Incomplete Deployment of an Expandable Metallic Stent in a Patient With Esophageal Malignant Stenosis

Gabriel Dimofte¹, Radu Moldovanu¹, Felicia Crumpei², Oana Grigoras³, Eugen Tarcoveanu¹

1) Department of Surgery; 2) Department of Radiology; 3) Department of Intensive Care and Anesthesia, “Gr. T. Popa” University of Medicine and Pharmacy “St. Spiridon University Hospital” Iași, Romania

Abstract

The use of self expandable metallic stents (SEMS) in the palliation of dysphagia due to malignant esophageal stenosis is a gold standard. Covered stents are used in all cases with overt air-digestive fistula or high potential for fistula development. The procedure is associated with a low incidence of procedure-related complications. We present a case with a major accident which developed during stent deployment. The delivery system became blocked and we found it impossible to fully deploy the stent, which remained attached to the introductory system. The stent was forcefully removed and replaced later on with a new stent. This is the first report of a SEMS related accident due to malfunction of the stent deployment system. Stent malfunction is unusual and unlikely to happen, but one should be aware and prepared for such unusual situations.

Key words

Self expandable metallic stent (SEMS) – esophageal malignant stenosis – incidents and accidents.

Introduction

Esophageal cancer is well known for its late presentation, when most cases are unsuitable for surgical resection [1, 2]. As the majority of patients will not be expected to survive for a long time, the main goal of treatment is the palliation of dysphagia. This is usually achieved with self expandable metallic stents (SEMS) placed under fluoroscopic or endoscopic guidance [1-4]. Aero-digestive fistulas represent a major emergency and require rapid sealing of the abnormal communication with covered expandable esophageal or tracheobronchial stents [5]. Placing SEMS is usually simple, with a few complications, of which the most frequently encountered are: haemorrhage, stent migration, late perforation with fistula formation, tumor overgrowth or ingrowth and free gastro-esophageal reflux [6, 7]. There are few data regarding the immediate procedure-related risks and we found no report in the literature describing complications related to malfunction of stent deployment system.

Case report

A 78 year old male patient was referred to our department with a three month history of progressive dysphagia that had become complete in the last two days. The patient had been diagnosed 12 months earlier with a locally advanced squamous-cell carcinoma of the left main bronchus, for which the patient refused either chemotherapy or radiotherapy.

Evaluation of the patient showed signs of advanced cachexia with the patient in a very bad general status, having difficulty in walking unaided. Respiratory function was significantly restricted, the patient becoming acutely dyspnoeic even after minor efforts. Plain thoracic X-ray showed a bronchial tumor involving the upper left lobe, with significant mediastinal shift and global enlargement of the mediastinum (Fig. 1). There were no other major abnormalities in the pre-procedural evaluation.

Fig. 1. Thoracic X-ray showing advanced fibrosis and a tumor mass in the left upper lobe. The mediastinum is enlarged and shifted to the right side.
Upper GI endoscopy was non-relevant, as the passage of the scope was facile, and the only abnormality was the impossibility to distend the middle and lower esophagus using air inflation. We assumed that stenosis was due to extrinsic compression from metastatic mediastinal lymph nodes. Lack of the tumor in the esophageal lumen and easy passage of the scope made us aware of the possibility of stent migration very soon after placement, and the patient was fully informed of this possibility. Otherwise, we assumed no difficulties in stent positioning and deployment.

A barium study was required to assess the level and length of stenosis, in order to choose the correct stent size and length. To our surprise we found a clinically silent fistula between the middle part of the esophagus and the right main bronchus (Fig. 2).

We chose a 100/70 mm partially covered SEMS (Ultraflex Esophageal NG Stent with proximal release, Boston Scientific) with 28 mm proximal flange diameter and 23 mm distal flange diameter. Both proximal and distal ends are not covered and should help in fixation.

The procedure was started under local anesthesia with 10% lidocaine associated with 2 mg of i.v. midazolam. The patient was psychological stable, tolerated very easy the endoscopic evaluation and we expected a simple procedure with minimal discomfort. A guide wire was inserted and the system composed of introducer and collapsed stent was positioned using predetermined anatomic landmarks. We began to pull the thread that kept the stent collapsed and deployment was monitored using fluoroscopic imaging. Suddenly the smooth process of thread pulling stopped and could not be finished. The last 1.5 cm of stent appeared to be folded and stuck to the introducer. Unfolding was attempted using balloon dilation in the stent, as well as the breaking of the thread with a biopsy forceps, but deployment could not be finished. Endoscopic evaluation did not aid significantly and Fig. 3 shows a thoracic X-ray with the endoscope shaft positioned in the lower part of the partially deployed stent, bent in an attempt to break the thread.

![Fig 2. Eso-bronchial fistula visible after water soluble contrast administered orally.](image)

![Fig 3. Bent endoscope in the partially deployed stent.](image)

In the end we assumed that deployment was not possible and decided to attempt stent removal. The patient was placed under general anesthesia and the stent was removed forcefully using traction on the introducer as well as on the upper edge of the stent, with a foreign body grasper. After initial mobilization removal was possible with the stent partially inverted over the introducer. Immediately after recovery the patient was given a water soluble contrast media that showed no significant injuries to the esophagus. Pharyngeal discomfort was significant but manageable. The removed stent was evaluated for a possible cause of malfunction. The thread that held the stent unwrapped over
the introducer appeared to be locked in a knot 1.5 cm above the distal end (Fig. 4).

Two days later another covered SEMS of the same type was uneventfully positioned. The patient was able to swallow immediately with little discomfort and was discharged the following day.

**Discussion**

Complications associated with SEMS are relatively common and these are considered acceptable side effects for a technique that has proven to be extremely beneficial in the palliation of esophageal malignancies [7, 8]. Most patients (up to 75%) will develop one or more complications including pain, gastro-esophageal reflux, bleeding, tracheal obstruction, food impaction, stent migration, fistula formation and tumor growth in or over the stent. Minor complications are usually related to the procedure and are self-limited, while late complications are more dangerous and require intervention. Although it is considered to be a safe procedure, up to 16% of patients will eventually die due to complications directly related to stent placement [7-9]. To this gloomy perspective we need to add that mean survival is reported between 3.3-4.5 months [7, 9, 10].

Early procedure-related complications are seldom reported but mortality in large series can vary from nil to as high as 3% [11, 12]. While we would expect most of the early complications (reflux and aspiration pneumonia, pain, bleeding) as being somehow predictable, some are unexpected surprises. There are reports of acute tracheal obstruction [13], fatal pulmonary embolism [14], intestinal perforation [15] and stent induced perforation with fatal mediastinitis [16].

We faced a very different situation and very challenging one both technically as well as psychologically. Blockage of the stent delivery mechanism is certainly an unexpected situation and there is no guidance on what to do. The choice of a proximal-release stent assists in the secure deployment for lesions in the upper part of the esophagus and are favored in most clinical circumstances. In our case it only aggravated the situation as the expanded part endangered the esophagus during removal. Non-retrievable SEMS are difficult to remove and can pose serious dangers including esophageal amputation and bronchial rupture [17, 18]. Our tentative measures to unlock the deployment mechanism failed and retrospectively we do not think they were worthwhile. Immediate retrieval of the stent and introducer complex should be attempted before full expansion occurs. Dealing with such a complication was made easier as the covered part of the stent did slide smoothly on the surface of the esophagus.

This is the first report in the literature of an accident with SEMS related to the malfunction of the stent deployment system.

**Conclusions**

Self expandable metallic stents remain the best choice in the palliative treatment of esophageal cancer and as an emergency procedure in cases with eso-tracheal or eso-bronchial fistulas. The procedure is associated with significant morbidity and mortality even in perfect conditions and the most experienced hands. Stent malfunction is unusual and unlikely to happen, but one should know that human error can produce countless situations. Being aware of possible acute procedure-related complications will help us react in such unusual circumstances.

**Conflicts of interest**

None to declare.

**References**