

REASONING AND UNDERTAKING OF PERCUTANEOUS IMAGE GUIDED GASTROSTOMIES (PIGGS)



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Since Gauderer and Ponsky at the University Hospital of Cleveland published the first written description of the innovative technique PEG (Percutaneous Endoscopic Gastrostomy) placements in 1980, it has become an accepted technique (3). With this advancement in medical innovation, PEGs were then widely utilised and favoured over the alternative laparotomy gastrostomy, being placed around the time due to the reduced cost and minimally invasive techniques.

Previously, patients were offered a laparotomy gastrostomy. As less invasive and more cost effective, the PEG soon became the favoured technique. Is there evidence or stats to prove the percentage of laparotomy gastrostomies placed vs PEGs/PIGGS?

Whilst, traditionally, gastroenterologists and surgeons perform the PEG placement, the advancement of radiological imaging techniques, especially in the area of radiological catheters and wires, has allowed for radiologists and other specialists to perform a fluoroscopically guided version of this percutaneous gastrostomy technique. Currently there are two main forms of radiological gastrostomy:

- RIG - Radiological Inserted Gastrostomy. The RIG method of enteral feeding has been around for a number of years. There are two forms of enteral feeding devices. The first being a RIG in the form of a pigtail catheter which is inserted into the stomach, where the pigtail is formed on the device either sutured at the skin or held in place by dressing. The second is the balloon gastrostomy which is inserted into the stomach via the aid of wires and dilators before the balloon gastrostomy is inserted and the balloon inflated to retain the tube fixated in the stomach.
- PIGG – Percutaneous Image Guided Gastrostomy - Corflo a supplier of enteral feeding tubes have developed an over the wire version of their bumper (what is a bumper feeding tube) enteral feeding tube.

This article describes the Percutaneous Image Guided Gastrostomy technique which is being increasingly utilised by radiology departments.

INDICATIONS

There is currently a variety of nutritional feeding methods available. Enteral nutrition is the preferred method of feeding in the majority of situations. Benefits of enteral feeding include bypass of the oropharynx and oesophagus, administration of balanced nutrition and medication directly into the stomach or jejunum. This allows for individuals with classic indications such as inability to swallow food as a result of neurological disorders such as stroke, MND (Motor Neurone Disease), to be nutritional managed (1).

There are numerous legal, ethical and social issues to consider when determining if PIGG placement should be undertaken as a result of poor oral intake due to dementia or irreversible chronic conditions such as pharyngeal or oesophageal malignancies or severe facial trauma. These are complex decision making processes and are widely debated (9). Nasogastric or nasojejunal tubes can be used for short-term situations, PIGGs should be considered for intermediate (1/12) or long-term feeding. Feeding extension tubes can be placed through the PIGG tube to allow for jejunal feeding in individuals with severe gastro paresis and pancreatic disease. Less commonly, extension tubes are used in individuals with recurrent large volume aspiration of gastric contents leading to pneumonia (11).

CONTRAINDICATIONS

Advancements and innovations have extended the role of medical imaging in interventional procedures. Gastrostomies can now be placed under fluoroscopic guidance when endoscopic techniques have failed or

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are deemed too risky. When looking at the risks of the procedure, we can categorise potential patients into one of three groups; absolute contraindications, relative contraindications and no contraindications, that is to say safe to proceed. There are only a few absolute contraindications to PIGG tube placement. Please refer to the Table 1 below (9).

Table 1: Contraindications of the placement to a percutaneous gastrostomy

	PEG <i>Percutaneous Endoscopic Gastrostomy</i>	PIGG <i>Percutaneous Image Guide Gastrostomy</i>
Absolute contraindications		
Inability to pass endoscope	X	
Inability to see gastric trans illumination	X	
Peritonitis	X	X
Untreatable massive ascites	X	X
Bowel obstruction	X	X
Uncorrectable coagulopathy	X	X
Relative contraindications		
Massive ascites	X	X
Large gastric varices	X	
Extensive abdominal surgery	X	
Morbid obesity	X	
Gastric wall neoplasm	X	X

X = not advisable to perform procedure

Relative contraindications include situations whereby placement of the tube is technically viable. However, with this there is an increased incidence of morbidity and even mortality.

The most common relative contraindication to the insertion of a PIGG is altered coagulopathy. This is commonly seen in the advancing age group whereby other pathological factors have meant that the individual is required to take some form of antiplatelet or anti-coagulate therapy, thus increasing the risk of procedure related haemorrhage (10).

Other haematological and pathological factors have to be accounted for prior to intervention, such as any alteration in leukocytosis or amylases or ongoing systemic infections, fevers or pain that would mask immediate or post-procedure complications.

PIGGs can be performed successfully in situations whereby general surgical intervention may be deemed risky. At local trusts, patients, 30 days after MI (Myocardial Infarction), have had PIGGs performed without any significant increase in morbidity and mortality, a practice based upon Cappell's 1996 study into insertion of PEGs post MI (2).

PATIENT PREPARATION

The reduction of risk or post procedure complications is essential, so correct patient preparation is vital. Pre-procedure preparation involves a number of things; the patient being NBM (nil by mouth) for a period of no less than six hours. The patient's coagulation should be checked to ensure that the prothrombin time is within reasonable limits. If however this isn't the case then

alterations to the clotting time can be treated and rechecked prior to the procedure (1).

A pre-procedural prophylactic dose of a broad spectrum antibiotic should be administered IV (intravenous). This is done within the local trust whilst the patient is within the procedure room, therefore ensuring that all patients have had the correct dose of prophylactic antibiotic, thus reducing the risk of local or systemic infection, prior to them returning to the ward (12).

The legality of these cases is normally determined prior to the patient's arrival to the radiology department. Informed consent is gained on day of admission, or if an individual has a neurological deficit, it is done in conjunction with family members who can decision-make for their relative (5).

PROCEDURE

Prior to the procedure being undertaken, the surgical WHO (World Health Organisation) Safety Checklist form is undertaken with all staff members within the procedure room being present along with the patient (Patterson 2009). Following this, the patient is laid supine on the fluoroscopy table. Topical analgesia in the form of Xylocaine spray is administered to the back of a patient's throat, this allows for the wires and catheters to be manipulated in oropharyngeal area without distressing the patient.

Monitoring in the form of BP (Blood Pressure), P (Pulse), SpO₂ & ECG (electrocardiograph) is applied to the individual allowing for constant monitoring throughout the procedure, with four litres of O₂ per minute being prescribed through a nasal cannula to the patient (8).

To assist the patient throughout the procedure, the patient is sedated at this point with a combination of opioids and benzodiazepines. Commonly in the UK, the preferred choice is Midazolam given in conjunction with Fentanyl or Pethidine.

The insertion of a PIGG tube can be broken down into two main stages: 1) the sociable clean stage is used for the intubation the stomach; 2) The surgically aseptic technique of the percutaneous access and extubation of the stomach.

SOCIABLY CLEAN INTUBATION

A 4Fr head-hunter catheter with a hydrophilic Terumo wire are used to intubate the oesophagus, whilst the fluoroscopy machine is in a lateral position screening over the oropharyngeal area allowing clear visualisation of the position of the oesophagus in conjunction with the trachea. Once the oesophagus has been intubated, the image intensifier moves around into a AP (Anteroposterior) view; with the catheter and wire progressing down to the stomach, it is accessed by passing the two down until they're in the mid-body of the stomach.

Fig. 1: Percutaneous clean intubation

Here the wire is removed from the catheter and the stomach is insufflated with air using a hand puffer. This allows the stomach to be visualised on fluoroscopy as the air acts as a negative contrast agent. It also assists by displacing the colon if it is between the stomach and

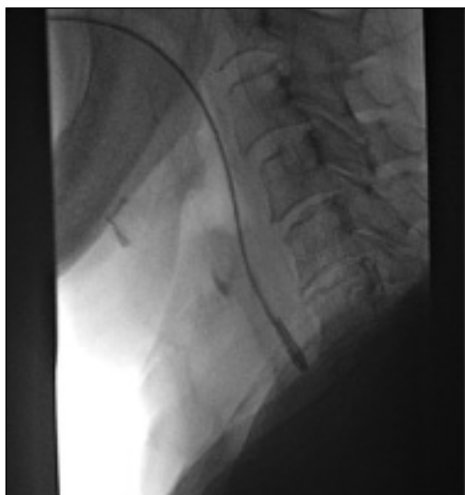


Fig. 1: Percutaneous clean intubation



Fig. 2: Percutaneous AP view

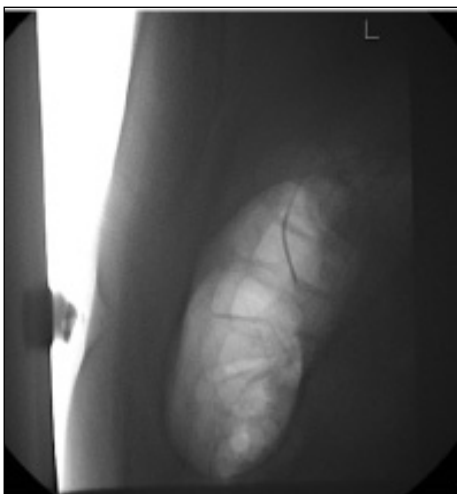


Fig. 3: Percutaneous lateral view

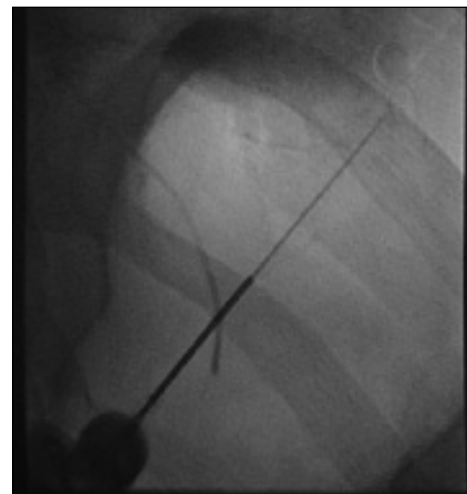


Fig. 4: Percutaneous surgical access

anterior wall of the peritoneum. Once insufflated to its full potential, the gastric rugal folds become less obvious or the patient will reflux air. The position of access then can be marked out by using a radio opaque marker to find the correct position with the image intensifier in an AP view. Positioning the image intensifier in the lateral position allows you to see that the stomach is up against the anterior wall of the peritoneum, reducing the chance of any colon being along the access point.

Fig. 2: AP view seeing stomach insufflated and colon being displaced below the stomach

Fig. 3: Lateral view of stomach against anterior wall

A quick ultrasound scan over the access site gives reassurance that no transection of liver will occur if it is slightly overlapping the stomach. Only air artefact should be seen on the USS machine if the liver is clear of the area. The optimal position of the access point should generally be in the region of the Antrum along the midline of the stomach.

SURGICAL PERCUTANEOUS ACCESS AND EXTUBATION

With the position of access noted, the clinician will then scrub for the procedure, ensuring that this stage of the intervention is aseptic. The site is cleaned with

chlorhexidine, and surgical drapes are applied reducing overall chance of PIGG site infections. One percent lignocaine is then administered to the position where the PIGG will be inserted using a subcutaneous injection. The fluoroscopy is then used to ensure that the stomach is still distended with air and that the area of access hasn't moved.

Fig. 4: Percutaneous surgical access

The needle and syringe with a local anaesthetic is brought vertical and inserted directly posterior, whilst slight traction is applied to the syringe at all times until air is seen entering the syringe, demonstrating that the stomach has been entered. At this point, the local anaesthetic is injected whilst retracting the needle out of the patient ensuring that a nice anaesthetised track is formed. A half centimetre cut with the scalpel is made where the subcutaneous injection had been given, reducing the chance of necrotising fasciitis and for reduced skin tension later on when pulling the enteral feeding tube through.

The large diameter access needle is then attached to a 20ml syringe with 10ml contrast in it. With the needle tip placed in half centimetre incision, fluoroscopy is quickly used to confirm once again that the stomach is distended. The needle and syringe are then brought vertical and with a stabbing motion inserted posterior with negative traction on the syringe. Once air enters

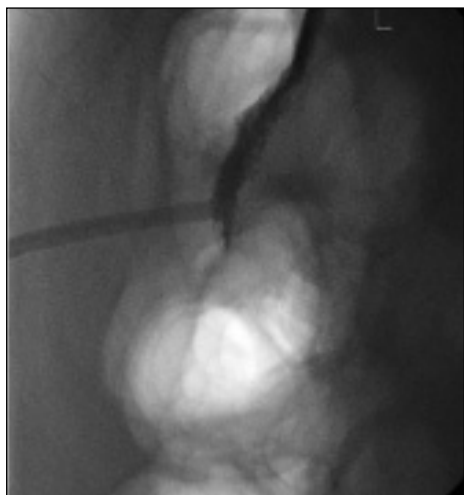


Fig. 5: Percutaneous lateral view PEGogram



Fig. 6: Percutaneous AP view of PEGogram

the syringe, the needle and syringe are advanced half a centimetre to a centimetre further under fluoroscopy and the contrast is injected. The contrast should be seen shooting towards the fundus of the stomach to confirm position. The little plastic cannula that is over the needle can then be advanced into the stomach. At this point the metal needle trocar is then removed leaving the plastic cannula; a stabilisation wire is then inserted through the cannula and into the stomach. The cannula is then removed over the wire, leaving only the wire percutaneously in situ in the stomach. A 4Fr access sheath is then passed over the wire to ensure that stomach access isn't lost.

A 4Fr head-hunter is placed over the wire through the sheath and used in conjunction with the wire to extubate the stomach through the GOJ (Gastro-Oesophageal Junction) and up the oesophagus. Once the wire and catheter is at the cricopharynx, the image intensifier is positioned into a lateral position allowing for the clinician easy access out of the oropharynx.

Once the catheter is out of the mouth the wire is removed from the catheter and the nurse at the head of the patient removes the initial catheter that was used in a sociably clean stage to intubate the stomach. A very long four metre wire is placed through the 4Fr head hunter that is going percutaneously through the sheath which passes the wire out of the mouth where the clinician then grabs hold of the wire and pulls the majority of it down to the area of the patient's knees. This therefore means that the wire is going through the patient's stomach up their oesophagus, out the mouth and both ends around about the patient's knees. The PIGG tube is then placed over the wire that is coming out the patient's mouth. At this point the clinician holds on to both ends of the wire with one end in each hand and with a swinging motion pulls all of the PIGG feeding tube through the oesophagus into the patient's stomach and through the peritoneal wall, leaving the PIGG tube bumper up against anterior wall of the stomach. The tube is then cut to length thus removing the dilator from the PIGG tube.

POST PROCEDURE

Following the insertion of the tube, the area around the access site is cleaned with chlorhexidine and the exter-

nal fixator is attached. At this point a note is made of the length of the tube from bumper to skin so that this can be documented in the patient's notes in case the tube is displaced and the measurements are needed to ensure tube position.

Fig. 5: Lateral view of PEGogram post insertion (previous page).

Fig. 6: AP view of PEGogram post insertion (previous page).

The Y feeding connector is then connected to the end of the tube and a check tubogram is performed. This is done by injecting contrast down the tube and ensuring that it is in the correct position on both lateral and AP projections. Position and patency are confirmed by seeing the contrast flowing from the tube posteriorly into the fundus of the stomach.

Following this the stomach is decompressed of air via the tube from any leftover air that is inflated earlier and the tube flushed with normal saline. The drapes are removed and the patient returned to their own bed ensuring that they are not in any discomfort or pain.

COMPLICATIONS

Whilst undertaking intervention, the key is to reduce the possibility of intra or post-procedure complications. Even when accepted, careful technique is adhered to by skilled interventionalists as complications may occur. These can be severe and in some cases life threatening. The management of these complications is often very difficult considering that the reason for this intervention is that the patients are poor candidates for surgical investigations and treatment and so may respond poorly to aggressive medical care, due to the current debilitating or fragile pathological primary cause to their referral (7).

Within the United Kingdom, complications post PIGG, PEG, RIG and variants, are audited in relation to complication rates per centre and per undertaking clinician. These areas of complications can be broken down into one of two, major or minor complications (13).

It has only been seen in a very small percentage of the population that, following PEG/PIGG placements,

there has been an incidence of cancer seeding from head and neck cancer to around the insertion site in the stomach, due to the pull through method of tube placement. Currently in the UK, there has only been one reported case of seeding in relation to the thousands of percutaneous tubes placed in a year. This is an extremely rare risk to exclude this relative safe procedure by a skilling interventionist (14) (see Table 2).

Post-procedure, most patients may experience abdominal discomfort; this is not uncommon and will normally subside 48 hours after insertion. These patients will require an increased systemic analgesia to ensure that this post procedural pain is managed properly. For individuals already on analgesic control for underlying pain management, it shouldn't be expected that the analgesia that has already been prescribed for underlying pain indicis will also control the pain indices that have brought on by the PIGG insertion. Sometimes patients may experience intense abdominal discomfort for a period of two to 12 hours; this can commonly be caused by the tube being fixated too tightly at the skin, or that postsurgical oedema around the PIGG site has meant that the tissues have swollen in size creating localised pressure; it can be relieved very easily by unlocking the tube at the external fixator and lengthening the tube by about half a centimetre to a centimetre in length. If, however, it is deemed that within the 48 hours post-insertion that diagnostic radiology is required to ensure that no complications have arisen, then an abdominal CT (computed tomography) can be performed to ensure that no internal peritoneal anatomy was perforated in the insertion technique and that the bumper is correctly positioned. A CT should be a first-line diagnostic test when confirming whether or not post procedural complications have arisen.

Undertaking a contrast study as in a tubogram to ensure that the tube is correctly positioned will demonstrate if there is a leak around the tube or if has been dislodged. However, it will not demonstrate whether any internal structures were perforated or transected.

REPLACEMENT/REMOVAL OF PIGG TUBES

If removal of the PIGG tube is required, it can usually be done within the ward, clinic or radiological departmental setting with ease; this is commonly performed without the requirement of sedative, as it is a technique that is relatively quick, painless and risk-free.

Table 2: Complications

Major complications	Minor complications
Aspiration	Tube obstruction or fragmentation
Peritonitis	Leakage around feeding tube
Tube migration through gastric wall	Peri-stomal wound infections
Perforation	
Haemorrhage	
Necrotising fasciitis	
Tumour implantation at PIGG stoma	
Premature removal of PIGG tube	

PIGG & PEG tracks mature over a period of two to six weeks, determined by a number of factors including whether or not the patient is on any steroid therapies and the patient's nutritional intake and tube site of infection status (12).

The Corflo PIGG and PEG tube can be removed by asking the patient to lay supine on a procedure table or bed, removing the external fixator to the tube. Doing this allows for two things, one so that the tube can be advanced slightly posterior and anterior and secondly so that the air channel of the tube is unoccluded to allow air to escape from the bumper allowing it to collapse on removal. Sterile gel is then placed around the tube before removal; the tube is then pushed into the patient's stomach slightly allowing for the mature track to be lubricated by the gel. Following this, two fingers are firmly applied to the abdominal skin around the tube site to stop tenting of the abdomen and a firm grip is applied to the tube with other hand, a firm pull on the tube with constant traction will pull the bumper through the mature track and out of the patient, at which point a dressing can be applied to the track hole. Over the following 48 to 72 hours tissue granulation will take effect and the track will start to heal.

CONCLUSION

With PIGGs generally accepted as a means of obtaining long-term feeding access, the widespread acceptance of this method continues to grow. Barring a few contraindications and whilst following simple guidelines of use, placements can be made relatively easily in most patients. The benefits of PIGGs over RIGs increases in advancements for enteral feeding safety and procedural technique making it worthwhile procedure for patients who require prompt, long-term enteral nutrition and fluid.

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Questions relating to: Reasoning and undertaking of Percutaneous Image Guided Gastrostomies (PIGGs)
 Type your answers below and then **print for your records**. Alternatively print and complete answers by hand.

Q.1	What are the two main forms of radiological gastrostomy?
A	
Q.2	What are the benefits of enteral feeding?
A	
Q.3	When should PIGG placement be considered?
A	
Q.4	What are the three 'risk' groups of the PEG/PIGG procedure?
A	
Q.5	Describe the most common contraindications relating to a PIGG insertion.
A	
Q.6	What are the two main stages of insertion of a PIGG tube?
A	
Q.7	What is involved in patient pre-procedure?
A	
Q.8	Describe the most common post-procedure symptom and how it is best managed.
A	

Please type extra notes here . . .