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IN THE EXPERT'S FOCUS

Endoscopic Removal of an Esophageal Stent After Diffuse Hyperplastic Tissue Ingrowth ☆☆

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Abstract
Endoscopic placement of esophageal Self-Expandable Metal Stents (SEMS) is a therapeutic option for post-surgical esophageal leaks. Partially covered SEMS are mainly designed for malignant esophageal strictures, but are used off-label to close post-surgical leaks due to their lower migration rate than fully covered SEMS, and better adherence to the esophageal wall. Partially covered esophageal SEMS can achieve post-surgical fistula healing, but their removal is difficult due to tissue ingrowth through the uncovered part. A challenging case of a difficult removal of a partially covered esophageal SEMS (remove the indefinite article) is (below) presented.

Video Related to this Article

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1. Case report

- A 34 year old man underwent tangential resection of the gastric fundus for gastrointestinal stromal tumor. The post-operative course was complicated by the onset of a perigastric infected collection which was drained percutaneously.
- Subsequently, a gastro-cutaneous fistula developed.

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- The patient was referred to our endoscopy unit for endoscopic evaluation and treatment. On upper GI endoscopy, there was a fistulous orifice 2 cm distal to the gastroesophageal junction.

2. Technique

Esophagogastroduodenoscopy (EGDS) and SEMS/SEPS insertion/removal.

3. Materials

- Endoscopes: GIF Q165 and GIF 2T160 (Olympus, Tokyo, Japan).
- Esophageal stents: Ultraflex™ stent (Boston Scientific, Natick, MA, USA); Polyflex stent (Boston Scientific, Natick, MA USA).
- Forceps: rat tooth forceps (FG 44 NR1, Olympus, Tokyo, Japan).
- Guide wire: Terumo Radifocus® wire (Terumo, Eschborn, Germany).
- Balloon: CRE™ 12 mm (Boston Scientific, Natick, MA USA).
- Overtube: Guardus® overtube, 50 cm long, 19.5 mm external diameter (US Endoscopy, Ohio, USA).
- Snare (Olympus, Tokyo, Japan).
- Argon plasma catheter (Erbe VIO 200D, Tübingen, Germany).
- Escort II® double lumen biliary extraction balloon (COOK Medical, Bloomington, USA).

4. Endoscopic procedure

- Under general anesthesia, partially covered Nitinol Ultraflex SEMS was placed. The gastro-cutaneous fistula closed within 24 h after stenting.
- After 45 days during the planned stent removal procedure, there was an extensive tissue ingrowth even in the covered portion of the stent, which was due to an almost complete loss of the covering of the stent. Every attempt to remove the stent with forceps failed.
- A Self-Expandable Plastic Stent (SEPS) 15 cm long (diameter 21–25 mm) was placed into the Ultraflex to obtain compression and ischemia of the hyperplastic tissue ingrowth.
- After 14 days, the Polyflex stent was removed but the tissue ingrowth in the Ultraflex stent was still present. SEMS removal was attempted with a double channel operative gastroscope, using two foreign body forceps. However, these maneuvers resulted in “invagination” of the distal end of the stent, which rolled over like a sock. This complicated the situation because the lumen of the stent was closed.
- In a way to re-open the stent, a hydrophilic guide wire was passed through followed by balloon dilations of the neolumen (12 mm diameter balloon), which was successful. In order to induce further compression and ischemia of the ingrowth, a new SEPS 9 cm long (diameter 21–25 mm) was inserted into the “invaginated” Ultraflex stent.
- The Polyflex stent was removed after 60 days. There was still a partial ingrowth form one side of the stent. A hydrophilic guide wire was passed between the stent and the esophagus, and multiple gentle dilatations were applied in order to slowly and gently distich the esophageal mucosa from the stent.
- The Ultraflex stent was pushed into the gastric cavity; however, since the stent was double layered after invagination, it was impossible to retrieve it in this form.
- Striving to reduce the diameter of the stent, a polypectomy snare was used, but it was slipping over the stent.
- Longitudinal trimming of the stent was carried out with argon plasma (setting forced 80 W). After the trimming, the stent restored its natural shape.
- The stent was safely extracted after the placement of a large bore overtube in the esophagus.
- After 12 months of follow-up, the patient is in good general conditions and completely asymptomatic.

5. Discussion

Endoscopic placement of esophageal Self-Expandable Metal Stents (SEMS) is a therapeutic option for post-surgical esophageal leaks. Fully covered SEMS can dislocate, migrate, get obstructed, perforate the esophagus or become embedded. Partially covered SEMS are mainly designed for malignant esophageal strictures, nevertheless, they anchor better to the esophageal wall, and avoid migration. In some cases a partially covered Ultraflex can be used off-label due to its characteristics to adapt better to the shape of the esophagus, and to adhere to the esophageal wall, in order to close the fistulous orifice.

As described in the literature, SEPS can be placed into SEMS to induce ischemia by compression of the hyperplastic inflammatory tissue, and with this permitting delayed removal of the latter stent [1,2].

This technique was also used in our case, but after the two SEPS placements, there was still ingrowth on the outer site of the invaginated stent that precluded the SEMS extraction. The Ultraflex stent was detached from the esophagus only after the use of a biliary extraction balloon. This was done for safety reasons, because the rubber of this balloon is soft and do not transmit high pressure.

Another safety reason is the pushing of the stent into the gastric cavity and trimming it with argon plasma. This brought the nitinol stent into its original shape. Furthermore, injury of the esophageal wall by the cutted wires of the stent was avoided by placing an overtube.

One of the most important characteristics of the endoscopic approach is that it can be repeated. The possibility to repeat endoscopy, and think and plan further treatment is, perhaps, the key point to solve difficult situations like in the hereby presented case.

6. Tips and tricks

- Choosing the best type of stent for esophageal fistula is very important.
- Fully covered SEMS can dislocate or migrate, get obstructed, perforate, or become embedded. Partially

covered stents can be used, but attention must be paid on the timing of the stent removal. A partially covered Ultraflex can be used off-label due to its characteristics to adapt better to the shape of the esophagus, and to adhere to the oesophageal wall.
- Time of the removal of a partially covered stent should not exceed 2 weeks.
- In some cases, removal of the stent can be attempted with a double channel operative gastroscope, using two foreign body forceps. This is to apply constant traction force while pooling the stent.
- In case of partial ingrowth, it is advisable not to pool with force the stent, but to apply a constant traction force.
- Partial ingrowth through the meshes of the stent can be safely detached with a biliary extraction balloon over hydrophilic guide wire. To avoid tissue damage slow and gentle inflations should be done under fluoroscopy and endoscopy.
- Nitinol stents have a memory shape. This characteristic was used to bring the SEMS (by trimming the stent) into its original shape and to reduce the radial force since it was invaginated. Trimming was done with argon plasma (setting forced 80 W).
- After trimming, there were free metal wires that could potentially damage the esophagus; to avoid damage a safe extraction was done by placing a large bore over-tube into the esophagus. Subsequently, the stent was removed through the overtube.
- Endoscopy is a repeatable procedure, take your time and plan which is the best device to be used in certain circumstances.

7. Scripted voiceover

Voiceover Text

A 34 years-old man underwent tangential resection of the gastric fundus for gastrointestinal stromal tumor. The post-operative course was complicated by the occurrence of a perigastric infected collection

which was drained percutaneously. Subsequenly a gastro-cutaneous fistula developed.

The fistulous orifice was on the Z-line level, where a 12cm long partiallycovered Ultraflex stent was placed, and the fistula closed within 24 hours.

Here we see an extensive hyperplastic tissue ingrowth trough the meshes of the stent, making impossible the stent removal.

As already described in literature, placing a plastic stent into the previous one, induces ischemia of the ingrowth by compression. This is a 15cm Polyflex stent placed inside the Ultraflex stent.

Fourteen days later the Polyflex stent was removed. This is an attempt to remove the Ultraflex stent with a foreign

Voiceover Text

body forceps which resulted in “invagination” of the the stent, that rolled over like a sock, complicating the situation, and closing the lumen of the stent.

To restore the lumen of the stent a balloon dilation inside the stent is done. As expected, this resulted in re-opening of the lumen of the stent.

Now over the hydrophilic wire, it is possible to place a new 9 cm Polyflex stent. This should induce further compression and ischemia of the hyperplastic tissue ingrowth. Here you can see the Polyflex stent after placement.

This is the appearance of the Polyflex stent two months later. Here we use an operative double channel Olympus gastroscope with two foreign body forceps. The stent is captured, and slowly extracted.

However, there is still some mucosal ingrowth. This is an attempt to detach the stent from the mucosa using a double forceps, applying constant traction force, without pooling too much, which as you can see, failed.

To detached the stent from the mucosa, a biliary stone extraction balloon is used, over a hydrophillic wire.

Multiple slow and gentle inflations of the balloon are done in order to avoid tissue damage. Pushing the stent into the stomach is much more safer than pooling it, since the radial force of the stent in this case is higher due to the double layer of the stent after invagination.

A polypectomy snare can be the best device to catch the stent and to reduce its dimensions by closing the snare. This is the attempt to catch of the stent, but as you can see, since the radial force of the stent is too high, the snare slips over.

The only way to bring the stent to its “natural” shape is to cut it longitudinally with Argon Plasma. Here you can see the trimming procedure.

After trimming, the free wires of the stent could injure the esophagus. In this case injury was prevented by inserting a large bore overtube into the esophagus.

The stent is safely extracted through the overtube. Note the complete loss of the covering.

Conflict fo interest

The authors declares no conflict of interest.

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