Percutaneous Ultrasound-guided Gastrostomy (PUG) Course

Self-learning module to be reviewed prior to the cadaver lab.

PUG procedure steps:

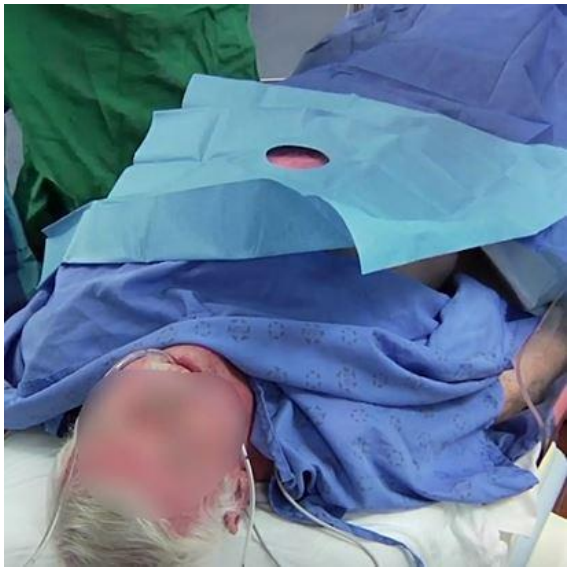
1. Place the magnetic tipped catheter/balloon into stomach through the mouth

2. Feel for magnet coupling with catheter tip

3. Inflate balloon with 30mLs of dyed fluid

4. Visualize balloon with U/S

5. Sterilize surgical field



5. Visualize needle with U/S

6. Insert needle into the balloon and confirm by aspirating dyed fluid

7. Insert guidewire over the needle into the balloon

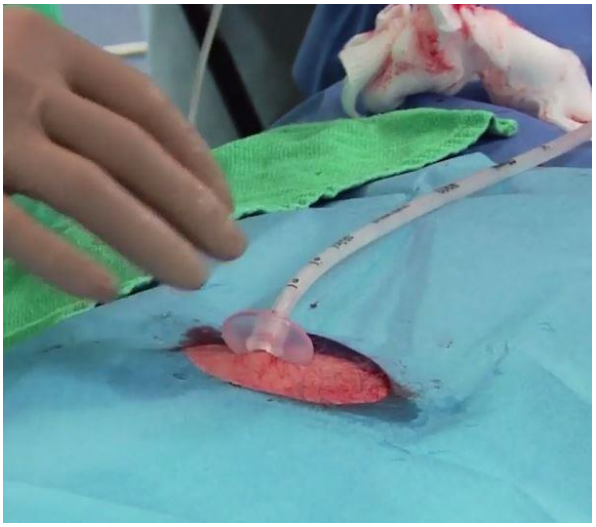
- Wire will coil into balloon (stop a couple centimeters after a drop in resistance)

- Deflate balloon/remove magnet

8. Advance wire and gently pull catheter out of mouth at same rate

9. Cut guidewire over darkened area

10. Place gastrostomy tube over wire and secure



Review article: Percutaneous endoscopic gastrostomy: Indications, technique, complications and management. World Journal of Gastroenterology. 2014

Indication: Establish adequate nutrition for patients with expected long-term (> 30 days) insufficient oral intake. This is an individualized decision according to patient's needs, preference, diagnosis and long-term prognosis

Conditions for which gastrostomy tube is commonly placed:

Neurological diseases and psychomotor delay

- Cerebrovascular disease
- Motor neuron disease (amyotrophic lateral sclerosis)
- Multiple sclerosis
- Parkinson's disease
- Cerebral palsy
- Dementia
- Psychomotor retardation

Reduced level of consciousness

- Intensive care patients
- Prolonged coma

Cancer

- Head and neck cancer
- Esophageal cancer (strict contraindication in PUG)

Other

- Burns
- Congenital anomaly (e.g., trachea esophageal fistula) (strict contraindication in PUG)
- Fistulae
- Cystic fibrosis
- Facial surgery
- Poly-trauma
- Gastric decompression

Contraindications:

Age <21 (FDA established cut off)

BMI >30

Coagulopathy (use of DOAC within 48 hours, INR >1.5, PTT >50)

Thrombocytopenia (<50,000/mm^3)

Pacemakers/AICD or other implanted electronic and/or metal devices that can be affected by magnet.

Hemodynamic instability

Infection: Sepsis, peritonitis, abdominal wall cellulitis

Abdomen fluid/mass: Ascites, carcinomatosis, gastric cancer, gastric varices, pregnancy

Oral/pharyngeal/esophageal mass inhibiting oral-gastric tube placement.

Abdominal surgery: prior laparotomy, gastric surgery, peritoneal dialysis

Obstruction: gastric outlet or sever gastroparesis

Active or recent GI bleeding

Preparation:

Informed consent

Patients should fast 8 hours

Prophylactic antibiotic one hour before procedure (cephazolin IV 1-2gm)

Suppress gag reflex and procedural sedation per institution protocol

Post insertion care:

May start using gastrostomy tube as early as 4 hours after placement

Examine stoma for infection and clean daily

Rotate tube 180 degrees daily after the stoma has healed

Flush tube before and after each use to prevent clogging

Complications of gastrostomy:

Minor:

- Wound infection
- Improper placement or inability to place gastrostomy tube
- Stoma leakage
- Tube migration - gastric outlet obstruction
- Inadvertent tube removal
- Pneumoperitoneum
- Tube blockage or deterioration

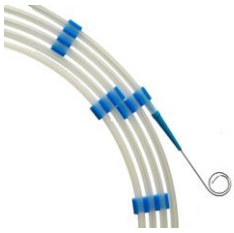
Major:

- Aspiration pneumonia
- Hemorrhage
- Peritonitis or septic shock
- Buried bumper syndrome
- Perforation of bowel
- Necrotizing fasciitis
- Metastatic seeding
- Colocutaneous, gastrocutaneous or small bowel fistula
- Sigmoid intra-abdominal herniation and volvulus
- Esophageal injury
- Bowel obstruction

Tools & equipment:

There is currently only one manufacturer supplying the following tools:

Balloon Catheter 

Guidewire 

Handheld magnet 

Magnet sterile cover

Trauma shears

Needle/Syringe (18G, 7cm)

Other Equipment Needed

25g needle/3cc syringe

1% lidocaine with epinephrine

Ultrasound machine + linear transducer

Ultrasound probe cover

Sterile field/solution/gown and gloves

50mL syringe

Sterile Methylene blue dyed water

PUSH (trans-oral, over-the-wire) Gastrostomy tube

Procedural sedation monitoring (cardiac, pulse ox, end-tidal CO2)

Cetacaine spray to suppress gag reflex

Procedural sedation medication of choice

PUG detailed procedure steps:

1. STOP if any contraindications to percutaneous gastrostomy or magnetic fields (such as pacemaker) are present.

2. Insert a temporary oral-gastric feeding tube and confirm placement below the ribs with auscultation. If unable to complete, STOP.

3. Remove the balloon catheter from packaging. Lubricate the catheter liberally. Insert the catheter orally using standard gastric tube insertion technique. If sensing resistance, STOP. Once completed, remove the inner stylet.

4. Confirm catheter placement in stomach by moving the handheld magnet along the abdomen below the ribs and feeling for coupling with the balloon catheter. If coupling is not obvious, fill the balloon (approximately 30mLs) with methylene blue dyed sterile water or saline and attempt to find the balloon catheter by ultrasound. Another method for finding the internal magnet is utilizing the Gauss Meter over the abdominal region. If unable to achieve coupling and/or confirmation by ultrasound, STOP.

5. Prep the abdomen with sterilizing solution and place sterile field cover (don sterile gown and gloves)

6. Prep the handheld magnet and ultrasound probe by placing in sterile covers.

7. If the balloon has not been inflated under prior steps, infuse approximately 25mL of methylene blue dyed sterile water or saline into the balloon catheter. Be sure to first gently aspirate the balloon catheter to remove air from the balloon. NOTE: adding more than 35mL of fluid into the balloon catheter may impact visualization.

8. Use ultrasound to visualize the balloon. To enhance visualization, agitate the fluid by pressing repeatedly on the external tubing or pumping the syringe (up to 5mL of fluid in and out). If unable to visualize the balloon on ultrasound, STOP.

9. For gastrostomy tract formation, make minor adjustments to balloon location using the handheld magnet, as needed. Verify with ultrasound that no bowel, viscera or vessels are overlaying the stomach at the planned gastrostomy tract. Note the balloon depth on ultrasound to estimate the gastrostomy tract length. Record the planned tract length. If unable to identify a safe tract site, STOP.

10. Inject local anesthetic at the planned gastrostomy site if needed for patient comfort. Create a gastrostomy tract using an access needle attached to a syringe. Under real-time ultrasound guidance, advance the needle to target the balloon while gently aspirating. Confirm placement in balloon by aspirating blue dyed fluid into the syringe. If unable to aspirate, STOP.

11. Hold the access needle in position while removing the syringe.

12. Insert curled end of guidewire into the access needle. To achieve this, pull the guidewire back into the feeder tip, which will temporarily straighten the guidewire tip. Insert until resistance is relieved, or approximately 5 cm beyond the needle. If excessive resistance is present, STOP.

13. Gently remove the needle, leaving the guidewire in place.

14. Deflate the balloon by aspirating all fluid from the external port.

15. Remove the handheld magnet and place it safely away from the patient and other magnetic material.

16. Gently advance the guidewire while simultaneously retracting the balloon catheter from the mouth. This should be done slowly and at equal rates. Upon completion of this step, the curled guidewire tip will have exited the mouth with the balloon catheter, with the other end of the guidewire exiting via the gastrostomy tract. If coupling of the guidewire and balloon is lost during this process, remove the guidewire from the stomach and STOP.

17. In order to push the gastrostomy tube over the guidewire, cut off the curled end of the guidewire at the shaded section. Discard the curl and balloon catheter. CAUTION: cutting outside the shaded region will cause unraveling of the guidewire.

18. Follow standard percutaneous gastrostomy PUSH (Sachs-Vine) technique to place gastric tube.