CASE REPORT

Naughty knot: a case of nasogastric tube knotting

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SUMMARY

Nasogastric intubation is a common procedure for enteral nutritional support in medical practice. Random spontaneous true knot formation in the tube is rarely encountered and is a cause of unanticipated trauma. This is a case of a true knot formation diagnosed with fluoroscopy and managed without untoward trauma.

BACKGROUND

A nasogastric tube is used for gastric intubation through the nasal passage and provides access to the stomach for diagnostic and therapeutic purposes.^{1 2} Complications with nasogastric tubes are known. True knotting of nasogastric tube is rare, and there have been various reported incidences of considerable degrees of trauma to the nasopharynx and other related structures on unknowingly extubating the knotted tube.³ The case illustrated is unique with respect to the identification of the problem by fluoroscopic imaging, which helped to detect the true knot of the nasogastric tube and to save the patient from subsequent trauma and complications due to any attempt to forcefully remove the tube.

CASE PRESENTATION

An elderly man with no known medical comorbidities, diagnosed as having moderately differentiated squamous cell carcinoma of the cervical oesophagus, stage III, received external beam radiation with palliative intent. On treatment, he developed absolute dysphagia, and to maintain nutrition, was advised nasogastric tube (Ryle's tube) feeding.

With the patient's head flexed, a lubricated 14F plastic nasogastric tube was introduced through the right naris, up to 60 cm, with the assistance of an upper gastrointestinal endoscope and under fluoroscopic guidance. A prior dilation up to 12 mm with Savary-Gilliard dilators was also carried out. Free drainage was ensured. The patient completed the treatment without any complications. Thirty days after treatment, removal of the nasogastric tube was attempted in the outpatient department. A resistance was felt on pulling the tube at a distance of 20 cm from the incisors, and the patient also experienced severe retrosternal pain. The procedure was abandoned and the possibility of the nasogastric tube kinking over the residual tumour was considered.

The opinion of the medical gastroenterologist was sought and a fluoroscopy was advised for further evaluation.

INVESTIGATIONS

- ▶ Video-assisted fluoroscopy
- ▶ Chest X-ray posteroanterior view
- ▶ Upper gastrointestinal endoscopy

TREATMENT

The fluoroscopy (figure 1), surprisingly, revealed a true knot along the nasogastric tube. This posed a challenge, and attempts were made, using a guidewire, for the removal of the knotted tube without causing trauma. However, use of a blunt guidewire or stylet is discouraged due to perforation risks. Hence, under upper gastrointestinal endoscopic guidance and employing Savary-Gilliard dilators, the proximal end of the tube was cut and the knotted end removed through the mouth. The remainder of the nasogastric tube was removed through the nostril. The patient was relieved of pain, and fluoroscopy revealed that the structures were intact and no trauma had resulted.

OUTCOME AND FOLLOW-UP

Evaluation of the chest X-ray taken about 2 weeks prior (figure 2) to the incident had shown the beginning of a knot formation. This wide knot had probably become tightened due to repeated manipulation. The cause of the knot formation might have been the small diameter of the tube and excess length of it remaining in the stomach. The X-ray, at that time, should have alerted to the later possibility of a knot formation. Fluoroscopic evaluation identified the knotting of the nasogastric tube, which was extricated without causing any trauma. No further complications relating to the incident were observed. Meanwhile, the patient's primary disease had progressed and he was being given supportive care.

DISCUSSION

Enteral tube feeding was used 3500 years ago, but it was John Hunter, in the 18th century, who developed the concept of enteral feeding.^{3 4} Today, the nasogastric tube is used for stomach decompression as well as for enteral feeding purposes. Although routinely used in the clinic, nasogastric intubation is a blind procedure and can cause unexpected complications.

There are four different types of nasogastric tubes, namely the Levin tube (single lumen), Salem-sump tube (bi-lumen), Miller-Abbott tube (bi-lumen with a balloon at one end) and the Cantor tube (single lumen with a bag containing mercury attached).⁵ The newer generation tubes are made of silicon and polyurethane (eg, Freka nasogastric feeding tube), and have provisions for using a guidewire, which prevents kinking.⁶

Various complications have been reported in the previous literature, the most common being aspiration; perforation of vascular structures; oesophagus, pneumothorax, epistaxis, tracheal or intracranial misplacement; retained nasogastric tube in the nasopharynx; and others, such as

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Figure 1 Fluoroscopy image showing the true knot formed in the oesophagus of this 63-year-old patient.

mediastinitis, sinusitis, nasogastric tube syndrome and knotting of the nasogastric tube (single true knots, multiple knots or complex four loop knot, 'Lariat' knot and overhand knot).^{1–3 7 8} The majority of complications are due to faulty insertion of the tube, which amounts to about 0.3–8%.⁹ However the incidence of true knot formation is limited to a few case report series.^{1 3 7–11}

Factors known to lead to nasogastric tube knotting are faulty insertion technique, narrow bore design of the tube, anatomical alteration secondary to abdominal surgery, repetitive manipulations of the tube, excessive length of tube being placed in the stomach, prolonged duration of placement of tube, spontaneous knotting due to neck flexion, violent peristalsis, swallowing or coughing and softening of the tube at body temperature or by acidic gastric pH.^{1 7 8 10 11} Of these, the narrow bore of the tube and excess length of tube in the stomach are considered to

Figure 2 A chest X-ray taken as part of a routine check-up 10 days before the extubation, showing the beginning of knot formation.

be the major culprits.^{7–10} Confirmation with radiological imaging and epigastric auscultation along with air insufflation prevent these to a great extent.¹²

Knotting can lead to further complications such as respiratory difficulty, and trauma to the laryngeal apparatus and nasal pathway, mostly in the nasopharynx, oesophagus and stomach; as well as serious complications such as tracheo-oesophageal perforation and, rarely, tracheo-oesophageal fistula. The literature also reveals rare case reports of the nasogastric tube knotting over the epiglottis, a knot forming around the tracheal tube and knotting occurring at intubation.^{1 2 7 12–14}

In our case, the probable reason for true knotting may be due to the excessive length of the nasogastric tube being placed into the stomach and vigorous bowel movements. The postulated mechanism of knot formation, especially in cases of an excess length of tube being placed, may be similar to the principle of super coiling and concatenate formation.¹⁵ The excess length of tube can coil back on itself and once a knot is formed, the traction given during extubation further tightens the knot thus resulting in failure of removal of the tube. Hence the placement of the tube to full length should be avoided; it is best advised to measure the length of insertion of the nasogastric tube prior to its placement and to score this length with a marker or tape.

The usual way a nasogastric tube is removed is simply by physically pulling on the tube, and is mostly carried out by nursing or paramedical staff. On encountering any resistance, proper evaluation is rarely performed and the tube is pulled out, thereby causing trauma and epistaxis.⁸ The literature shows that blind attempts to extubate have led to serious trauma to the nasopharynx, with haemorrhage and other related complications.^{1 8 10} Hence, if any stiff resistance is felt while attempting removal of a nasogastric tube, the possibility of complications has to be envisaged. Use of radiological investigations, such as the fluoroscopy image employed in this case, can protect the patient.

Learning points

- ▶ Excessive length of nasogastric tube being retained in the stomach, followed by vigorous peristalsis, is the most common cause of nasogastric tube knotting; this may have been the reason for knotting in the presented case.
- ▶ Avoid using a blunt guidewire or stylet for removal of a knot, as it has a high risk of perforation. This risk has to be considered very important in case of nasogastric tube knotting.
- ▶ Resistance encountered while extubating the nasogastric tube should alert paramedics or the clinician regarding the possibility of nasogastric tube knotting.
- ▶ Awareness of possible complications and timely intervention with the use of expert facilities can avoid a possible disaster.

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