Diseases of the Esophagus (2019) **32**, 1–5
DOI: 10.1093/dote/doy131

DISEASES OF THE ESOPHAGUS

ISDE The International Society for Diseases of the Esophagus

Original Article

Intraluminal mesh erosion after prosthetic hiatoplasty: incidence, management, and outcomes

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SUMMARY. **The purpose of the present study was to analyze the incidence, presentation, and treatment of mesh erosion into the esophagus or stomach after mesh hiatoplasty for primary or recurrent hiatal hernia. The study is a single-institution, retrospective cohort study. From November 2005 to December 2016, 122 patients consecutively underwent mesh hiatoplasty in our department, 91 during a primary surgery and 31 for a surgical revision. Follow-up was complete for 74%. Six patients of this series were evaluated for mesh erosion. In all cases, the mesh employed was a dual-type circular one. The mean time from surgery to erosion diagnosis was 42 months (median time 46 months, interquartile range 64 months). Three patients were asymptomatic, 1 had dysphagia, 1 had reflux recurrence, and 1 presented with mediastinal perforation. The absolute erosion rate was 4.9%. For patients under surveillance, the erosion rate was 6.6%, or 1 case every 48 patient-years of follow-up. The erosion rate after primary surgery was 3% or 1/86 patient-years of follow-up, and after surgery for recurrent hernia recurrence was 16% or 1/29 patient-years of follow-up. The mesh was left in place in 2 asymptomatic cases and endoscopically removed in 2 cases. Two patients submitted to surgical removal of the mesh, and only one needed a limited gastroesophageal junction resection for a conversion to a Roux-en-Y gastric bypass. The patient with esophageal perforation submitted to mesh removal, drainage, and an anterior partial fundoplication. There was no mortality. Mesh erosion after hiatoplasty presents with a high rate, especially when hiatoplasty is performed during revisional antireflux surgery. Most patients can be managed conservatively, and endoscopic removal should be considered a first-line therapy.**

KEY WORDS: **erosion, fundoplication, hiatal hernia, mesh.**

INTRODUCTION

Mesh reinforcement of the hiatus in the treatment of a large hiatal hernia is achieving growing acceptance due to the presumed decrease in the hernia recurrence rate.[1-4] However, opponents of this attitude claim that presentation of long-term complications can counterbalance the initial benefit of the prosthetic repair. Bleeding, migration, infection, stricture, and adhesions have all been reported after hiatal mesh reinforcement, the most feared complication being erosion into the esophageal or gastric lumen. Major concerns arose after Stadlhuber *et al.* reported a 28-case multi-institutional series, including 17 erosions associated with mesh hiatoplasty, of which 9 patients required major organ resection and, in 6 cases, esophagectomy.[5] Although visceral erosion has been related to the mesh material and shape, there is no current knowledge of the real incidence and the predisposing factors favoring this complication.

In our department, prosthetic repair of the diaphragm has been performed systematically for huge paraesophageal or sliding hernias and for recurrent hernia regardless of the hernia size. Since November 2005, the most frequently employed mesh has been an 8 × 7 cm circular dual mesh with a polypropylene side toward the diaphragm and a silicon abdominal side; it also has an internal silicon ring, 3 cm in diameter, to protect from contact with the esophagus (RH Implant, Microval, Saint-Just-Malmont, France). The mesh is positioned onlay after suturing the hiatus, and its two limbs are sutured together to keep the circular form. All sutures used are Ethibond 00 (Johnson & Johnson). In the present work, we aimed to study the incidence, forms of presentation, management strategies, and consequences of hiatal mesh erosion into the gastroesophageal lumen.

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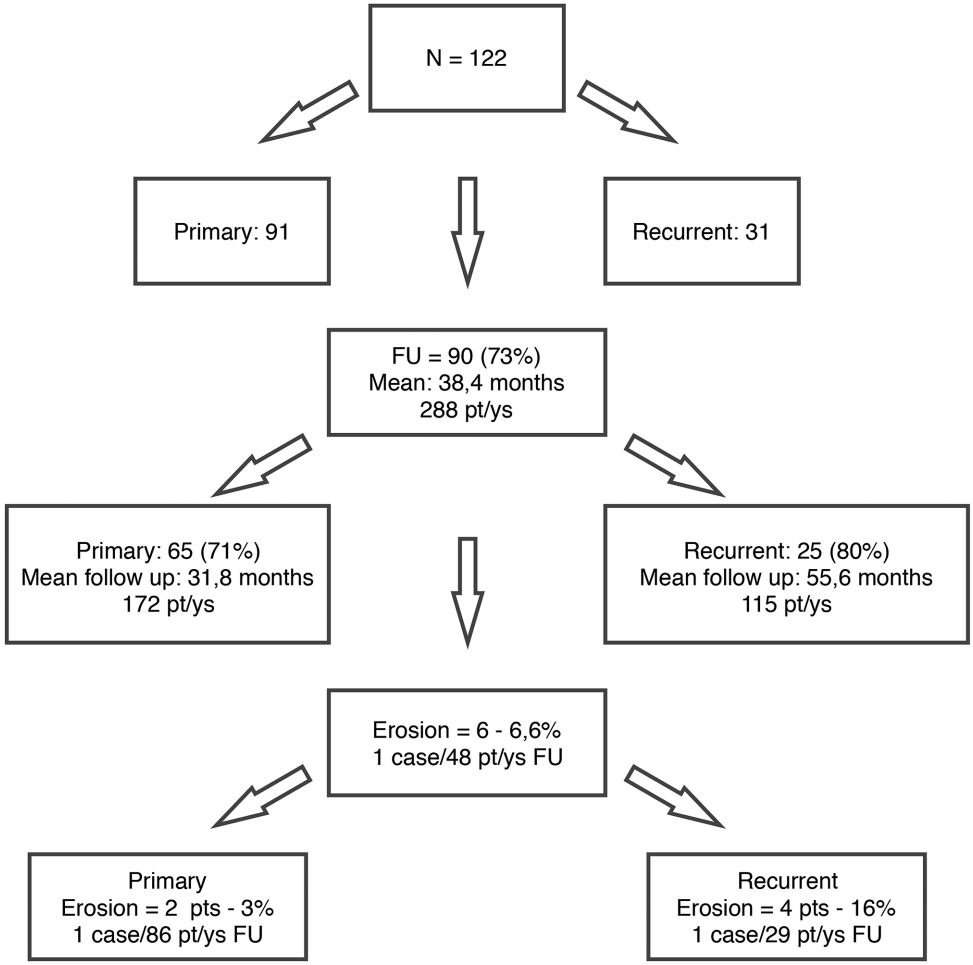

Fig. 1 Flow chart of the whole series.

MATERIALS AND METHODS

One hundred twenty-two patients submitted consecutively to mesh hiatoplasty between November 2005 and December 2016, 91 (74.6%) for a primary hiatal repair and 31 (25.4%) for revisional surgery. Follow-up was complete for 90 patients (73.8%), with a mean time of 38.4 months and a total follow-up of 288 patient-years (Fig. 1). All patients were under clinical follow-up, with sporadic radiological or endoscopic evaluation.

Six patients of this series, 3 female and 3 male, mean age 58 years, presented in the follow-up for mesh erosion in the esophagus or stomach and constituted our group of study. The study was approved by the institutional review board, and all patients gave their informed consent for review of their clinical data.

Hiatoplasty was performed by 4 surgeons in the department. The mesh employed was in all cases the circular dual-type RH Implant (Microval®). Mesh hiatoplasty was performed during a primary paraesophageal hernia repair in one case, during a primary sliding hernia surgery in another patient, and in surgery for a recurrent hiatal hernia in 4 cases. Four patients had a Nissen fundoplication, and 2 patients had a transthoracic Collis–Belsey procedure after two failed transabdominal surgeries (Table 1).

Results

No patient developed postoperative complications after the mesh implantation surgery. Patients were under clinical follow-up with a yearly clinical evaluation and endoscopy, radiology, and functional tests at 1 year from surgery and when symptoms arose. Erosion was diagnosed at a mean time of 42 months from the mesh hiatoplasty (23–120), 3 cases during the third postoperative year and 3 late cases, more than 5 years from the initial procedure. Three patients were asymptomatic, 1 complained of dysphagia, 1 had retrosternal burn, and 1 presented with esophageal perforation and mediastinitis. Gastroesophageal reflux (GERD) recurrence was demonstrated in 1 patient, hiatal hernia recurrence in another one, and both GERD and hernia in 2 cases, for a total rate of 50% GERD recurrence and 50% hernia recurrence (Table I).

The absolute erosion rate was 4.9%. With all 6 patients under surveillance, the erosion rate in this

Table 1. Patients characteristics, surgeries and outcome

Patient	Surgeon	Age hiatoplasty	Type of hernia	Previous surgery	Type of fundoplication at hiatoplasty	Time to erosion (months)	Symptoms	Abnormal pH	Radilogic recurrence	Treatment
1	A	82	Paraesophageal	No	Nissen	32	No	No	No	No
2	B	55	Recurrent	Nissen	Nissen	23	Reflux	Yes	No	Endoscopic
3	C	70	Recurrent	Nissen	Nissen	25	Reflux + Dysphagia	Yes	Yes	Surgical—resection
4	D	49	Sliding	No	Nissen	60	No	No	Yes	Endoscopic
5	C	48	Recurrent (x2)	Nissen (x2)	Collis-Belsey	78	Pain (perforation)	Yes	Yes	Surgical—removal
6	C	45	Recurrent	Nissen	Collis-Belsey	120	No	No	No	No

Fig. 2 Endoscopically removed mesh.

group was 6.6%, 1 case every 48 patient-years of follow-up. Two patients presented with mesh erosion after primary hiatal hernia surgery, which means a 3% rate (2 cases out of 65 under follow-up) or 1 case every 86 patient-years of follow-up. Four patients presented with mesh erosion after surgery for recurrent hernia, what signifies a 16% erosion rate (4 cases out of 25 under follow-up) or 1 case every 29 patient-years of follow-up (Fig. 1, flow chart).

Mesh removal

The mesh was left in place in 2 cases; both patients had been under surveillance for more than 4 years, and no further complications were detected. Two patients submitted to endoscopic removal of the mesh. None of them had dysphagia; only one had GERD recurrence, and mesh erosion was an incidental finding during routine gastroscopy. Both patients submitted to subsequent endoscopies until the mesh was found to be completely included into the stomach and then removed at 2 and 3 months, respectively, from the first endoscopy (Figs 2,3).

Two patients underwent surgical mesh removal. The first one had been scheduled for a Nissen conversion into a Roux-en-Y gastric bypass. There was a radiological suspicion of mesh inclusion, so when it was confirmed during surgery, the decision was changed to a Roux-en-Y esophagojejunal bypass with resection of the gastroesophageal junction, including the mesh and the previous fundoplication. The patient developed an anastomotic leak and was operated on again,

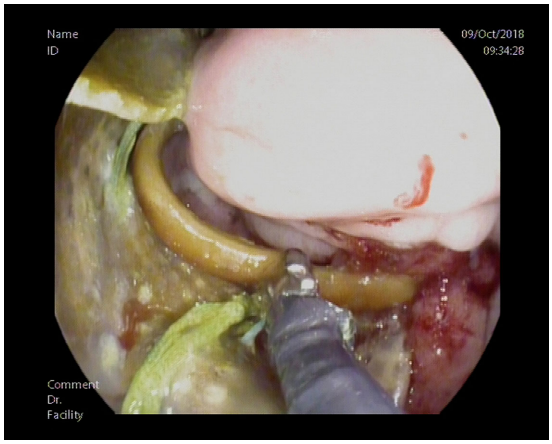

Fig. 3 Endoscopic appearance of the eroded mesh. The endoscopic forceps are pulling from the silicon ring of the mesh. Two Ethibond sutures are included along with the mesh.

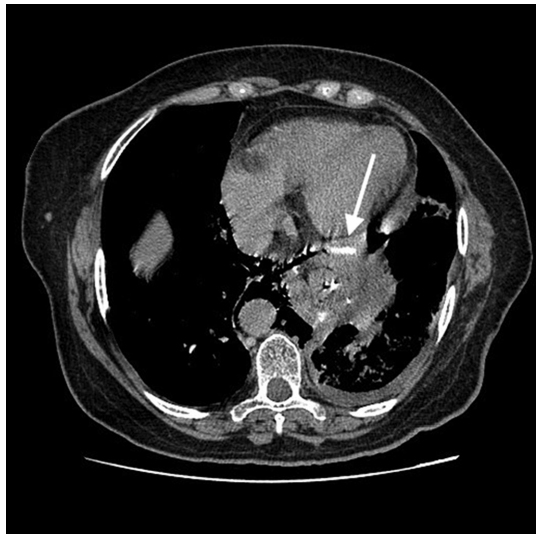

Fig. 4 CAT of the patient presenting with perforation into the mediastinum. Hernia recurrence and pneumomediastinum and contrast spillage into the mediastinum are evident (arrow).

to drain it. The second patient was admitted through the emergency ward, with a sudden retrosternal pain and fever. She had undergone two Nissen fundoplications and mesh hiatoplasty and, after a second recurrence, a thoracic approach was accomplished to perform a Collis–Belsey procedure 5 years before this complication. On computed tomography, pneumomediastinum and a left pleural effusion were found (Fig. 4), with contrast spillage into the mediastinum. She was submitted to a laparoscopy, in which a complete herniation of the previous fundoplication was demonstrated, with a perforation of the anterior wall of the upper stomach through which the hiatal mesh was found penetrating into the stomach. The mesh was removed, the gastric wall was sutured, the hernia was reduced, and a partial anterior fundoplication was completed, buttressing the sutured perforation. She recovered uneventfully and is asymptomatic 8 months from surgery.

DISCUSSION

In the past two decades, different authors have stressed the importance of mesh hiatoplasty when dealing with very large paraesophageal hernia or recurrent hiatal hernia to decrease the high recurrence rates reported after simple crural closure along with fundoplication.[4,6,7] However, claims have been raised against liberal use of mesh hiatoplasty due to the possible secondary effects and long-term complications, principally dysphagia and erosion.[5,8,9] The real incidence of mesh erosion is unknown; the 2010 SAGES survey reports an incidence rate of 0.27%, and higher for the expanded polytetrafluoroethylene mesh type, 0.5%.[2] The most recent European survey does not report a concrete number, although 21% of respondents admit to having seen cases of mesh erosion.[10] This is the first study reporting a reliable mesh erosion incidence based on a long follow-up of a single institution's series. The overall erosion rate we found was 6.6%, 3% for primary surgeries and 16% for patients who underwent mesh hiatoplasty in a revisional operation. These numbers, however, do not reflect the real magnitude of the problem, because the number of cases usually increases with the length of the follow-up, so a better understanding is obtained by presenting the incidence density (ID), which is 1 case for every 48 patient-years of follow up. The ID is double for patients who undergo revisional surgery (1/29).

Two questions arise from these data. Could it be a higher incidence rate than expected due to the use of a circular mesh? Furthermore, if the ID is so high for mesh repair during a recurrent-hernia repair, is it still justifiable to use a mesh in this setting? The answer to the first question is that there are no data in the literature relating the mesh shape to a higher complication rate. The circular mesh has been recommended for very large hiatal defects due to the higher reinforcement strength and lower deformability, regardless of the orientation of the mesh fibers and the type of mesh material[11]; its safety has been demonstrated both in the animal model and in clinical practice.[12,13] Regarding the second question, the erosion rate in the small subset of patients submitted to revisional surgery seems to be alarmingly high. Again, there is not a single reported reference to this in the scientific literature, so we can only compare with data of our erosion rate after primary hernia repair. Both the absolute rate and the ID are significantly higher for patients who underwent mesh repair after hernia recurrence. Some factors can influence these numbers. We speculate that manipulation of the stomach during reoperative surgery, and sometimes the use of mechanical sutures to dismantle a previous fundoplication or to perform a wedge gastroplasty, could be an inflammation focus, where the erosion could start.

The second aspect, and probably the most important of this study, is the few consequences of mesh erosion: only 1 patient out of 6 presented with a surgical emergency; only 1 patient out of 6 underwent visceral resection; 2 patients retained the mesh in place; and 2 underwent endoscopic removal. The simple reoperation for antireflux failure (dysphagia, herniation, or disruption) in patients with a previous mesh hiatoplasty has been related to a high rate of visceral resection. Khajanchee *et al.* found a 30% rate of resection among patients with a previous mesh, versus 4% among patients without a mesh.[14] Nandipati *et al.* reported a series of 27 patients with a previous mesh hiatoplasty who underwent reoperation, in which 6 patients had to be converted to a Roux-en-Y gastric bypass and 8 underwent esophageal resection.[15] Stadlhuber *et al.* presented a multi-institutional study of 26 reoperations for mesh-related complications, in which erosion was found in 17 cases (65%) and esophagectomy or gastrectomy was necessary in 9 patients (53%).[5] Experience with the management of foreign-body erosion into the esophagus or the stomach has been acquired after the spread of some bariatric procedures such as vertical banded gastroplasty, laparoscopic adjustable band, and banded Roux-en-Y gastric bypass. Although erosion rates are also difficult to assess, reported incidences are as high as 10%. Initially, open surgery was performed to manage erosion, but after the recent advances in bariatric endoscopy, most of the cases are treated nonsurgically.[16]

Our series is in consonance with these reports, suggesting that although the incidence rate of mesh erosion might be higher than we could expect, it is not as severe as has been previously reported: not all the patients present symptoms secondary to mesh erosion; in asymptomatic patients, the mesh can be left in place until it is completely included. For symptomatic patients, endoscopic removal can be safely performed, and for the few patients admitted to surgery, a laparoscopic approach can be completed with no need for visceral resection.

We can say that there is a significant rate of mesh erosion into the esophagogastric lumen after mesh hiatoplasty with a circular mesh. The main limitation of the study is that only one type of mesh was employed, a circular one, which is not the most frequently used by upper gastrointestinal surgeons. We cannot affirm that a posterior mesh could also be followed by a high rate of visceral erosion. The erosion rate is much higher when the mesh is placed during a revisional surgery for hiatal hernia recurrence. Other hiatal repair alternatives have to be explored to reduce complications of crural mesh hiatoplasty during revisional hiatal surgery, perhaps changing the position of the mesh to a relaxing incision in the diaphragm.[17]

ACKNOWLEDGMENTS

Dr Esteban López-Jamar, Dr Ceballos, and Dr Fernández Díez, from the Department of Gastrointestinal Endoscopy, Hospital Clínico San Carlos, contributed to mesh removals. Radiological studies are courtesy of Dr Rodríguez, from the Department of Radiology, Hospital Clínico San Carlos.

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