Removal of Percutaneous Endoscopic Gastrostomy tubes in adults using the "cut and push" method: a systematic review

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Abstract

Background: PEG tubes are inserted for long term enteral feeding and may need to be removed at some point post insertion. A recognized method to remove the PEG is the cut and push method (CP). Some studies have suggested that CP is safe whilst others have reported complications and death. Subsequently the use of CP is not uniform but, if safe, could provide a cost effective, minimally invasive, alternative to gastroscopy. The aim of this study was to locate and critically appraise all publications relevant to CP in adult patients using a systematic approach.

Method: Systematic searching of electronic databases Embase, Medline and Cinahl, using keywords in title and abstracts. Exclusions were: non-human, under 18 years of age, Non-English language. Time limits were not applied. Preliminary searching gave 538 hits that were then hand reviewed for relevance. Selected studies were critically appraised and data summarized into tables for use in the review.

Results: 27 records were included in the review spanning from 1990-2014. A total of 21 case reports detailing complications in 24 individuals, including 5 deaths. There were 5 cohort studies and 1 case report detailing the safe use of CP, with 3 complications. Cases totalled 373 with 27 complications (7%). Most common complication was gastrointestinal obstruction, usually occurring in the first 6 months post CP. A history of bowel surgery was evident in some cases where obstruction occurred. The majority of cohort studies reported the use of assessment criteria to exclude those at risk of obstruction and reported low complication rates.

Conclusions: The quality and quantity of the evidence on CP is insufficient to make recommendations for clinical practice. Further research is needed to evaluate the effectiveness of CP.

Introduction

The first Percutaneous Endoscopic Gastrostomy tube was placed in 1979 ([1]) and it has since become established as the route of choice for long term enteral feeding ([2, 3]). In order to insert a PEG a gastroscopy is performed during which the PEG tube is pulled down though the oesophagus, into the stomach and out of a small hole that is made in the abdomen; the PEG is securely held in the stomach by a small flange on the end of the PEG tube, that is positioned on the inside of the stomach, against the stomach wall.

Post insertion of the original PEG tube removal, and/or replacement, of the tube may be required. There are three recognised methods of removing a PEG tube: endoscopic via gastroscopy; traction removal via the abdomen (certain types of PEG only), or bedside removal using the "cut and push" method (CP). The CP method involves pulling the PEG tube taught, cutting the PEG tube at skin level, pushing the remaining part into the stomach, and allowing the inner remnant (flange and small portion of tube) to pass through the gastrointestinal system to be excreted in the stool.

One of the first authors to report the use of the CP method in the literature was Korula and Harma ([4]); 48 patients had expulsion of the PEG remnant verified by x-ray with one case requiring gastroscopy to retrieve a flange impacted at the pylorus. Merrick et al ([5]) report use of the CP method in 42 adult patients; in 20 patients x-ray confirmed expulsion of the of the PEG remnant, 20 self reported PEG remnant seen in stool. Kerjariwel et al ([6]) studied 89 adult patients over a five year period and did not identify any complications post removal of PEG. Similarly, Pearce et al ([7]) studied 73 adult patients, identifying complications in two patients. Most recently Agha et al ([8]) removed 79 large calibre PEG tubes, using the CP method ,reporting PEG remnant seen in patients stool in 63 cases with zero complications in all patients over a one month follow up period. Three of the four cohort studies published have been from the UK ([5-7]), which may be reflective of the healthcare system.

There are, however, case reports in the literature that report bowel perforation post CP where the inner remnant of the PEG tube has become lodged in the bowel causing obstruction or perforation ([9-12]). In some instances this had been fatal ([13]).

In terms of policy guidance, the National Institute for Clinical Excellence Guideline 32: Nutrition Support in Adults ([14]) does not address PEG removal; the British Society of Gastroenterologists ([2]) advises that where the CP method is used a risk assessment should be carried out for possible bowel obstruction, and that patients should be appropriately consented. The European Society of Parenteral and Enteral Nutrition ([15]) recommends endoscopic removal. There has not been a Cochrane review on CP PEG tube removal, nor any literature/systematic reviews on the topic.

Due to the lack of robust research evidence and policy guidance the use of the CP method varies with some Centre's deeming it safe whilst others view the risk of bowel obstruction/ perforation (and the potential consequences) to be too high. It is worth Noting that there are many different manufacturers of PEG tubes. The manufacturer of one of the most commonly used PEG tubes in the UK recommends endoscopic removal ([16]), and that any other removal methods require intensive follow up; the use of CP is not specifically addressed.

An advantage of the CP method is that the tube can be removed easily at the bedside, by a suitably trained nurse, which avoids an invasive endoscopic procedure for the patient. A gastroscopy has associated risks such as perforation, aspiration, bleeding and adverse reaction to sedation, which also need to be considered. CP may be a cost effective procedure for healthcare providers as opposed to an endoscopic procedure in the removal/ replacement of PEG tubes.

The aim of this review is to locate and critically review all publications relevant to the use of CP in adult patients using a systematic approach.

Methods

Search strategy

Full database searching was used to identify relevant literature. A systematic search of the electronic databases Embase, Medline and Cinahl was undertaken via EBSCO and completed in June 2015. Keywords were mapped to the thesaurus; title and abstracts were searched. As preliminary searching had demonstrated that the literature was not extensive, time limits were not applied, as the requirement was to obtain all of the available evidence. Searching was restricted to humans, English language and adult age groups; under 18 yrs were excluded.

Search terms were: gastrostomy/ gastrostomy tubes/ gastrojejunostomy tubes/percutaneous endoscopic gastrostomy/ PEG tube/feeding tubes/ enteral tube feeding. These results were then combined using "or" resulting in 2240 hits (A). A search was then carried out for: intestinal obstruction/ gastric outlet obstruction/ intestinal perforation/ bowel surgery/ retained bumper/and retained PEG end. The results of these were then combined using 'or" resulting in 1952 hits (B). Searched: device removal/ removal/ replacement/cut and push and results combined using "or" resulting in 27736 hits (C). Searched: endoscopy/ gastrointestinal/ "OGD"/ endoscopy/ gastroscopy and results combined using "or" resulting in 4174 hits (D). Search results were then combined using "and": AB (36 hits), AC (1230 hits), ABC (25 hits), ACD(52 hits), ABCD (3 hits). Limits of English language and adult age group were applied which reduced hits to 24, 469, 16, 29 and 3 respectively. These search results were then reviewed by the Author and appropriate studies selected.

Relevant records were retrieved electronically or via the University library. Retrieved records were searched for additional references that may have been missed in the database searching. Records were then assessed for eligibility and included/ excluded. Additional keyword searching of Google Scholar was carried out using keyword search terms "cut and push" and "gastrostomy removal" but no additional sources were identified. The Cochrane database was searched using terms "enteral feeding" and "gastrostomy tubes" but nothing of relevance was found.

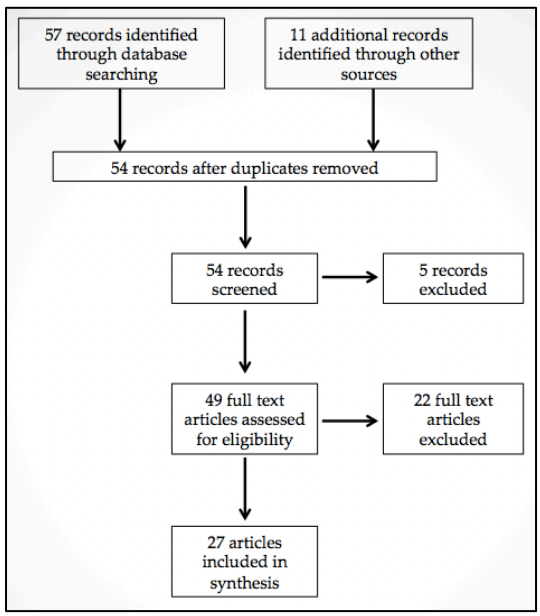
The selected records were a mixture of cohort studies and case reports. The cohort studies were appraised using the Critical Skills Appraisal Skills Programme [CASP] cohort study

checklist ([17]). The case reports were appraised using the Center for Evidence –Based Management Critical Appraisal of a Case Study checklist ([18]). Data was collated in the form of tables to enable analysis and synthesis of results.

Results

Initial database searching identified 57 records, reduced to 43 records once duplicates had been removed. These records were then screened for eligibility with four records being excluded as found not to be relevant. A further 11 records were identified through reference lists which were reduced to 10 once screened. This resulted in 49 full text articles to be assessed for eligibility. Of these 22 were excluded: 10 related to balloon gastrostomy, four related to a child, two foreign language, three tube migration, one push PEG, one endoscopic removal, one PEG insertion; 27 were selected for the review.

Figure 1. Search results: PRISMA diagram ([19])



Records spanned the time period from 1990 to 2014. Of these 21 records looked at case reports of complications post CP: 19 single case reports and two records reporting a total of five cases of complication post CP; 10 were from the USA, six from the UK, three from Australia, one from New Zealand and one from Italy. Another record from the USA reported two cases of CP without complication; the remaining five records studied cohorts of patients that had undergone CP: three from the UK, one from the USA and one from

Italy. Two records, although reporting complications post CP, mention that these are taken from a larger series of CP cases but no further detail is provided ([20-21]).

Case reports of complications post CP

There were 21 records that reported complications post CP in 24 patients with a wide range of age and diagnosis (see Table One). Of these 15 were elective CP ([12, 13, 20, 21, 27-35]); three were CP following failed traction removal of the PEG ([11 22, 23]); two were elective CP due to the inability to perform a gastroscopy secondary to oesophageal stricture ([10, 24]). One record was elective CP following a failed endoscopic removal ([9]). Three records report cases where the PEG either broke or was pulled apart leaving the flange inside the stomach ([20, 25, 26]). However, a CP procedure would not have been used which may have affected the outcome.

None of the records described the clinical procedure undertaken in any detail therefore it is impossible to know if CP was performed in the same way. None of the records reported any assessment of the patient for risk of complication prior to CP. Three of the records reported a long length of PEG tubing attached to the flange ([11, 20, 27]) which may have had some affect on the flange failing to be excreted. The type of PEG tube used varied enormously and most commonly the type of PEG was not stated at all.

The time span from CP to identification of complication ranges from four days ([27, 28]) to 22 months ([24]). Median time to presentation was 9 weeks. The majority of complications occurred within six months or less with only three complications presenting after six months ([10, 24, 26]). In many cases complications occurred within a month or less ([9,13, 20, 21, 23, 27, 28, 31, 33-35]).

The type of complication was most commonly gastrointestinal obstruction with patients presenting with obstructive symptoms. This occurred in 21 cases with 16 of those requiring laparotomy ([9, 11-13, 20, 22,26, 28-34]); one case required colonoscopy ([27]); one case died prior to any surgical intervention due to peritonitis ([10]); one case required surgical revision of stoma ([25]). Another case required oesophagoscopy, for massive haematemesis,

193Table 1: Case Reports Data

Author and country of origin	Type of study, number of cases reported	Case characteristics	Type of PEG, time to complication and location of flange	Intervention and outcome	History of abdominal surgery	Comments
Agaba A Sarmah S, Victor Babu B et al ([29]) United Kingdom	Case report One case	Male, 76yrs CVA	Not stated 6 months Distal ileum	Laparotomy Resection for perforated distal ileum. Survived.	Not stated	
Brown J, Borrowdale R([11]) Australia	Case report One case	Female, 84 yrs Achalasia	Not stated 3 months Ileum	Laparotomy Resection for perforated bowel Survived	Not stated	6cm of tubing attached to flange Failed traction removal of PEG
Burdick J, Venu R, Hogan W ([21]) USA	Abstract Three cases	Unclear	20 Fr Bard 2 cases – 1week. 1case-6 weeks 2 cases impacted in duodenum 1 case in gastric antrum	All cases had endoscopy to retrieve flange. All survived	Not stated	Brief abstract Reports 20 cases of CP with 3 complications
Campbell T, Drabek G, Tatum H et al([28]) USA	Letter to editor One case	Elderly female Anoxic brain injury	Ross PEG- size not stated 4weeks mid ileum-adhesions	Laparotomy. Fistulae and abcess in jejenum and ileum Died from sepsis	Recent hysterectomy – ileum fixed to pelvis	
Coventry B, Karatassas A, Gower L et al ([20]) Australia	Case report Two cases	Case One: female 86yrs Bulbar palsy Case two: male 74yrs CVA	18FG Flexiflo PEG 4 months Ileum 18fg Flexiflo PEG 4 days Mid small bowel	Laparotomy for perforated bowel. Adhesions form previous surgery Survived Laparotomy to retrieve flange Survived	Appendicectomy-adhesions Cholecystectomy	Case1: PEG "broke": 5cm of tubing attached Reports 2 complications from a series of 100 CP but no detail
Harrison E, Dillon J, Leslie F ([10]) United Kingdom	Case report One case	Elderly female Oesophageal stricture	Freka 15fg PEG 8 months small bowel	Treated with I.V antibiotics but developed peritonitis 3 days later Died	History of abdominal surgery	Multiple adhesions in small bowel Not possible to perform gastroscopy
Highhouse R, Roberts W, Towsley G et al ([25]) USA	Case report One case	Female 48yrs Radiation necrosis Short bowel syndrome	Not stated Approx. 6 months Ileum, close to ileostomy stoma	Surgery to revise stoma; flange removed Survived	Resection of distal ileum and ileostomy for radiation necrosis	PEG "fell out"
Johnson R, Sharma A, Carey P ([30]) United Kingdom	Letter One case	Female 18yrs Crohns Disease	Freka PEG- size not stated 6 months small bowel stricture	Laparotomy and resection Survived	Not stated	Active Crohns disease at site of obstruction
Khan S, Gatt M, Petty D et al ([12]) United Kingdom	Case report One case	Male 73yrs Crohns Disease, CVA	Freka 9fg PEG 6 months distal small bowel at site of anastomosis	Laparotomy and resection Survived	Ileal resection for Crohns	
Lambertz M, Earnshaw P, Short J et al ([22]) United Kingdom	Case report One case	Female 86yrs CVA	Corpak PEG- size not stated Not stated Ileum	Laparotomy – flange retrieved Not stated	Not stated	Failed traction removal

Author and country of origin	Type of study, number of cases reported	Case characteristics	Type of PEG, time to complication and location of flange	Intervention and outcome	History of abdominal surgery	Comments
Lattuneddu A, Morgagni P, Benati G et al [31] Italy	Case report One case	Male 57yrs Oral cancer- non curative	Bard (size not stated) 4 weeks Distal ileum	Laparotomy and resection Died 24hrs post op	Perforated duodenal ulcer	
Mutabagani K, Townsend M, Arnold M [32] USA	Case report One case	Male 80yrs CVA, dementia	PEG type not stated 5 months Ileum	Laparotomy Survived	Not stated	
Nind G, Tam W, Schoeman M [24] Australia	Case report One case	Female ?age Supraglottic tumour	PEG type not stated 22 months In pelvis	Laparotomy Survived	Not stated	High oesophageal stricture – failed endoscopic removal
Peacock O, Singh R, Cole A et al [13] United Kingdom	Case report One case	Male 36yrs Cerebral palsy	Freka 15fg 6 days mid small bowel	Laparotomy Died	Fundoplication Surgery for buried bumper	PEG flange caught in adhesions
Perkins J, Smith S [9] USA	Case report One case	Female 70yrs COPD	Ponsky Gauderer(size not stated) 2 weeks Terminal ileum	Laparotomy Not stated	Pelvic surgery x two	PEG flange above stricture. Failed endoscopic removal of PEG
Robinson S, Johnston P, Wyeth W [23] New Zealand	Case report One case	Male 59yrs CVA	Entristar(size not stated) 4 weeks Oesophagus	Oesophagoscopy Died during procedure	Not stated	Flange perforated oesophagus Failed traction removal of PEG
Siegel T, Douglass M [35] USA	Case report One case	Female 78yrs Ischaemic colitis, rectal cancer	Not stated 1 week Ileum- above stoma	Flange removed digitally from stoma Survived	AP resection Colectomy and ileostomy	
Waxman I, Al-Kawas F, Bass B et al [33] USA	Case report One case	Male 76yrs Metastatic prostate cancer. Subdural haematoma	Ponsky-Gauderer(size not stated) 2-3 weeks Distal ileum	Laparotomy Survived	Not stated	
Weston A, Campbell D [27] USA	Case report One case	Male 80yrs Demetia, lung mass	Sandoz Caluso PEG 22fg 4 days Terminal ileum	Colonoscopy Survived	Not stated	9cm of tube attached to flange
White P, Alexandroni A, John L [36] USA	Poster abstract Two cases	Case1: spinal cord injury Case2: spinal cord injury	Type of PEG not stated NA NA Type of PEG not stated NA NA	NA NA	Not stated Not stated	Flange excreted rectally, x-ray confirmed Flange excreted rectally, x-ray confirmed
Wilson W, Zenone E, Spector H [34] USA	Case report One case	Make 69yrs ETOH, dementia	Milrose E-Z PEG 22fg 4 weeks Distal small bowel	Laparotomy and resection Survived	No prior abdominal surgery	
Wu R, Govil Y [26] USA	Abstract One case	Female 90yrs Advanced dementia	Not stated 11months Distal small bowel	Laparotomy and resection Not stated	Hysterectomy Cholecystectomy Small bowel obstruction secondary to adhesions	PEG pulled apart by patient PEG flange distal to anastomosis

due to the PEG flange becoming lodged in the oesophagus ([23]). In three cases the patient presented with obstructive symptoms; the flange was lodged in the duodenum in two cases and in the stomach in another case; all three were retrieved via endoscopy ([21]). Another case presented with bloody ileostomy output; the PEG flange was found in the ileostomy stoma and was digitally removed ([35]). The overall incidence of surgery in relation to the complication was 67%.

A history of abdominal surgery was evident in 11 of the cases ([9, 10, 12, 13, 20, 25, 26, 28, 31, 35]) but was not stated in 12 cases ([11, 21-24, 27, 29, 30, 32, 33]). One case reported no history of previous bowel surgery ([34]). One case had stricturing of the ileum secondary to Crohns disease ([30]). Of the 24 records where complications post CP were reported five cases died ([10, 13, 23, 28, 31]).

Additionally a poster abstract ([36]), reported two cases where PEG tubes were removed using CP in patients with spinal cord injury. The type of PEG is not stated but the author reports that the flanges were excreted rectally at four and 13 days; absence of the flange was confirmed by x-ray.

Cohort studies.

Five cohort studies were identified that reported the use of CP in larger groups of patients ([4-8]). Of these three studies were prospective ([4, 5, 8]) and two were retrospective ([6, 7]). Patient characteristics vary although two studies report the use of CP in cases where Head and Neck cancer was the primary diagnosis; the PEG was removed at the end of treatment ([5, 6]). The cohort studies are summarized in Table Two, totaling 347 patients.

The studies report excretion of the inner flange by x-ray, visualization of flange in stool, absence of reported complications or any combination of these. Only three of the 347 cases reported in the cohort studies experienced complications as a result of the CP procedure. The interventions required as a result of the complications of the CP procedure were gastroscopy to retrieve a flange from the pylorus ([4]) and surgery to remove a flange from the stomach wall ([7]).

227 Table Two: Cohort studies data

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Author and country of origin	Type of study, number of cases reported and time period	Type of PEG	Patient characteristics	Results	Exclusion/assessment criteria
Agha A, Alsaudi D, Furnari M et al ([8]) Italy	Prospective study 79 cases 2009- 2011	Endovive 20fg, Endovive24fg	CVA 75%, Parkinsons, MND,	74 flange seen in stool – reported by caregiver 4 cases no complications at 12 months 1 case died unrelated cause	Paediatric age, pyloric stenosis, intestinal stricture, bowel surgery, intestinal dysmotility, cystic fibrosis
Kerjariwal D, Bromley D, Miao Y ([6]) United Kingdom	Retrospective study 89 cases 2002-2007	Freka 15fg	Head and Neck cancer 62% CVA 27%	Follow up by Nurse Specialist:1-66 months, mean 26 months. Hospital system checked for readmissions related to CP. No complications identified 21 cases died of unrelated causes.	< 18 yrs of age previous abdominal surgery gastrointestinal strictures motility disorders
Korula J, Harma C ([4]) United States of America	Prospective study 64 cases 1988-1990	Not stated	Head trauma from RTA: 50%	48 cases –x-ray verified flange excretion 2 cases – flange seen in stool by pt 1 case– flange stuck in stomach 10 cases– no reported problems at 153 days 2 cases -died 1yr later 1 case - lost to follow up	Not stated
Merrick S, Harnden S, Shetty S ([5]) United Kingdom	Prospective study 42cases 29 months	Freka 15fg	Head and Neck cancer 90%	20 cases – x-ray verified flange excretion 22 cases – flange seen in stool reported by patient to researcher	<18 yrs of age immobile, gastrointestinal dysmotility or stricture, pyloric stenosis, constipation, spinal cord lesion above T1.
Pearce C, Goggin P, Collett J([7]) United Kingdom	Retrospective review 73 cases 1995-1999	Freka 9fg -41 Freka 15fg – 3 Flocare 14fg –7 MIC – 4 Unknown - 17	Various. CVA 47%	Absence of known complications by Nutrition Nurse2 known complications: 1 case pain post procedure 1 case flange stuck in gastric mucosa-surgically removed cases recovered	Previous abdominal surgery, anatomical abnormality of gastrointestinal tract, motility disorders, cystic fibrosis.

Verification of flange excretion was reported using various methods. X-ray is considered to provide unequivocal evidence of flange excretion ([4]) but this was only reported in 68 cases ([4, 5]). Most frequently excretion of the flange was confirmed by visualization of the flange in the stool and was reported in 98 cases, usually by the patient or caregiver ([4, 5, 8]). Two studies reported a combination of x-ray verification and flange seen in stool ([4, 5]) whilst Agha ([8]) reported flange seen in stool. Two studies reported absence of known complications as the outcome measure ([6, 7]).

All studies except for Korula and Harma ([4]) state exclusion criteria when assessing patients for suitability of CP. These include: children, pyloric stenosis, intestinal strictures, motility disorders, cystic fibrosis, immobility, constipation and a history of abdominal surgery ([5-8]).

The type of PEG tube varied but the most frequently cited PEG was the Freka 9fg and15fg tube, which was used in three studies ([5, 6, 7]) with a total of 175 patients. This may reflect the fact that these are all UK studies and this type of PEG is commonly used in the U.K.

Discussion

Quality and quantity of the evidence

Despite the fact that the use of CP was first reported over 25 years ago the available evidence on this topic remains very limited. Only four cohort studies have been published, since the first in 1991([4]), supporting the use of CP and reporting three complications. There are 21 case reports of complications of CP in 24 cases across the time span. Many of the case reports are not of good quality, being brief in nature, and some are poster abstracts/letters. The cohort studies supporting the use of CP are a mixture of prospective and retrospective studies. Some of the outcome measures, length and depth of follow up are not robust, making conclusions difficult. There is variation in the type of PEG used and in patient characteristics, again, making conclusions difficult.

As it is not known how common the use of CP is, it is difficult to quantify the likelihood of a complication occurring in relation to the available evidence. It is likely that the use of CP,

and the complications of CP, are under reported. It is worth noting that there are no studies that compare the safety and efficacy among the three PEG removal methods: gastroscopy, CP and traction.

Type of PEG tube

The type of PEG tube used varies across the studies with several studies making no reference to the type of PEG. The nature of the internal flange may impact on the likelihood of the PEG flange getting stuck in the bowel post CP. In the UK cohort studies the Fresenius Kabi PEG tube (15fg and 9fg) was most commonly used totaling 175 cases and two complications ([5-7]) with four case reports of complications where the same PEG tube was used ([10, 12, 13, 30]). It is therefore not possible to make generalisations about CP with all types of PEG tubes although the evidence details the use of the Fresenius Kabi PEG most commonly, although the manufacturer of this PEG does not recommend CP. The development of a flange held PEG that is suitable for CP may be a future development that the manufacturers of PEG tubes should consider.

Patient assessment

Where CP is used routinely, as in the cohort studies, it would seem that assessment of patients is important in order to exclude patients who would not be suitable for this intervention. This means excluding those patients who might be predisposed to the flange becoming stuck in the gastrointestinal tract, such as those with motility disorders, constipation and a history of previous abdominal surgery ([5-8]). Of the case reports that reported complications post CP the use of assessment or exclusion criteria was not reported. Eleven cases had a history of bowel surgery and in a further 12 cases this was not reported, so is unknown.

However, most of the cohort studies assessed cases pre CP and excluded those at risk of bowel obstruction ([5-8]). This may reflect the lower complication rate reported in the cohort studies, although this could equally be reflective of the patient characteristics, or unknown complications secondary to incomplete/inadequate follow up.

It is also of note that 15 of the 24 case reports were elective CP. Three reports were CP after failed traction removal ([11, 22, 23]), three reports were unintentional CP secondary to the PEG breaking ([20, 25, 26]), two reports were of oesophageal obstruction where CP was the only option as it was not possible to perform endoscopic removal ([10, 24]), and one case reported CP after a failed endoscopic removal attempt ([9]). It is possible that in some of these cases CP was the best option for the patient.

Verification of flange excretion

The only method to unequivocally confirm that the flange has been excreted is to perform an abdominal x-ray but and was reported in 20% of patients across the cohort studies. Where alternative outcome measures are used the detail/follow up is insufficient to be sure that it is accurate.

The outcome measure in some studies was visualization of flange in stool and the reliability of this could be called into question. Some studies verified flange excretion by the patient or caregiver reporting that they had seen the flange in the stool ([5, 8]). Patients or caregivers may not report accurately for a number of reasons and searching through faeces may not be socially acceptable to others. Equally, the outcome stated may be entirely accurate but this cannot be known for sure and gives rise to uncertainty. For future studies a more reliable method may be to ask the patient to keep the flange to enable confirmation by the researcher.

Similarly two studies relied on follow up of the patient by a healthcare professional; observation for complications and awareness of any known complications ([6, 8]). It is impossible to know, in any of these cases, if the flange has been excreted or if it is still retained within the patient to potentially cause problems at some point in the future. However the literature has shown that the majority of reported complications occurred within 6 months with the latest complication reported at 22 months ([24]). There have been no reports beyond 22 months and this was quite an unusual complication. It may therefore be reasonable to follow patients for 6 months post CP to monitor for any adverse signs.

As x-ray is the most robust method by which to be sure that the flange has been excreted it raises the question of all patients undergoing CP having an abdominal x-ray to verify excretion at some point in time post CP. Issues to consider are the cost and ethics of radiographs and feasibility/appropriateness in bedbound, or frail patients who are asymptomatic. The risk of performing an x-ray may outweigh the perceived benefit if the patient is symptom free.

Summary

The aim of this review was to locate and review publications relevant to the use of CP in adult patients using a systematic approach. It has shown that the research evidence on the use of CP is limited and of relatively poor quality, with diverse patient and PEG tube characteristics, and a lack of robust outcome measures and follow up.

Complications of CP have been identified, some of which are serious, with patients requiring surgery and fatal outcomes. The evidence totals 373 cases with complications reported in 27 cases (7%). Reported complications using the CP method of PEG removal range from abdominal pain ([7]) to death ([10,13, 23, 28, 31]).

Where CP is used routinely assessment of cases for contraindications to the procedure is important; risk of gastrointestinal obstruction is the greatest risk, which may be increased by previous abdominal surgery and certain medical conditions/illnesses. As most cases presented with obstructive symptoms in the first six months post CP it would seem reasonable to monitor patients closely during this time. However, this may not be a cost effective option.

In the future the use of CP may become redundant due to the increasing use of the balloon held tube and techniques to insert these as primary tubes. Currently in clinical practice the endoscopically placed flange held PEG is routinely used, and replacement or removal may be required. CP may be an alternative in patients who are high risk for endoscopic removal/replacement, although the patient should be made aware that serious complications can occur and that close follow up is required.

The extent to which CP is used in the UK is not known. This review has shown that the evidence is not robust, and mortality has occurred, which is probably why the use of CP has not been widely adopted. Further research should be undertaken to evaluate the effectiveness of the CP method for removal of PEG tubes.

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