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Advanced therapy by device-assisted enteroscopy

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ABSTRACT

Standard therapy using device-assisted enteroscopy includes different hemostatic therapies, polypectomy, dilation and other possibilities. The most frequent indication is small bowel bleeding. However, other specific settings could require dedicated therapies such as desinvagination, percutaneous enteroscopic jejunostomy, stent placement, endoscopic mucosal resection in polypoid vascular lesions and foreign body extraction. The present review aimed to investigate and describe device-assisted advanced therapies in the small bowel, excluding conventional hemostatic therapies of vascular lesions.

Keywords: Device-assisted enteroscopy. Therapeutic endoscopy. Double-balloon enteroscopy. Desinvagination. Small bowel.

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INTRODUCTION

Standard therapy using device-assisted enteroscopy (DAE) includes different hemostatic therapies such as thermal, injection or mechanical methods. Although, polypectomy, dilation and other possibilities have been described in the guidelines (1). The most frequent indication for DBE is small bowel bleeding (SBB) due to vascular lesions. Thus, hemostatic therapies is the most common therapeutic scenario (2). However, other specific settings, both inside and outside the SB, could require dedicated therapies. An example of the latter would be ERCP in altered anatomy (3) or the rescue techniques for conventional colonoscopy (4). The present rapid review aimed to investigate and describe DBE-guided advanced therapies in the SB, excluding conventional hemostatic therapies of vascular lesions.

SB POLYPS

Conventional SB polypectomy is often not safe and should be associated with mechanical techniques. Of note, ligation devices such as the endoloop (polyloop®. Ompus) allow the ligation of the stalk before polypectomy in pedunculated polyps or large submucosal lesions. This device can prevent bleeding and perforation following resection (5). Other mechanical devices such as clips are also used to induce ischemia of the lesion without resection (“loop-and-let-go"), producing late necrosis (6).

Tattooing is used to mark the reached distance that can be identified in future capsule endoscopy (CE) or DAE procedures. A previous injection of clean physiological serum is recommended. Tattooing lesions with a high risk of rebleeding treated by double balloon enteroscopy (DBE) is a common practice in our SB unit. Indeed, a 24 h CE control can check the post-resection mucosal defect, thus allowing hospital discharge. In these cases, a good description in the DAE report can be crucial to understand the successive distances of tattoos in patients who undergo several DAE during their lifetime (e.g. Peutz Jeghers syndrome, PJS, patients). Surgery can also be guided by this technique.

DESINVAGINATION

Surgery has been the traditional approach in symptomatic intussusception associated with SB obstruction. During the natural history of the PJS, recurrent intussusceptions are very frequent due to multiple large polyps. Regarding hamartomatous polyps, the energic SB peristalsis movement makes a "stretching" effect caused by the weight of the polyp at the head of the invagination. This forms a pseudo-pedicle, which also includes a normal complete SB wall after the head with a serosa layer.

Yamamoto et al. (7) published a DBE technique for desinvagination in the ileum. First, the enteroscope passes distally to the polypoid lesion and the invagination is reduced by pulling back the DBE with an inflated distal balloon of the enteroscope to grip the intussuscepted SB. Subsequently, the polyp (head of the intussusception) returns to its implantation base and endoscopic mucosal resection (EMR) is performed (Fig. 1). Recently, a large-channel double balloon enteroscope (3.2 mm channel diameter) provides new therapeutic solutions, by oral and anal routes. In the ileocecal intussusception, anal desinvagination can be feasible in selected cases (8). A better visualization of the lesion can be achieved with a cecal retroversion of the enteroscope (Figs. 2 and 3). Following the identification of the underlying cause of the intussusception (i.e. a polyp), the head of the invagination can be pushed with the inflated enteroscope balloon through the ileocecal orifice. When the lesion is inside the ileum, the implantation site can be reached by push and pull movements and the polyp should be placed to perform further techniques (i.e. EMR).

It is important to highlight that sessile polyps can simulate a pedunculated morphology. In addition, the lesion should not be removed in the colon lumen, although this is technically possible, as there is a possibility of perforation of the invaginated serosa. The lesion can quickly return to its implantation origin site, placing the EMR scar out of reach of the DBE treatment. Furthermore, SB ischemia in the vascular axis through the narrow ileocecal orifice should be excluded (Fig. 2), as this can contraindicate the technique. These aspects are important to avoid complications.

EMR IN POLYPOID VASCULAR LESIONS

Blue rubber bleb nevus syndrome (BNBRN) is a rare disease and there is no consensus on which DAE techniques should be carried out in these patients. Sclerosis injection with several substances such as macrogol, coagulation or band ligation have been used in the SB. However, only the surgical resection of the entire lesion guarantees the absence of bleeding recurrence (9,10). EMR has also been described in selected cases. However, the limitation of this technique is the unknown depth of the lesion, which can reach the serosa. Therefore, it is essential to raise the lesion by injecting diluted adrenaline at various points before performing en-bloc resection. Finally, a combined surgical and DAE treatment could also be a possibility (11).

PERCUTANEOUS ENTEROSCOPIC JEJUNOSTOMY

Percutaneous enteroscopic jejunostomy (PEJ) allows enteral nutrition in gastrectomized patients or proximal SB decompression in SB malignant tumors (12). The indications are comparable to traditional percutaneous endoscopic gastrostomy, such as to prevent aspiration or enteral nutrition when the gastrostomy is contraindicated (13) (i. e. surgically altered anatomy, intrathoracic stomach, lung transplantation and gastroparesis). There are also other special indications for selected cases such as Wilkie syndrome or superior mesenteric artery syndrome (14).

DAE-guided PEJ should be reserved for referral units, as this is challenging, has a limited technical success rate and a high complication rate (15,16). The main limitations are non-transillumination and the wall thickness in obese patients. The fluoroscopic control is not mandatory (16). However, it is helpful to find the puncture location site if the patient has adhesions, altered anatomy after surgery or has undergone a previous SB stent placement (Fig. 4). In addition, it allows a PEJ-gram control after the procedure. The inflated overtube stabilizes control during the puncture and subsequently allows the bumper to pass through. In addition, DAE-guided PEJ can be a rescue treatment of conventional PEJ failure (17).

SB STENOSIS

Currently, the introducer of the self-expanding enteral stent does not pass through the working channel of a conventional enteroscope (3.2 mm: 8.5 FR). However, the biliary stent can be used but they are insufficient to allow intestinal transit in the case of SB tumors. On the other hand, the length of conventional overtubes is excessive for these introducers.

Several solutions have been proposed in this setting. A guidewire can be placed through the stenosis in a distal SB loop.

Afterwards, the enteroscope can be removed with the shorter DBE overtube inflated and left in place (18). The overtube tip should be close to the stenosis. Then, a thicker conventional introducer of the SB stent can be pushed over the guidewire, under fluoroscopic control. After stent deployment, the introductory catheter should be removed and the enteroscope can be passed again into the overtube. Contrast can be used under fluoroscopic control to better assess the expansion of the stent (20-24 mm) and the permeability of the distal loops. It is interesting to note that biodegradable stents have a larger caliber of their introductory catheter but they can also pass through the overtube. Stenosis dilation should be considered in these cases.

FOREIGN BODIES EXTRACTION

The most frequent SB foreign body is a retained CE. In these cases, the diagnosis and treatment of the underlying stenosis that causes the retention should be considered (1). Crohn's disease is a frequent cause of CE retention.

The CE can pass one or more SB stenosis and proximal dilation may be needed to reach this retained device by DBE. Fluoroscopic control can be useful in these cases. A guidewire can be used to measure the length of the stenosis and to check the distance to the foreign body. Only the radiological image is not enough to determine the distance from the tip of the enteroscope to the CE. However, numerous foreign bodies impacted in the SB have been described (19). Those that are sharp and radiopaque can benefit from extraction by DBE under fluoroscopic control controlled, especially if they are penetrating the SB wall (Figs. 5 and 6). Endoscopic submucosal dissection techniques have also been described to

extract impacted foreign bodies, such as dentures (20).

DAE can also be useful for the management of an SB obstruction due to intraluminal substances, such as solid mucus in patients with cystic fibrosis after lung transplantation. In these cases, hydrosoluble contrast is instilled through the working channel (21). In addition, several types of parasites can be removed by DAE, which can cause bleeding and obstruction (22).

ENTEROSCOPY DEVICES

When the enteroscope is deeply inserted, there are usually two or more SB loops and advancing conventional accessories can be challenging despite a 3.2 mm operating channel. In these cases, the overtube and the enteroscope can be pulled back with the balloon(s) inflated. This maneuver allows rectifying the loop and facilitates the passage of flexible accessories through the channel. Silicone spray can also be useful.

In the case of injection needles, even if the accessory is in the lumen, it can be difficult to expose out of the metal core. However, external rapid push and pull movements of the accessory, while maintaining the position of "taking out the needle" can achieve needle outlet into the lumen. If the needle still does not come out (or a polypectomy snare, dilation balloon, etc.), the enteroscope and overtube can be pulled back several SB loops. Subsequently, the accessory is inserted and then return to the distal location with the instrument slightly outside the tip of the enteroscope. Finally, a distal hood can also be useful in selected cases such as foreign body extraction or SB polypectomy.

There are a high number of DAE-guided advanced therapies. These techniques can be effective in selected settings. However, they can also be challenging and should preferably been performed in referral SB units.

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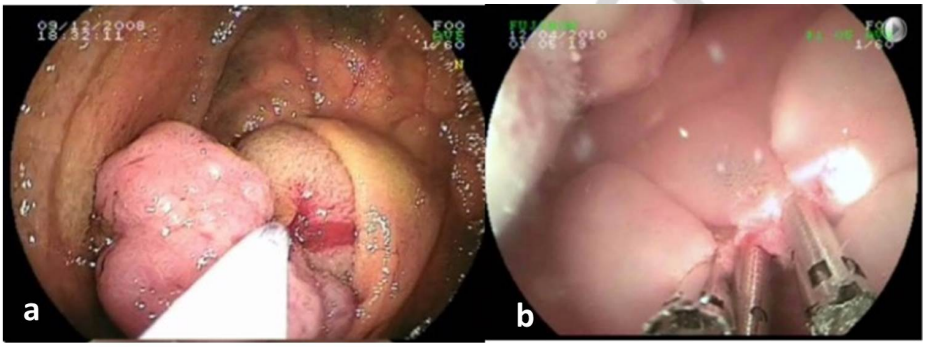

Fig. 1. Invagination. Double-balloon enteroscopy by oral route. A. Intussusception due to a giant polyp. Oral double-balloon enteroscopy desinvagination and adrenaline injection. The lesion is better placed to perform further therapy. B. Clips after endoscopic mucosal resection.

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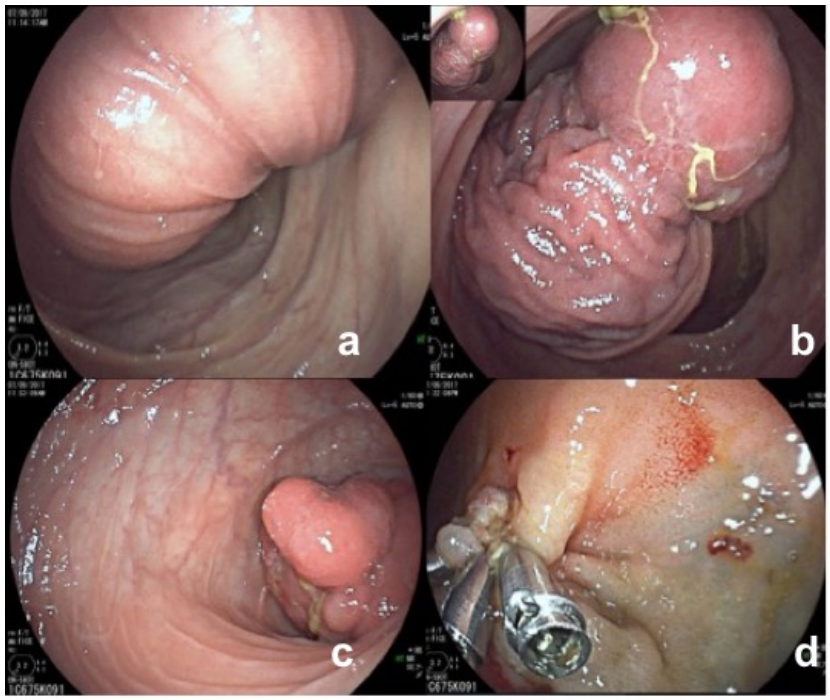

Fig. 2. Invagination. Double-balloon enteroscopy by anal route. A. The SB mucosa does not present signs of ischemia, passes through the Bauhin valve and transversely occupies the colon lumen. B. DBE cecal retroversion: Head of the invagination. C. The polyp in its implantation site at 60 cm from Bahuin. D. The mucosectomy defect was closed with clips and tattooing was performed. Histological examination: hamartomatous polyp.

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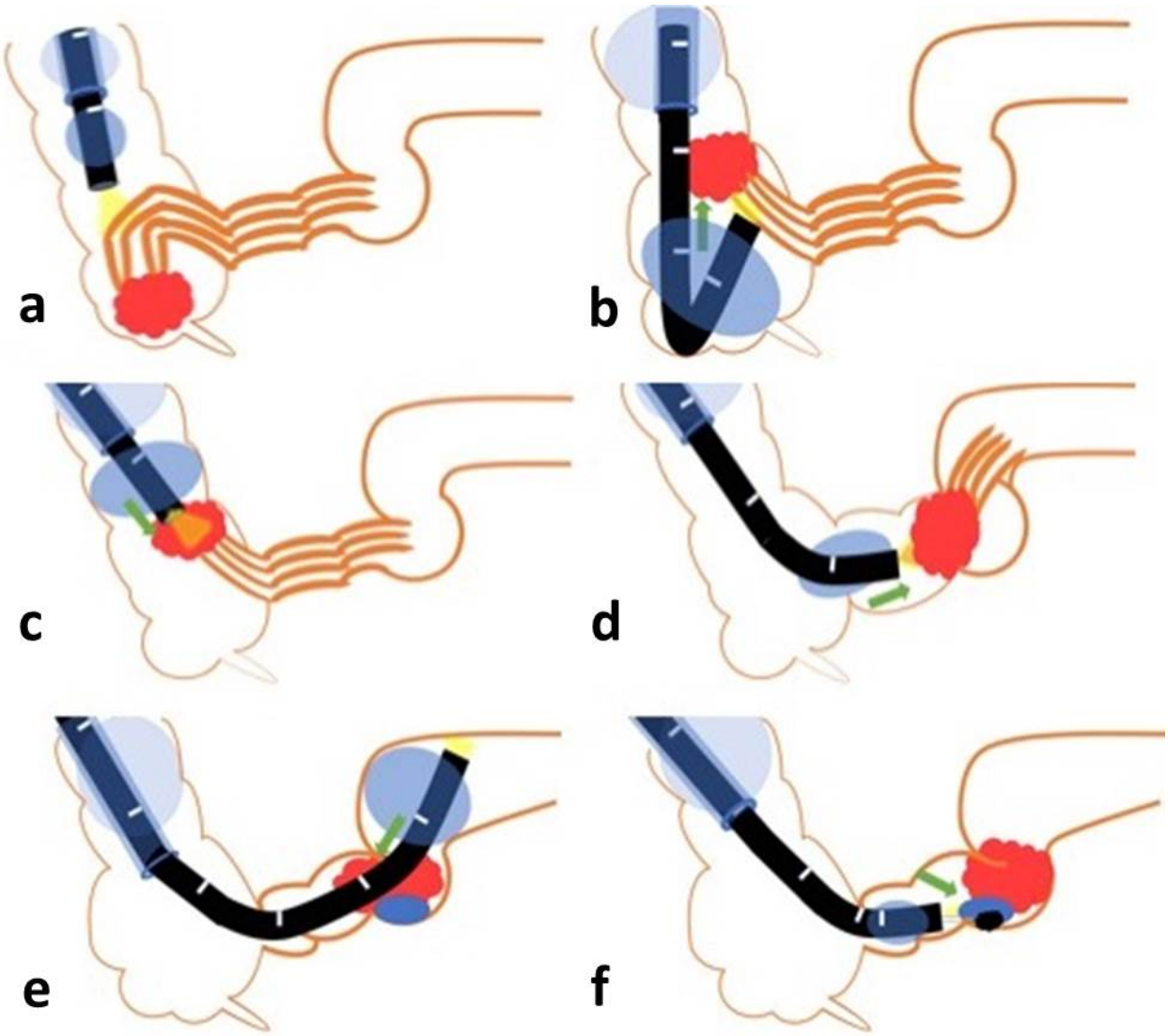

Fig. 3. Summary of the disintussusception technique: A. The enteroscope is in the cecum, without identification of the invagination head. B. Retroview to identify the base of the lesion. C. Favorable anatomy to push the polyp with the enteroscope balloon into the SB. D. When the polyp is through the Bauhin´s valve, it quickly returns to its place because it is not trapped by the ileocecal orifice. E. The lesion is reached but the anatomy is unfavorable to visualize the base because it is behind a fold. The enteroscope passes to the proximal part with the inflated balloon pulling the instrument out. F. The lesion is correctly placed to perform further therapy.

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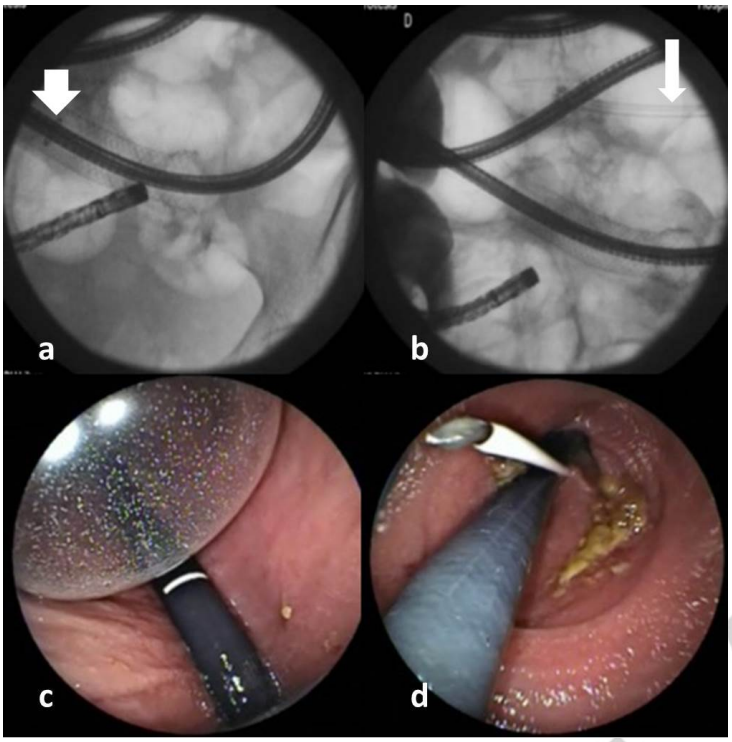

Fig. 4. Percutaneous enteroscopic jejunostomy (PEJ) placement through an enteral stent. A. The overtube (arrow) passes through the small bowel stent pushing under fluoroscopic control. B. Enteroscope tip (arrow: dysfunction of a previously placed PEJ). C. Retroversion of the enteroscope with the overtube balloon inflated (visible under fluoroscopic control). D. Percutaneous puncture needle: DBE control.

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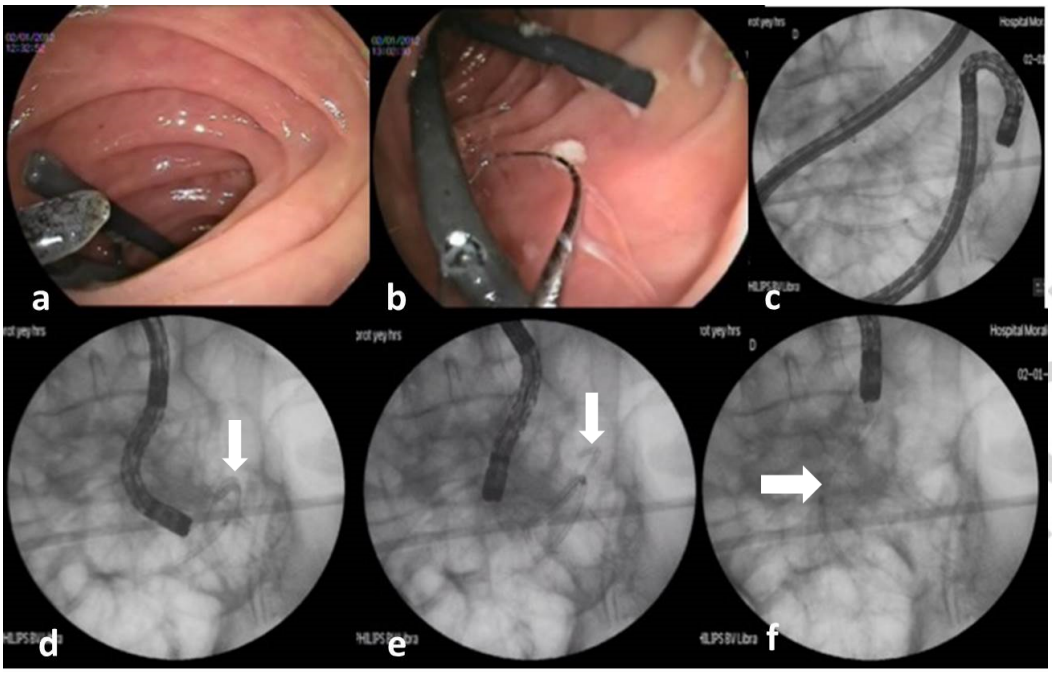

Fig. 5. Plastic biliary stents impacted several years in the distal jejunum after a endoscopic retrograde cholangiopancreatography. A. Two impacted stents detected by double-balloon enteroscopy. B. Polypectomy snare trapping the first stent. C. Fluoroscopic control with alignment of the tip of the enteroscope and stents. D. Gentle traction of the stents under fluoroscopy in a small bowel angulation (arrow). E. The first stent is unimpacted at its distal end (arrow). F. After disimpactation of the second stent, there is no angulation and they are aligned with the axial axis of the enteroscope and removed (arrow). Absence of pneumoperitoneum.

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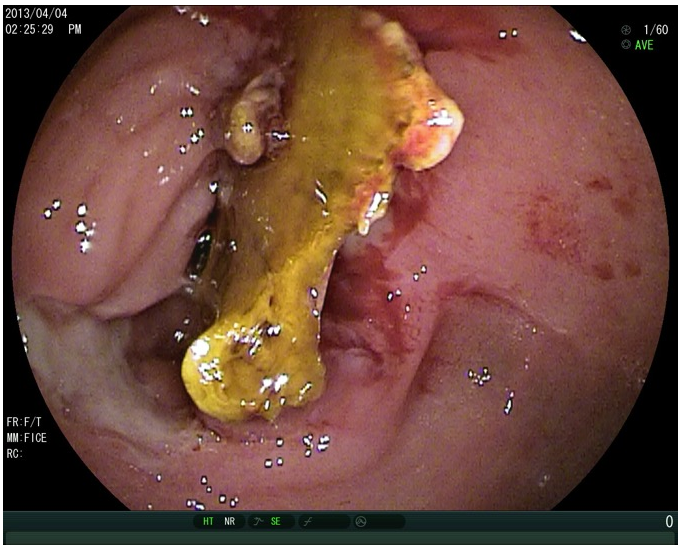

Fig. 6. Bone of animal origin impacted in a stenosis of Crohn's disease. Complex extraction under radiological control. Assessment of the stenosis and complications following extraction in a second time during disimpactation and withdrawal. In these cases, the over-pipe can be useful to protect the walls of the small bowel.