Replacement Gastrostomy Button Appliances

Pediatric Gastrostomy

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There are many reasons why your child may need a gastrostomy (gas-tros'-to-me). A gastrostomy is the creation of a new opening into the stomach. A small incision (stoma or opening) is made in the skin and stomach wall. The feeding tube is inserted into the stomach. This tube can deliver fluids and formula directly into the stomach enabling your child to receive enough nutrition essential for function, growth, and healing. It can easily be removed if your child is able to consume adequate calories by mouth at a future time.

Many children need assistance to get optimal nutrient intake. They might have a neurologic impairment that prevents them from swallowing safely or are at risk for *aspiration* (inhaling food into the lungs). Other conditions that require temporary nutritional support are: abnormal esophagus (i.e. esophageal atresia or stricture from gastroesophageal reflux), prematurity (i.e. less than 38-40 weeks gestation), chronic lung disease (i.e. cystic fibrosis), failure to thrive, short bowel syndrome, cardiac disease with poor feeding and growth, or any other medical condition that prevents a child from eating and swallowing safely. Children with pseudo-obstruction or other motility disorders might require a gastrostomy for chronic stomach drainage or *decompression (removal of pressure).*

Children with poor nutritional intake are at risk for skeletal muscle weakness, organ dysfunction, gastrointestinal wasting, neurologic abnormalities, delayed wound healing, and depressed immune function. A gastrostomy is essential for prevention of malnutrition and helps many children reach their potential for growth and development.

A pediatric surgeon should evaluate children who require a gastrostomy. A pediatric surgeon devotes his or her practice to the surgical care of children. He or she must have graduated from medical school, and completed five years of postgraduate General Surgery training in an accredited training program. Pediatric surgeons must then complete an additional accredited two-year fellowship program in Pediatric Surgery. Your child's primary pediatrician will refer you to this specialist, who preferably will perform the surgery at a *children's* *hospital.* A children's hospital is planned around the special needs of children and their families.

Children who need a gastrostomy will usually have an upper GI series, or a *barium swallow*, to help visualize anatomical abnormalities and evaluate gastric emptying. The barium is tracked into and through the stomach.

This x-ray film should be read jointly by your surgeon and a *pediatric radiologist,* who has expertise in pediatric problems. If the UGI series confirms *malrotation,* which is the abnormal rotation of all or any portion of the intestinal tract, it will be corrected at the time of surgery. Operative intervention may also be required if the child has reflux and gastric outlet obstruction.

The esophageal *pH probe* will measure the amount of pre-existing reflux (the action of bringing contents from the stomach into the *esophagus* or food pipe). If reflux is present, they may perform a *fundoplication* (antireflux surgery) at the time of gastrostomy placement. Studies do indicate that a gastrostomy may also predispose a child to reflux. The pH probe study requires an overnight hospitalization. A flexible probe is placed through the nostril and fed down into the lower esophagus. The parent or nurse documents the child's activity, positioning, and diet during this period. Definition of a reflux varies from a drop in pH less than or equal to 4 lasting at least 8 - 15 seconds. Pre-test instructions include the cessation of H2 blockers, i.e. ranitidine, cimetadine for 3-5 days prior to the test, and nothing by mouth 3-4 hours prior to testing.

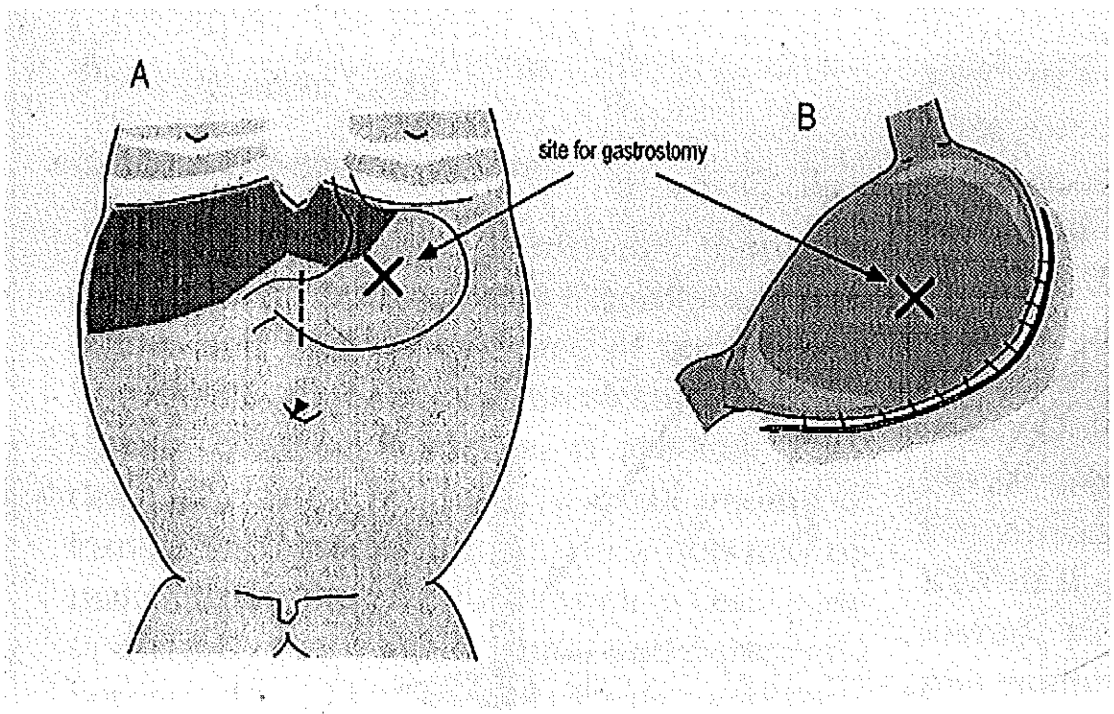
A gastric emptying study may be considered prior to fundoplications in order to rule out the need for concurrent *pyloroplasty* (helps stomach contents empty into the duodenum). Infants with dysmotility syndromes may benefit from a percutaneously placed GJ (Gastrojejunal) tube rather than fundoplication.

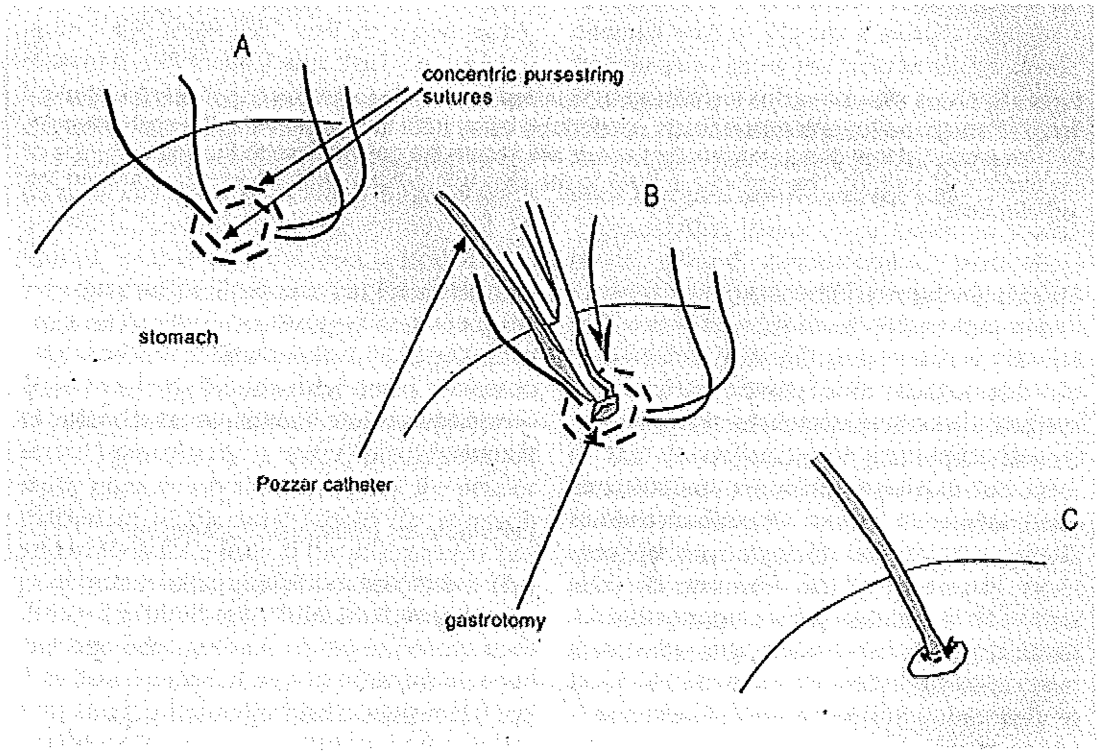
Operative Techniques

The gastrostomy operation has been performed for over a century, as far back as 1870 by Verneuil. The Stamm gastrostomy, which is the procedure used today, was first performed in 1894. For children that require a feeding tube and fundoplication for reflux, general anesthesia is preferred. Parents can tell their older children that they will be in a *special sleep,* and will wake up after the operation is over.

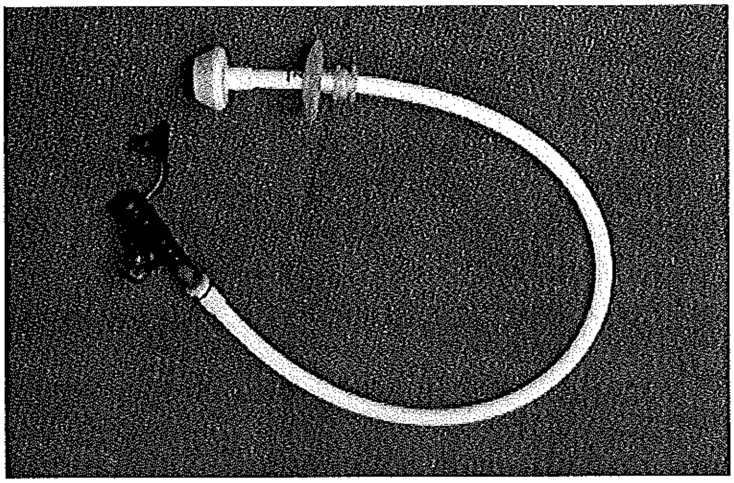
Stamm Gastrostomy

A Stamm gastrostomy is the standard surgical technique. (See picture) It can be performed either by open or laparoscopic method. In laparoscopy, surgeons make small incisions and look at the affected area through a video camera. Some surgeons state that the laparoscopic procedures tend to cause less pain and help the patient recover more quickly after surgery. Ask your child's doctor if you have any questions about laparoscopy. With the open Stamm gastrostomy, a short midline incision above the umbilicus or left upper quadrant transverse incision is made. The stomach is decompressed with a nasogastric tube (NG tube) if the esophagus is open. Two *concentric* (segments of circles are within one another) purse string sutures are placed over its midbody, on the front surface of the stomach wall. The gastrostomy tube (a de Pezzar, Malecot, or primary MicKey) is passed through this incision and into the stomach through the center of the purse strings. The first purse string suture is tied and the tube is infolded into the second purse string as that suture is tied to create a serosal tract. The stomach is sewn to the anterior abdominal wall. The gastrostomy tube is secured to the skin with nonabsorbable sutures (will need to be removed later) and the gastrostomy tube is checked to make sure it's open and in the correct place. Surgeons avoid placing the tube too close to the rib cage. The mortality and complications from this procedure are almost zero. The gastrostomy is kept to gravity drainage until gastrointestinal function resumes (24-48 hours), and then oral and/or tube feeds can be started. After 3-4 weeks, the tract is healed and matures enough for a tube change. If the tube is accidentally pulled out earlier, a smaller tube should be immediately placed and the child should be brought to the hospital for evaluation. Your child's nurse will teach you what to do in the event the tube is accidentally pulled out, and should give you an emergency tube for replacement.

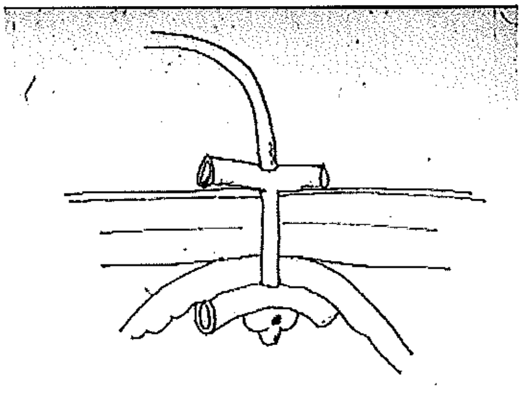

A
B
site for gastrostomy


A
concentric pursestring sutures
stomach
B
Pozzar catheter
gastrotomy
C

PEG (Percutaneous Endoscopic Gastrostomy)



A PEG placement is a technique that can be placed without an abdominal incision for children that do not require antireflux surgery. It is the least invasive method, and has been placed in infants as small as 3 kg. It is done with local anesthetic and sedation in adults, and brief general anesthesia in children. *Gastric endoscopy* (visualization of the food pipe with a special lighted scope) is used and the stomach is filled with air. The position of the stomach is determined by seeing the light from the scope shine through the abdominal wall. A needle is passed through the abdominal wall and into the stomach and a wire is passed through this needle. The person operating the endoscope grasps the wire with a snare and brings it out through the mouth. The gastrostomy tube is secured to this wire and pulled back down the food pipe and exits the opening in the stomach. Placement of this gastrostomy tube is confirmed by the lighted scope. Internal and external flanges are used to sandwich the stomach to the abdominal wall and secure the tube. This tube can be exchanged later for a more durable balloon catheter after 3-4 weeks when the tract is healed.



PERCUTANEOUS ENDOSCOPIC GASTROSTOMY

Postoperative Care

After surgery, your child will be transferred to the recovery room. This room has specially trained nurses and physicians that watch over your child. When he or she is awake and stable, the child will be taken to their room on a pediatric surgery floor. These nurses are trained to take care of children after surgery. Postoperatively, the gastrostomy tube is left to gravity drainage. Initially, the drainage looks green because the bowel is not functioning yet. When the drainage clears, (24-48 hours later), the volume of gastric drainage decreases, and feedings can be initiated. We usually start with a small amount of pedialyte and then advance the feeding to the quantity goal as ordered. With infants, volume is tolerated much more readily than increases in osmolarity (full strength formula). Inability to tolerate increased volume is evidenced by abdominal distension, vomiting, or increased gastrostomy residuals (amount of fluid lying in the stomach). Inability to tolerate increased osmolarity is evidenced by diarrhea. If an infant has difficulty digesting a standard or lactose-free formula, a pre-digested formula could be trialed. It is generally best to use diluted formulas (quarter-strength or half-strength) and then advance the diet first in volume and then in concentration over 3-4 days. Once the child is able to tolerate formula sufficiently in volume and concentration, intravenous fluids can be discontinued. Initially, constant infusion with a pump is the preferred method of gastric feeding. Early bolus feeding can cause nausea, cramps, and diarrhea.

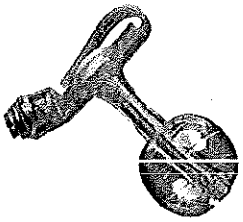
Children who are taking medications for seizures will have their medications converted to an IV (intravenous) form until they are able to tolerate oral or gastric routes of administration. Sometimes we can give the medication via g-tube and clamp the tube for one hour until it is absorbed.

If a primary MIC-KEY button was not placed at time of surgery, this is a good time to introduce a kit and let the family become familiar with it. Instruction should include feeding schedules, type of tubing used, how to vent the button, and how to clean the tubing when home. The family will be reinstructed at clinic in 3 weeks during their postoperative visit. There the MIC-KEY will be placed by the pediatric surgery nurse clinician, and home care instructions will be reviewed.

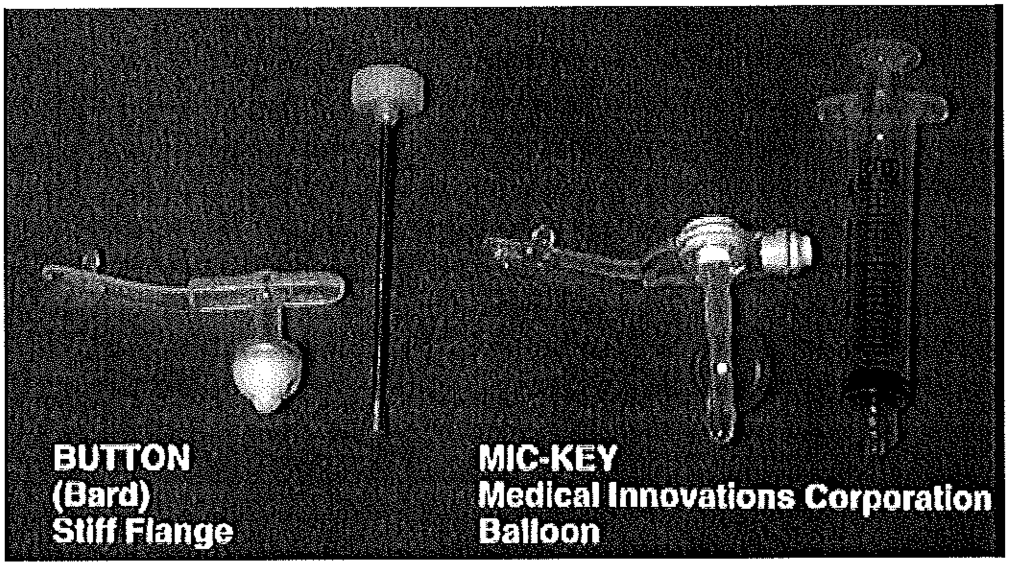
Before a patient is discharged from the hospital, they should know basic gastrostomy care, and what to do if the tube is accidentally pulled out. Each family will receive a Foley catheter, a 5cc syringe, tube plug, water-soluble lubricant for insertion, and instruction on how to place the catheter in the stoma and fill the balloon.

Instruction on how to insert a Foley catheter into the stoma:

1. Gather your supplies.
2. Wash your hands.
3. Fill the syringe with 5cc (one teaspoon) of tap water.
4. Connect the syringe to the side port of the clean Foley catheter. Push the tap water into the catheter. The balloon at the end of the catheter should inflate. If it does not, get a new one. Make sure the balloon on the catheter will inflate.
5. Remove the water from the Foley and disconnect the syringe.
6. If needed, cleanse the stoma and pat dry.
7. Wet the tip of the new clean Foley catheter with water-soluble lubricant (surgilube).
8. Insert the tip of the catheter into the child's stoma about 1 inch past the deflated balloon.
9. Fill the balloon with 3-5cc of water.
10. Pull gently on the tube feeling the balloon is against the wall of the stomach.
11. Place the catheter plug in the end of the catheter to prevent gastric contents from spilling.
12. Tape the catheter to the abdomen in an upright position without tension on the tube.
13. Note: Once the tube is out, it needs to be replaced immediately to prevent the stoma from closing!



There are two main types of long-term gastrostomy button appliances: Buttons with balloon devices and buttons with soft retention domes that rest against the stomach wall. The buttons are ordered by diameter and length. For example the MIC-KEY and AMT mini-button (both balloon devices) come in diameters of 14 or 16 or 18...to 24 French while the Bard Button (not a balloon) can be ordered in only 18 or 24 French diameters. The lengths of the MIC-KEY buttons are as short as 0.8 and can be as long as 4.4 cm. The depth of the stoma determines the length of the button. Your pediatric surgeon or nurse clinician will correctly size your child's stoma for the initial button. A good fit is about one-eighth inch above the skin. A parent will be able to eventually change the balloon devices, while your physician or nurse clinician will replace the Bard button. The main disadvantage to a balloon button is that the balloon can break. Its life span is approximately 4-6 months while the Bard button can last a year or longer. Disadvantages to the Bard button are that it requires a mature gastrostomy site, a stoma that can accommodate a size 18-20 French catheter and it cannot be placed until 2-3 months after surgery. A Bard button replacement is more painful and requires sedation or a topical anesthetic. There are also advantages to the Bard button. They have a decreased possibility of accidental dislodgment and skin breakdown. Many teenagers seem to prefer the Bard because they are easier to conceal. Your provider should discuss the advantages and disadvantages of the available tubes, and work with each patient individually.



Another type of button offered is the AMT MINI button. It combines the smaller features of a Bard button and has a balloon device. It is available in most of the same sizes as the MIC-KEY. The balloon is rounder and does not have the protruding tip that the MIC-KEY does. There are many companies that provide a variety of g-tubes. Each child is different, and should be treated as such. It is important for parents to know there are options, and help them find the best one for their child.

Venting

Venting allows air or gastric contents to be expelled through a decompression tube from the stomach. It is easy to do and prevents abdominal cramping and distension. Preferably, venting is most effective before a feeding. The tubing needs to be attached to a 60cc syringe and held lower than the child's stomach. It is also helpful to roll the child side to side to expel the air (it needs to reach the bottom of the button). Persistent pain and distension are indications to stop the feeding. Your physician needs to be notified and may suggest changing the formula or decreasing the rate of the feeding.

Some gastric contents may also be expelled along with the air. Remember to return the gastric contents after the air has been expelled and then flush the tubing with 5-10cc of water.

Note: After surgery, a small **amount of blood tinged residual** is normal, and guaic positive stools will be present for several weeks. If the residual is bright red and continuous, the physician should be notified.

Opening the tube and withdrawing gas or stomach contents to empty the stomach can alleviate retching. If this problem is ongoing, there can be many reasons for this and your surgeon should be notified. At times, the cause is just simply from increasing the rate too quickly. Your child may need a prokinetic agent (reglan or cisapride) that helps promote stomach emptying. Also, sometimes feeding intervals with 2-3 hour on, and one off help alleviate this problem. We sometimes run the feedings continuously at night and then turn them off for 1-2 hours before the child awakens. Some parents continually vent the tube while feeding to avoid this overdistension of the stomach. Each child is an individual and will require unique management to ensure their best recovery.

Residual is the amount of fluid (acid and formula) that can be checked before feedings. Remember, the stomach empties at it's own rate. Some children need medication to help increase gastric emptying (motility). A parent can check their child's gastric residual if abdominal distension or vomiting occurs. If the amount of residual is more than 1/2 of the previous feeding (i.e. 4 hours before), then wait 30 minutes and recheck the residual before giving the next feeding. Always return the gastric contents back into the stomach.

Oral Hygiene

It is important to stress the importance of oral hygiene even though a child may only receive g-tube feedings. Gums need to be massaged and teeth need to be cleaned and flossed. In a very young child, the gums can be massaged with a toothette or moistened with a cloth placed around your finger. Later on, a small brush can be used. It is best to give oral care at least twice a day. Many special needs children take medicines that soften the gums and contribute to tooth decay or discoloration. It is also a good idea to offer a pacifier to an infant during a g-tube feed so they can connect the feeling of hunger and then satiation with sucking. Sucking comforts a baby, and should be promoted. Lips should be moistened with water or Vaseline.

With older children, provide other opportunities to chew or suck. An Occupational Therapist can work with your child to promote oral development and help them reach their potential.

Remember that the mouth contains bacteria. When the mouth is kept clean, bacterial growth is prevented. Children with good oral hygiene will have less cavities and gum inflammation. A clean mouth may prevent or reduce the risk of pneumonia should the child aspirate their saliva.

Gastrostomy Site Care

Gastrostomy site care is usually initiated on post-operative day two. The dressing over the site is removed and assessed for redness, edema (swelling), drainage, tenderness at site, or bleeding. First, the family is instructed to wash their hands. The nurse will show the family how to mix a cleaning solution of 1/2 strength hydrogen peroxide and 1/2 strength normal saline. This is done twice a day (or more often if needed). Once the site is healed (usually 3-4 weeks), the site can be cleansed with a mild soap (pH balanced) and water. **The key point in this care is to keep the area clean and dry.** Gauze may be applied under the gastrostomy tube (G tube) if there is drainage. The gauze may be changed as often as necessary to keep the site clean and dry. The tube (except if there is a primary MicKey) will need to be anchored to the skin with adhesive tape to **prevent tension** on the tube. It is important to secure the tube under clothes in infants and toddlers to prevent accidental dislodgment. Ideally, the *stoma* (surgical opening where the G-tube is placed), should be flat, dry, and not tender. Rotate G-tube one-quarter turn 3-4 times a day until the site is healed. Report to your physician any signs of infection at the site. It is important to know that 2-3mm of a faint redness and a crusty drainage is common until the sutures are removed. After the sutures are removed, a daily bath will be sufficient in cleansing the site. Your child will be able to bathe and go swimming like any other child.

The two most import aspects of gastrostomy care are to tape the tube upright without excessive tension and keep the site clean and dry. This will prevent many of the complications that may occur.

Feeding Procedure

1. **Wash your hands.**

2. As the caregiver, make the feeding a relaxing event. Place your child in a comfortable position. If the child is in bed, elevate the head of bed 30-45 degrees during feedings and 30 minutes after. Cradle small children in your arms keeping their head elevated, remembering to offer them a pacifier during the feeding. Children that can walk around can join their families during meals. If your child cries during feeding, stop until he or she is quiet and comforted.

3. Open the safety plug in the top of the button. Insert the extension tube into place by lining up the black lines on the MIC-KEY, and locking the tube into place by turning the tubing clockwise 1/2 turn. Caution: Do not turn past this stop point or you can break the locking device. For the Bard button, attach the appropriate feeding tube.

4. Attach a syringe with 5-10 cc of water and inject the water into the tube. This is called the *flush.*

5. For Bolus feeds, pour 30-45 cc of formula into the syringe and let the formula flow in by gravity. The syringe should not be more that a few inches above the stomach. Continue adding fluid until the full feeding has been given. Never push all the feeding in with a plunger. Avoid letting air into the stomach by keeping formula in the tubing at all times. The feeding should take place over a 20-30 minute period. Adjust the flow of the rate by opening or closing the clamp or raising/lowering the syringe.

6. Flush the tubing with 5-10cc of water, and clamp the extension tubing.

7. Disconnect the feeding set or syringe from the port.

8. Wash the tubing and syringe with warm soapy water. At least once a day, soak the tubing in vinegar (10-25%) and water and rinse. This will prevent formula build-up and extend the life of the tubing. They can be reused until they are worn or unable to be cleaned. Usually the tubing is changed every 1-2 months. Hint: You can clean out bolus tubes by using a long pipe cleaner. Some parents have also discovered that denture cleaner (Efferdent) is helpful when removing formula build-up in the tubing.

Continuous feeds - follow the manufacturer's instructions for pump setup and operation.

1. Attach the feeding container to the *continuous tubing* set. Check to make sure that the tubing is connected to the pump properly and open the clamp on the pump tubing.
2. Follow the pump instructions and set the pump at the appropriate rate.
3. Add the amount of water (free water prescribed by your doctor) in the feeding container.
4. Turn on the pump and pump the water in at the prescribed rate.
5. When the water is almost finished, put new formula into the feeding container. One can hang 4-6 hours of feeding at a time or place ice in the outside pocket of the feeding bag. Change the feeding bag daily.
6. Hints for canned formulas: Clean the top of the can with soap and water before using. Shake the can well before opening. Always check the expiration date.
7. Store unused formula in the refrigerator with plastic wrap covering the top.

Giving Medications: Whenever possible, use liquid medications. If tablets must be used, crush them to a fine powder and let them dissolve in 10-20 cc of warm water or formula. Capsules can be opened, and their contents dissolved in the same method. Note: If medications do not dissolve in liquids, applesauce or pudding can be used. Always flush with water between medications. Open the safety plug on the button and attach the feeding tube. Draw up the medication with a syringe and inject it into the tube. Flush with water after and detach the tubing. Close the safety port.

Complications

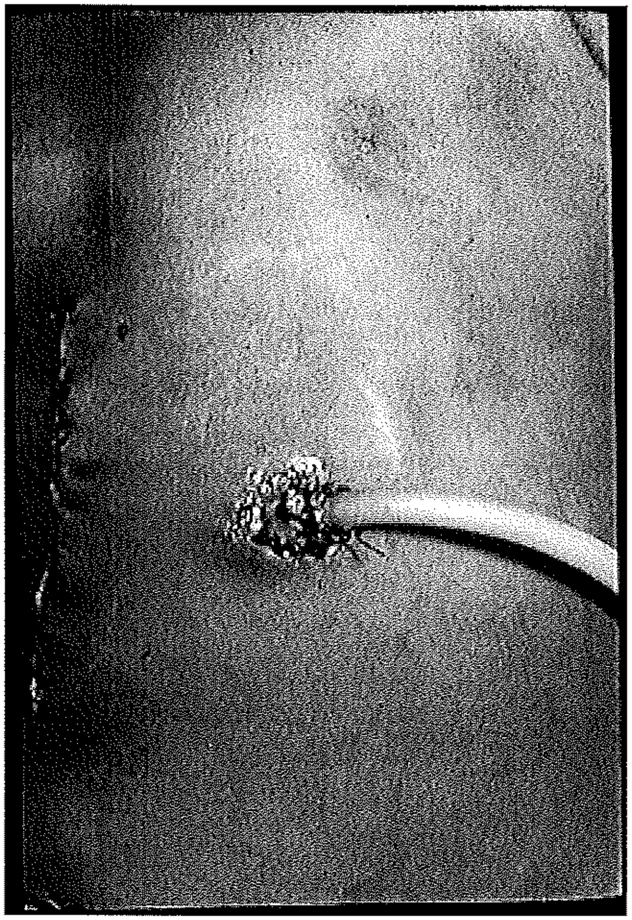
Leakage is the most common problem after tube placement. It causes a red, tender, peri-stomal area because gastric contents are acidic and burn the surrounding skin. Treatment is to determine the cause of the leaking. It is also important to find out if the leakage is around the tubing or from the broken antireflux valve. If the antireflux valve is sticking, gently insert the obturator or 8 French suction catheter into the shaft of the button until it moves the valve back to the closed position. It will make a popping sound and stop leaking. If the antireflux valve is broken, the button may need to be replaced.

Sometimes the water in the balloon has evaporated or leaked, and needs to be replaced. We teach our parents to check the balloon and add the difference if it is needed. Normally, 3-5 cc should be the amount needed to secure the balloon inside the stomach. Never use air or saline to fill the balloon. It is acceptable to add 1-2 cc of water to increase the balloon volume. Do not exceed 10 cc because the balloon will break.

Often with the balloon device, the balloon has broken and needs to be replaced. Your surgeon or pediatric nurse clinician will teach you how to replace the button and always send you home with a spare.

Putting in a smaller tube for several days or overnight will allow the site to close down. You may be able to remove the button from a well-healed track for 30 minutes to an hour and accomplish the same goal. The same button can be replaced in the stoma after it has closed down slightly.

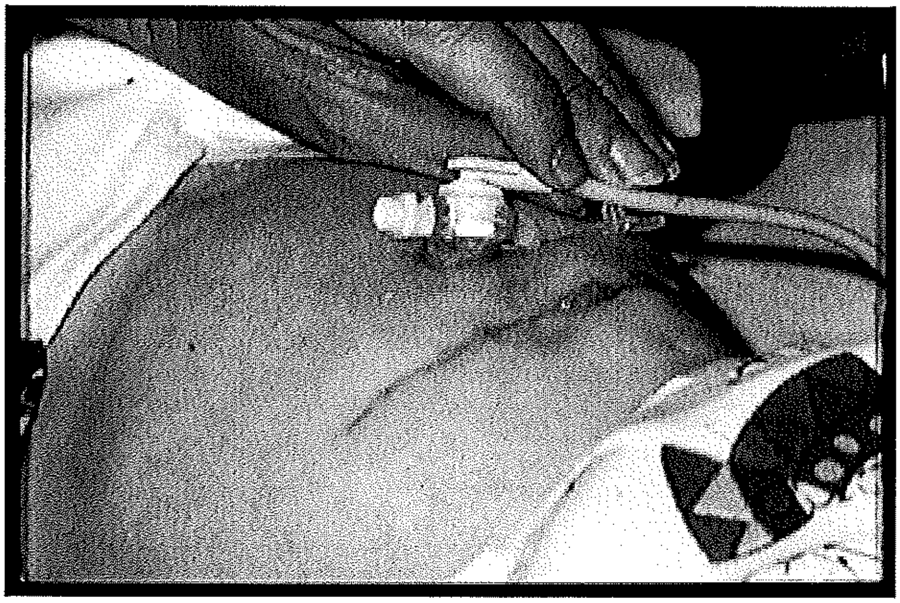
While it is leaking, the peri-stomal area needs to be protected. One can use a zinc oxide barrier cream or topical antacid. Sometimes an H2 blocker is ordered to decrease the volume of acid in the stomach leaking until the site is healed.



Excess motion and tension of the tube cause erosion of the site. Treatment is to secure the tube in an upright position. Meticulous skin care and stabilization of the tube will resolve this problem. Leaving the tube out for two -three hours (under close observation) with the child on their right side will also allow some healing.

THIS SHOULD ONLY BE PERFORMED UNDER PHYSICIAN SUPERVISION

Granulation Tissue (also called *proud flesh*) is raised beefy red tissue, which heals wounds. The body is sending a signal to heal over the opening. It is made of blood vessels and bleeds easily. It looks like raised red tissue that is mushrooming around the stoma. Granulation tissue leaks and bleeds and tends to enlarge if not treated. A chemical cauterizing stick, silver nitrate, easily treats it. The peri-stomal area outside the granuloma needs to be protected with Vaseline or a barrier cream so that the surrounding tissue will not be affected. The silver nitrate causes the granulation tissue to dry up and scar down. A topical anesthetic (EMLA cream) can be applied one hour prior to application as some children experience pain with this treatment. An alternative treatment is the application of triamcinalone cream in a thin layer several times a day until the site is healed.



Fungal Infections (usually caused by the genus Candida, especially Candida Albicans) occur when there is a disturbance in the balance of skin flora. (E.g., from treatment with an antibiotic, or a poor nutritional state). Your pediatric surgeon easily treats it by the application of topical and/or enteral nystatin. Sometimes a mixture of Mylanta and nystatin powder can be applied to the rash with a Q-tip. At all times, it is important to keep the site clean and dry.

Tube Dislodgment happens for many reasons. The important fact to remember is that a mature Stamm gastrostomy can close down in a matter of hours. Parents need to learn how to replace the tube at home and have a spare available at all times. If the Balloon device is accidentally pulled out and is inflated, simply remove the water from the balloon, reinsert the tube, and refill the balloon with 3-5cc of water.

Plugging of the button is usually caused by food or medicine occlusion. Remember to always flush the tubing with 5-10cc of water after administering food or medication. That said, diet soda or cranberry juice is useful to dissolve these clogs. One can also inject warm water gently, allowing it to flow back out of the tube until the blockage is cleared. Caution: Never use pressure to clear a blockage!

Feeding catheter becomes dislodged during a feeding

Check to make sure the feeding extension is locked in place. If it is a MicKey, use a FIRM 1/2 twist to make a secure connection. If it is a Bard connection, check to make sure the button is not clogged. Attach the appropriate feeding tube with the bolus or continuous adapter and flush with 5-10cc of water. Estimate the amount of formula lost and continue feeding, making sure to replace the amount of lost formula.

Wound Infection is extremely rare. Usually, there is redness (1-2mm) and drainage around the fresh gastrostomy site that is mistaken for infection. The body is actually reacting to the new tube (foreign body), and just needs to be kept clean and dry. When a true infection occurs, redness and swelling will measure 10-20 mm around the tube. This occurrence will need to be treated by your pediatric surgeon.

Pressure sores from tight appliance can occur if the child outgrows his or her appliance. Each button should rotate freely and have 1/8 inch of room above the skin. Good fit is important and should be checked frequently. Any button appliance can cause a deep pressure sore if the shaft length is too short. For this reason, fit should be measured with the child in a supine position and then sitting up. Treatment would necessitate exchanging the button for the appropriate size.

Hooray, your child may no longer need their g-tube one day. The parent, nurse clinician, or physician will simply remove the tube. The stoma will close in hours unless it has epithelialized. This would be called a **persistent gastrocutaneous fistula,** and will cause continued leakage of gastric contents. This occurs in about 15% of gastrostomies. If the tract has not closed after 4 weeks, or if the acidic leaking is causing severe inflammation, a surgical procedure can be done. This procedure will detach the stomach from the abdominal wall and close the fistula.

In closing, gastrostomy tubes improve the quality of life for children previously unable to achieve adequate nutrition. With good care and patient education, complications can be prevented. It is vital for these families to maintain open communication after discharge from the hospital. Parents can call their pediatric nurse clinician or pediatric surgery resident on call with any questions or concerns. Continuity of care is key for our children and families to make their transition to gastric feedings as atraumatic as possible.