TUBES, LINES, AND (PRETTY MUCH) EVERYTHING ELSE

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DISCLOSURES

• Nothing to disclose
OBJECTIVES

- Discuss types of enteral feeding tubes
- Identify pitfalls and complications encountered in enteral feeding
- Discuss types of parenteral access
- Identify issues encountered with parenteral feeding
ENTERAL AND PARENTERAL FEEDING

- Know your tube/catheter
  - The medical staff you interact with may or may not understand your tube
- Pick a facility for routine tube/catheter maintenance
  - Try to avoid hospital shopping
- Be wary of black pearls...
  - Have a reliable source for questions
- Don’t stop asking questions
ENTERAL FEEDING

- Nasogastric tubes
- Nasojejunal tubes
- Gastrostomy tubes
- Gastrojejunostomy tubes
ENTERAL FEEDING – NG AND NJ
ENTERAL FEEDING – NG/NJ

- Types of tubes:
  - Non-weighted vs weighted (Dobhoff)
  - Catheter material
  - Sizes: 6-12F (2-4mm)
- Typical length of time for a single tube to be in place
  - Silicone or polyurethane: <6 weeks (smaller bore)
  - PVC: 2 weeks or less (larger bore)
- May be replaced at home by parents/caregivers
  - pH of aspirate vs. auscultation
  - Significant risk of malposition

Northington 2017
ENTERAL FEEDING – NG/NJ

**Positives:**
- Access is easy (?)
- Minimally invasive
- Parents, caregivers, patients can be taught how to replace

**Negatives:**
- Passing the tube can be traumatic
- Noticeable
- Children and confused patients can (and will) easily pull out
- Aspiration (not with NJ)
- Rhinitis, pharyngitis, esophageal erosion
ENTERAL FEEDING – GASTROSTOMY (G)/GASTROJEJUNOSTOMY (GJ) TUBES

- Placement Techniques:
  - Endoscopic
    - Image Guided (Interventional Radiology)
      - Push (Retrograde)
      - Pull (Antegrade)
      - CT vs. Fluoro
    - Surgical (Laparoscopic)
ENTERAL FEEDING – G/GJ

- Placement Techniques:
  - Endoscopic
  - Image Guided (IR)
    - Push (Retrograde)
    - Pull (Antegrade)
    - CT vs. Fluoro
  - Surgical (Laparoscopic)

Laparoscopic Assisted Percutaneous Endoscopic Gastrostomy (LAPEG):
A Simple and Safe Technique of Gastrostomy Tube Placement by Surgeons with Basic Laparoscopy Skills
Alok K. Gupta, MD FACS; Alif M Manejwala, MD.

INTRODUCTION
- Percutaneous Endoscopic Gastrostomy (PEG) tube
  - Most Common method of Placement of Gastrostomy Tube
  - Nearly 200,000 Procedures performed yearly
- Features required for successful placement of PEG
  - Transillumination of the EGD scope light on the anterior abdominal wall
  - Visualization of the indentation in the gastric lumen on pressing the anterior abdominal wall
- Failure of placement of PEG
  - Occurs in approximately 10-15% of cases
  - Common reasons for failure of placement are:
    - Stomach located under the ribcage/too low
    - Stomach contacts with colon or omentum
  - Stomach covered with adhesions/previous procedure
- Options for patients with failed PEG tube
  - Open Gastrostomy
  - Laparoscopic Gastrostomy
- Most of the techniques of laparoscopic gastrostomy tube placement recommend gastroscopy which requires advanced laparoscopic skills of intra-corporeal suturing
- Difficult to perform by surgeons in community hospitals with basic laparoscopic skills only
- Open gastrostomy performed most commonly by these surgeons
- We describe a technique of Laparoscopic Assisted PEG which can be easily performed by surgeons with basic laparoscopic skills, consequently avoiding the need for open gastrostomy in similar situations.

CASE DETAILS
- 39 yr male Caucasian female
- Progressive worsening dysphagia due to ALS
- Planned for EGD-PEG tube for enteral feeding
- PEG tube could not be placed despite presence of transillumination and visualization of the indentation in the gastric lumen on pressing the anterior abdominal wall
- Planned for Laparoscopic Assisted PEG Tube placement.

PROCEDURE DETAILS
- Laparoscopic Assisted PEG Tube Placement Details
  - Procedure performed in OR under General Anesthesia
  - Pneumoperitoneum was established through a small 5 mm supra-umbilical incision using Verres needle
  - 5 mm supra-umbilical and 5 mm LiqG port, slightly to the left of the midline was placed
  - Examination showed the stomach in the upper abdomen covered with colon and omentum
  - Colon and omentum moved away from the stomach
  - EGD scope was then inserted into the stomach and stomach distended with air
  - Location for the PEG tube selected on the anterior surface of the stomach medial to the greater curvature
  - Angiocath needle was inserted into the stomach from the LiqG port and confirmed by the EGD scope
  - Blue guide wire then inserted into the stomach and grasped with the EGD scope snare
  - Blue guide wire then pulled out from the patient's mouth with the EGD scope snare
  - PEG tube connected to the end of blue guide wire in standard fashion
  - Blue guide wire then pulled out from the LiqG port site, thereby pulling the PEG tube into place in the stomach
  - LiqG port removed and PEG tube secured in place
  - Gastrostomy was not needed as the stomach attached to the anterior abdominal wall very well
  - Pneumoperitoneum discontinued and the umbilical port removed and port site sutured with absorbable suture
  - Patient taken out of anesthesia and shifted to recovery room in stable condition
  - There were no complications related to procedure
  - PEG tube was later used for tube feeding without any problems.

CONCLUSIONS
- Laparoscopic Assisted PEG tube avoids the need for laparotomy required for open gastrostomy
- Laparoscopic visualization allows manipulation of the stomach to the appropriate position and decreases risk of injury to surrounding viscera especially colon and liver
- Laparoscopic Assisted PEG tube placement without using gastroscopy as described here can be safely and easily performed by surgeons in community hospitals with basic laparoscopic skills avoiding the need for open gastrostomy.

REFERENCES
# Enteral Feeding – Bard G Tubes

## Standard Profile Replacement Devices

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<th>Size</th>
<th>Product Code</th>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>12F</td>
<td>000713</td>
<td>-</td>
<td>Bard® B-Funnel Replacement Gastrostomy Tube</td>
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<tr>
<td>14F</td>
<td>000714</td>
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<td>Bard® B-Funnel Replacement Gastrostomy Tube</td>
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<td>16F</td>
<td>-</td>
<td>000715</td>
<td>Inflatable internal retention balloon</td>
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<td>18F</td>
<td>-</td>
<td>000716</td>
<td>Radiopaque stripe for X-ray placement verification</td>
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<tr>
<td>20F</td>
<td>-</td>
<td>000717</td>
<td>Easy to identify obstructions with translucent silicone tubing</td>
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<tr>
<td>22F</td>
<td>-</td>
<td>000718</td>
<td>Meets patient sizing needs with adjustable external bolster</td>
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<tr>
<td>24F</td>
<td>-</td>
<td>000719</td>
<td>Separate medication port</td>
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## Low-Profile Replacement Devices

### Low-Profile Replacement Devices

#### Non-Balloon
- Bard® Button Gastrostomy Tube and Accessories
  - Cosmetically appealing low profile design
  - Designed with simple, easy to connect tubing sets
  - Obturator facilitates button placement
  - Anti-reflux valve helps to provide safer feeding
  - Kits include a continuous and bolus feeding tube
ENTERAL FEEDING – KIMBERLY CLARK G TUBES

The KIMBERLY-CLARK® MIC KEY® Low-Profile Gastrostomy Feeding Tube is a step-up from conventional gastrostomy feeding tubes. Highly popular and widely prescribed, the MIC KEY feeding tube is unobtrusive and easy to conceal, making it an ideal feeding tube for virtually all individuals. Specific features include:

- Medical Grade Silicone Construction
- Low-Profile Design
- Tapered Distal Tip
- Inflatable Silicone Internal Retention Balloon
- Distal Tip Receded at 5 ml
- Proximal Anti-Reflux Valve
- SECUR-LOK® Extension Set Connector Mechanism
- Radiopaque Stripe

The first of its kind, the KIMBERLY-CLARK® MIC® Gastrostomy Feeding Tube is indicated for patients requiring continuous enteral feeding. Specific features include:

- Medical Grade Silicone Construction
- Inflatable Silicone Internal Retention Balloon
- SECUR-LOK® External Retention Ring
- Universal Feeding Port Connector
- Medication Port
- Tapered Distal Tip
- Dual Exit Ports
- Radiopaque Stripe

The KIMBERLY-CLARK® MIC® Bolus Gastrostomy Feeding Tube is utilized for patients who are on a bolus feeding regimen. Specific features include:

- Medical Grade Silicone Construction
- Inflatable Silicone Internal Retention Balloon
- SECUR-LOK® External Retention Ring
- Tapered Distal Tip
- Dual Exit Ports
- Radiopaque Stripe

KIMBERLY-CLARK® MIC® Percutaneous Endoscopic
ENTERAL FEEDING – AMT G TUBES

Products in the MiniONE® Family

Select a device below to learn more:

- MINIONE® LOW PROFILE BALLOON BUTTON G-TUBE
- MINIONE® LOW PROFILE NON-BALLOON BUTTON G-TUBE
- MINIONE® LOW PROFILE CAPSULE NON-BALLOON BUTTON G-TUBE
ENTERAL FEEDING – GJ

• When is a gastrojejunostomy tube recommended?
  • Reflux, chronic, severe,
  • Aspiration
    • Stomach contents enter lungs
    • May cause massive inflammatory response: aspiration pneumonia
  • Delayed gastric emptying
  • Excessive vomiting
ENTERAL FEEDING - GJ

- Tip of the tube terminates in the small bowel
  - Ligament of Treitz
  - Distal duodenum
  - Post pyloric feeding?
ENTERAL FEEDING – MIC KEY LOW PROFILE GJ TUBES

- 16, 18, 22F
- Range of stomal sizes and tube lengths
- Silicone tube
- Retention balloon
- Gastric decompression port
  - Port adapter is the same for both the G and J lumens
ENTERAL FEEDING – AMT GJET

Clearly Labeled Device

- Gastric (stoma) length is printed on the “G” strap
- Jejunal length is printed on the “J” strap and laser engraved on the external bolster
- G and J safety plugs have distinctive shapes for tactile differentiation

- 14, 16, and soon 18F
- Range of stomal sizes and tube lengths
- Silicone tube
- Retention balloon
- Gastric decompression port is white
- Jejunal port “glow green”

http://www.appliedmedical.net/product/amt-gjet/
ENTERAL FEEDING – G/GJ

• Routine Maintenance
  • All care should be performed after washing hands with warm water and soap
  • Daily:
    • Clean the surrounding skin and exposed tube daily
    • Rotate the tube in a full 360 degree circle while cleaning
    • Flush, flush, flush – 3xs day – “Turbulent Flush” through the port NOT the connectors
  • Weekly
    • Check balloon volume
      • Must know the initial balloon volume
    • Replace with sterile or distilled water, never refill with air

http://www.gosh.nhs.uk/health-professionals/clinical-guidelines/gastostomy-management
ENTERAL FEEDING – G AND GJ TUBES

• Minor complications
  • Clogging
    • Flush with larger volume for GJ than for G – remember the length of the tube!
    • Flush often (every 3-4 hrs if on continuous feeds) and aggressively with WATER,
      prevention is best
    • Push/pull technique with warm water may help
    • Do not mix medications with formula
  • Tube degradation
    • Pancreatic enzymes (Clog Zapper), Sodas (diet vs reg), Cranberry juice
    • Acidity of above products actually make clogs worse

• Balloon rupture
  • Always have a spare tube
  • Balloon life varies (typically 6 months to 1 year)
ETENERAL FEEDING – G AND GJ TUBES

- Minor complications
  - Leaking
    - Cavilon barrier cream
    - Identify and treat cause
  - Granulation tissue
    - Keep site as clean and dry as possible
    - Treat early
    - Small amount, maxitrol eye ointment, 2xs/d
    - Larger amount, Silver Nitrate 75% caustic applicator sticks
ENTERAL FEEDING – G AND GJ TUBES

• Major complications
  • Infection
    • Cellulitis – usually resolves with oral antibiotic and improved daily maintenance
    • Abscess – may require aspiration or drainage coupled with antibiotics
    • Chronic – may require revision of gastrostomy site with new access
  • Bleeding
    • Angiogram
    • Surgical ligation of vessel or revision of feeding tube
  • Tissue necrosis
PARENTERAL FEEDING

- PICC lines
  - Peripherally inserted central catheter

- Tunneled, non-cuffed, small bore, low flow central venous catheters

- Tunneled, cuffed, small bore, low flow central venous catheters

http://www.chop.edu/treatments/peripherally-inserted-central-catheter-picc
PARENTERAL FEEDING

• **PICC lines**
  • Peripherally inserted central catheter
    • Access site matters
    • Upper extremity
      • Basilic > Cephalic > Brachial veins
      • Potential dialysis?

[Diagram of PICC Line]

http://www.chop.edu/treatments/peripherally-inserted-central-catheter-picc
PARENTERAL FEEDING

- PICC lines
  - Peripherally inserted central catheter

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PARENTERAL FEEDING

- PICC lines
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- Tunneled, cuffed, small bore, low flow central venous catheters
**Parenteral Feeding**

- Why Tunneled?
  - Internal jugular vein
  - Subclavian vein
- Why Cuffed?
- Power injectable?
- Multiple lumens?

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http://www.chop.edu/treatments/tunneled-catheter-placement
PARENTERAL FEEDING – CATHETER MATERIAL

- Tunneled, cuffed, small bore, low flow central venous catheters
  - Silicone vs Polyurethane
    - Broviac/Hickman/Leonard
      - 3, 4, 6, 7, and 9F
    - Polyurethane
      - 3, 4, 5F
    - Catheter fractures, complications
  - Alcohol lock
  - Heparin lock
PARENTERAL FEEDING - CATHETERS

- PICCs and Tunneled, non-cuffed CVLs can last weeks to months before exchange is required
  - Unless, a complication happens first
- Tunneled, cuffed CVLs can last months before exchange is required
  - Unless, a complication happens first
PARENTERAL FEEDING - PORTS

- Never use ports for parenteral feeding access
- Eventually all port sites get infected when TPA is administered
PARENTERAL FEEDING - CATHETERS

- Complications:
  - Infection – cellulitis, bacteremia, sepsis
  - Lumen(s) clogged
    - Typically thrombosed
    - Lock with low dose heparin or alcohol
    - Flush regularly
    - May try TPA (thrombolysis medication) to clear clot
  - Central venous stenosis
    - Scarring
    - Fibrin sheaths
    - May eventually require central venous stent
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