastric and Iliac Vessels
Access Tips

- Sharp entry into abdomen
  - Use #15 blade
  - Snap to guide
  - #11 blade through peritoneum
  - Blunt tip trocar
- Trocar with blades primarily on teenagers
- Use laparoscopic instruments to counter anterior abdominal pressure
Video: Working port access

Click here to view video
Insufflation & Access in Children

- Open Access in children is safest and preferred!
  - Hasson Technique
  - Bailez Technique
  - Radially dilating trocar Step System-US Surgical
    - 2/3mm- 12mm
  - Visualize

- Insufflate with warmed CO₂

(Schulam PG et al. Urology 1999)
Insufflation & Access

- Insufflation rate based on age or weight
  - < 1 yr: 0.3 l/min
  - > 1 yr: 0.5 l/min
  - > 5 yr: 1 l/min
  - >10 yr: 2 l/min

- Be wary rare events
  - Co₂ Embolus
    - Rt Heart Failure
  - Pneumothorax
    - Acute drop in SpO₂
      
      *(Waterman et al. J Urol 2004)*
Trocarless Laparoscopy?

- Limited Access with Stab Incisions
  
  (Hanson GR et al. J Urol 2004)

- 53 procedures without complications
  - #11 scalpel stab
  - 3 mm instruments

- No reported difficulty
  - Loss of pneumo
  - Instrument exchange

- Average of $277.00 per case
Needlescopic Orchiopexy with 2mm Instruments

- **10 Patients (8 mo-37 yrs)**
  - 8 Orchiopexy
    - 100% success
  - 2 Orchiectomy
  - 2 Diagnostic

- Avg time: 110 min

- Excellent Cosmetic Result

*(Gill et al. J Ped Surg 2000)*
Laparoscopic Orchiopexy
Laparoscopic Orchiopexy
Laparoscopic Orchiopexy: View
First Stage Fowlers Stephens

- Can attempt with one working port and camera port
- Two working ports
  - Will reuse at the time of 2nd stage
- Place clip as cephalad as possible
Video: 1st Stage Clip

Click here to view video
Neocanal

- Subdartos pouch in scrotum
- 3 mm instrument from abdomen to scrotum
  - Lateral or medial to inferior epigastrics
  - Identify straight path
- Step trocar back into abdomen
  - 10 or 12 mm
- 5 mm grasper to pull testis through
Scrotal Trocar – 10mm or 12mm
Neocanal

Inferior epigastric

Obliteral umbilical
Video: Neocanal Creation

Click here to view video
Laparoscopic Renal Surgery

- Place patient close to edge of the bed
  - Avoid constriction of instruments hitting bed
  - Prep to provide flank access if needed

- Triangulate relative to kidney

- Accessory port optional
Patient Placement
Flank incision
Port Placement

- Camera Port
  - Infraumbilical

- Working Ports
  - Between xyphoid and umbilicus
  - Lateral inferior epigastric
Basic Renal Port Placement

(Chen et al. Urol Clin N America 1998)
Lateral inferior To epigastrics
Accessory Port

- Place between either working port and umbilicus
- Careful with instrument passage when patient rotated
- Multiple uses
  - Retraction
  - Suction
  - Fast suture passage
Accessory port
Alternative Port Placement

- Camera and working ports all in midline
  - Good for smaller patients

- Keep one working port 5mm
  - Clip applier
  - Suction/irrigation
Simultaneous R Nephrectomy and L Pyeloplasty
Hitch Stitch

- Prolene suture
- Place in pelvis a/o ureter
- Carter Thomason device
- Direct passage out abdomen
- Fixation to anterior abdomen

CloseSure, Inlet Medical, Eden Prairie, MN
Video: Hitch Stitch

Click here to view video
Laparoscopic Tx of VUR

- **Transvesical vs Extravesical**
  - Transvesical: “Percutaneous”
    - Endoscopic trigonoplasty
    - Trans-trigonal reimplant
      - Robotic
      - Pure laparoscopic
    - Glenn-Anderson
  - Extravesical
    - Lich-Gregoir
Laparoscopic-Endoscopic Trigonoplasty
The Past

- First described as a percutaneous technique
  - Okamura K et al. J Urol 1996; 156: 198-200
  - Cartwright PC et al. J Urol 1996; 156: 661-4
- Medial Advancement of UO
  - Longitudinal incision intertrigonal ridge … detrusor intact
  - Heineke-Mikulicz closure
- Problem
  - Poor results: 59%-65%
  - Complication of “Trigonal Splitting”
Laparoscopic Cohen Cross Trigonal Ureteral Reimplantation

- **Gill IS et al. J Urol 2001**
  - 2 Children (10,11) & 1 Adult
  - OR Time 2.5-4.5 hours
  - Prolonged JJ stenting and bladder cath
  - 66% Success rate

  - 16 Pats, Avg Age: 4.1 yrs
  - Avg OR Time: 136 min
  - 96% success rate
• **Kutikov et al. J Urol Nov 2006**
  - N=32, Avg age 5 years (14 mo – 11 years)

• **Success rates:**
  - 93% for VUR
  - 80% for Primary Obstructing Megaureter

• **Highest complication rate in younger children**
  - smaller bladder capacity, < 120cc
Laparoscopic Reimplantation
Trocar Configuration
Robotic Cohen Cross Trigonal Ureteral Reimplantation for VUR

- *Peters CA & Woo R. J*  
  *Endourol 20056* 
  children (5-15 yrs) 
  - Hospital stay 2-4 days 
  - 83% success rate 

- Advantage?
Robotic Extravesical Reimplant
Laparoscopic RPLND
RPLND: Trocar Configuration
RPLND in 10 yr old with 5 mm Ports

- 5 mm Instruments
  - Monopolar scissors
  - Clip applier

- 5mm Flexible Scope Holder
  - Thompson Surgical Instruments, Inc.
Bladder Augmentation

- Laparoscopic Assisted
- Purely Laparoscopic
  - 12 mm port umbilicus
  - 5 mm and 12 mm ports in upper quadrants in midaxillary line
Laparoscopic Assisted Augmentation

Video and images to follow, please check back for updates.

(Hedican et al. J of Urol 1999)
Laparoscopic Augmentation

Video and images to follow, please check back for updates.

Lorenzo et al. Urology 2007
Augmentation: Nephrectomy with Ureteral Augment, Appendicovesicostomy
Supplemental Laparoscopic Equipment

- Endostitch
- Laparotie
- Size is primary limitation
  - 10mm port minimum
  - Large suture material needed
Conclusions

• The Pediatric Abdomen in compliant
  • Avoid positioning errors
  • Use open access

• Utilize mental and physical trocar maps
  • Plan for assistance as needed
  • Anticipate challenges for the rare cases
Conclusions

- **Step Trocar**
  - Frequently used
  - Easy to size up
  - Minimal leakage

- **Accessory ports**
  - Can save time and minimize frustration early