Balloon-Inflated Catheters for Enteral Feeding: a Word of Caution

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Abstract Catheters with inflatable balloons such as a Foley catheter may be used for feeding gastrostomy/jejunostomy. The incorrect or improper use of these catheters can have serious consequences. We report 13 cases of feeding jejunostomy with balloon-inflated catheter's malfunction, some referred to our centre and others operated here over a period of 8 years. The most dramatic consequence of such improper use led to rupture of the small intestine due to inadvertent over-inflation (over 100 ml) of the balloon of the catheter during a contrast study. The patient required a laparotomy with resection and anastomosis of the bowel. Three other patients had similar over-inflation of the balloon leading to severe pain and discomfort. In all three patients, timely deflation of the balloon was sufficient to relieve the symptoms. One patient had intussusception with the inflated balloon acting as a lead point. The patient underwent resection of the small bowel with end jejunostomy and distal mucous fistula. All other patients presented with abdominal pain and distension and intestinal obstruction and were managed non-operatively with deflation of balloon either by aspiration, cutting the balloon port or ultrasound-guided puncture of balloon. Healthcare personnel dealing with patients with indwelling catheters must be educated to suspect, detect and manage such

problems. The best measure for such unusual complications of otherwise safe devices would be prevention by training and generation of awareness.

Keywords Catheter · Feeding · Jejunostomy · Balloon · Malfunction

Introduction

Tubes such as Malecot catheters are frequently used for enteral feeding in patients with inadequate oral intake. If the patients need these tubes for long durations (more than a couple of weeks), these need to be replaced with balloon-inflated catheters for ease of maintenance and change in case the catheter gets blocked. These catheters are generally safe and effective. However, various complications have been reported even with their correct use. We report a series of 13 patients in whom improper use, possibly due to lack of awareness or training, led to problems, to the extent of necessitating a surgical intervention in two (Tables 1 and 2).

The Cases

We describe in detail two cases with complication of balloon-inflated catheters which then led us to look at all other patients who had experienced problems owing to the use of a balloon-inflated catheter. The first case was a 45-year-old man who underwent pancreatic necrosectomy, antrectomy, cholecystostomy, gastrostomy and a Witzel feeding jejunostomy (FJ) following gallstone-induced acute necrotizing pancreatitis with infected necrosus. A month after discharge, the FJ tube (Malecot) slipped out. It was replaced with a 14-Fr self-retaining balloon catheter (Foley) with a balloon

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Table 1 Results of 13 cases presented with complications related to feeding jejunostomy

Case	Age	Sex	Indication for feeding tube	Presentation	Diagnosis	Intervention
1	45	M	Severe necrotizing pancreatitis	Severe pain and distension of the abdomen and vomiting	X-ray/CT scan	Segmental resection with end jejunostomy and distal mucous fistula
2 ^a	28	F	Corrosive stricture status of cervical oesophagostomy	Severe pain of the abdomen and acute obstruction	Clinical/intraoperative	Resection of gangrenous bowel and exteriorization
3	65	M	Oesophagectomy	Chronic pain and distension	CT	USG-guided aspiration
4	22	M	Corrosive injury	Severe pain and give way sensation during feeding	Clinical	Catheter balloon decompression using a guidewire
5	24	F	Corrosive injury	Pain and give way sensation	Clinical	Catheter balloon decompression with a guidewire
6	28	F	Corrosive injury	Inability to remove the FJ after 6 weeks	Clinical/USG	Balloon decompression using a guidewire
7	58	M	Pancreaticoduodenectomy	Pain and lump formation	Clinical/USG	Cutting of the balloon port
8	19	F	Corrosive stricture	Severe pain of the abdomen with lump and subacute obstruction	Clinical	Balloon aspiration (110 ml feed)
9	58	M	Oesophagectomy	Pain and vomiting	Clinical/X-ray	Balloon aspiration with a syringe (100 ml water)
10	27	F	Corrosive stricture	Pain of the abdomen and lump	Clinical	Balloon aspiration (100 ml water)
11	62	F	Oesophagectomy	Pain and vomiting	Clinical/USG	Balloon aspiration with a syringe (80 ml milk)
12	62	M	Oesophagectomy	Abdominal pain and distension	Clinical	Balloon aspiration (60 ml liquid)
13	55	M	Pancreaticoduodenectomy	Colicky pain and abdominal distension	CT scan	Aspiration of 90 ml fluid, discharged and re-admitted with similar findings, replaced with Ryle's tube

USG ultrasonography

^a Expired in the postoperative period due to sepsis

Table 2 Management of an over-inflated feeding balloon catheter

Methods	Number of patients
Syringe aspiration through the balloon port	6
Catheter balloon decompression over a guidewire/ureteric catheter	3
Cutting of the balloon port	1
USG-guided aspiration from the bulb	1
Resection of the jejunum with end jejunostomy and distal mucous fistula	2

capacity of 30–50 ml. After 2 months, he was re-admitted for restoration of gastrojejunal continuity. A contrast-enhanced computed tomography (CT) scan of the abdomen was planned to rule out any residual collections or evidence of pancreatitis. As oral contrast could not be administered, diluted contrast (100 ml of gastrografin) was injected through the catheter for opacification of the small bowel. Soon after the injection, the patient complained of severe abdominal pain. Plain X-ray and CT scan revealed a hugely distended contrast-filled balloon inside the abdomen. Inadvertently, the contrast had been injected into the balloon. All of the contrast was aspirated, and a contrast study was done immediately after the feeding port of the catheter showed a free flow of contrast into the peritoneal cavity. The patient underwent an emergency laparotomy which revealed a large jejunal perforation with ragged edges and enteric contents in the peritoneal cavity. Segmental resection of the jejunum with end jejunostomy and distal mucous fistula was done, and a catheter was inserted through the mucous fistula for feeding. Four weeks later, the bowel continuity was restored uneventfully (Figs. 1 and 2).

Fig. 1 Plain X-ray abdomen showing the balloon of Foley catheter inflated with contrast material

The second case re-emphasized the gravity and severity of complications related to feeding tube. The patient was a case of corrosive oesophageal stricture which was being managed with endoscopic dilatation when she developed oesophageal perforation and underwent right thoracotomy and primary repair with bipolar exclusion with cervical oesophagostomy with feeding jejunostomy. She was admitted 2 years later for definitive treatment when she developed acute onset of severe abdominal pain along with intestinal obstruction. On exploration, there was intussusception of the jejunum into the terminal ileum with the inflated balloon acting as the lead point. Four feet of the bowel was gangrenous which was resected, and end jejunostomy and distal mucous fistula were done. Postoperatively, she remained in severe sepsis and required inotropic and ventilator support. She finally succumbed to sepsis on postoperative day 12.

The aforementioned cases represent the severest form of the problem of balloon-inflated catheters. A review of our patient records showed that 11 other patients had presented to us with issues related to the catheter's balloon over the past

Fig. 2 Operative photograph in which forceps are inserted through the seromuscular tube of Witzel feeding jejunostomy. Perforation site marked with artery forceps. FJ tube entry site labelled with white arrow

10 years. The mean age of the patients was 42 (19–65) years without any sex preponderance (seven males and six females). Most of these patients belonged to low- or medium-income group, and nearly all of them stayed far from the institute. Six patients with postcorrosive injury presented before the definitive surgery. The commonest presentation was abdominal pain and distension, vomiting and lump formation (due to distended balloon). In the early part of our experience, the diagnosis was made after imaging or during exploration. However, later on, the diagnosis could be made on clinical basis itself. The majority of uncomplicated cases were managed by simple syringe aspiration through the balloon port. Puncture of the balloon either by a guidewire through the balloon port or by USG-guided needle percutaneously was the next tier of management. One patient had recurrent problem, so balloon catheter was replaced with a Ryle's tube. All except four of these patients were managed on an outdoor basis. Nearly all cases occurred due to administration of water or feed through the balloon channel, and in most cases, this was by the attendant and not the patient.

Discussion

Over a period of 20 years, we have performed over 1000 oesophagectomies, 600 pancreaticoduodenectomies and 100 reconstructions for corrosive strictures of the oesophagus in our department. In the majority of cases, Malecot catheters were used for FJ. Foley catheter was not used routinely at our centre. However, many of the patients referred from peripheral hospitals for definitive treatment at our centre were using balloon (Foley) catheter as a feeding tube. Moreover, the patients who need long-term feeding tubes are changed to balloon catheters during outpatient visit. The benefits of balloon tubes are their easy availability, softer and pliable material and retention with minimal balloon inflation without the requirement of any anchoring skin sutures. So, these self-retaining balloon-inflated catheters are preferred by the patients who need long-term feeding tubes as a replacement tube. The safety and cost-effectiveness of such an approach, particularly with a feeding gastrostomy tube, finds support from the literature even though various complications have been reported [1, 2]. These include tube knotting [3], migration, intestinal obstruction, volvulus, intussusception, haemorrhage, stricture, infection at the catheter site, leaks and persistent fistula following removal of the tube [4–7]. Difficulty in tube retrieval because of a non-deflating balloon has also been reported, requiring guided percutaneous needle puncture [8].

Inadvertent over-inflation of balloon after incorrect administration of the enteral feeds through the balloon port has not been reported in the literature even though it has been proposed as a possible cause for non-deflation of the balloon [9]. In our patients, the balloon could be inflated much more than

its recommended capacity, albeit with resistance, without getting ruptured. In the majority of cases, it was found that the feed was being administered by more than one person. Early presentation, prompt evaluation and appropriate management were helpful in salvaging the patients. However, a similar situation in a patient with altered sensorium may lead to a worse outcome because of the possibility of a delay in diagnosis and treatment. Simple measures such as syringe aspiration may be sufficient to relieve symptoms in the majority, as in six of our patients [10–12]. Others may need balloon decompression with a guidewire catheter, cutting out the balloon port or ultrasound-guided aspiration of balloon. However, careful observation and an oral contrast study should be done in such patients to rule out any bowel leak. Recently, guidelines were proposed for replacement of gastrostomy tube [13]. Adherence to these guidelines and their modifications for FJ would be helpful. Our algorithm for managing these complications is shown in Fig. 3.

It is important to explain the use of such tubes to the patient and the caregiver to avoid similar complications. The patient should be advised to report to a healthcare facility in the case of difficulty in feeding or resistance to administration of feeds. We suggest a simple measure such as covering the balloon port of the catheter with an adhesive tape to prevent inadvertent injection of feeds into it. Also, patients who are likely to require enteral feeding for a long duration should be advised to have the catheters replaced regularly to avoid their malfunction. Ideally, the feeding should be given through the bags as drips rather than through syringes as bolus. After each 400–

Fig. 3 Algorithm for an over-distended balloon of feeding jejunostomy

500 ml of feed, the tube must be cleaned with instillation of 50 ml of water. In the case of blockade of tube or resistance to feed, forceful administration should be avoided. Patients and their attendants should be educated about these techniques to make feeding through tubes safe.

Conclusion

Balloon-inflated catheters are often used in clinical practice. Even though the indwelling catheter balloon has a safety capacity of 30–50 ml, it can malfunction and accommodate much more fluid. This exposes the bowel to injury. It is important to explain to the patient and caregivers the proper use of these catheters and to ensure a regular follow-up. If any resistance is felt during injection, the ports should be rechecked. Healthcare personnel should exercise caution in using the balloon-inflated catheters for injection or instillation purposes. Patients and their caregivers should be counselled regarding the proper use of these catheters.

CT, computed tomography; FJ, feeding jejunostomy.

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Compliance with Ethical Standards

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