

Central mesh failure (CMF) after abdominal wall repair.

A rare cause of recurrence



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Francesca Ceci*, Linda D'Amore*, Maria Romana Grimaldi**, Elena Annesi**, Lucia Bambi**, Paolo Bruzzone*, Paolo Negro*, Francesco Gossetti*

Department of Surgery "Paride Stefanini" Sapienza University of Rome, Rome, Italy

**Unit of Abdominal Wall Surgery*

***Postgraduate School of General Surgery*

Central mesh failure (CMF) after abdominal wall repair. A rare cause of recurrence.

Central Mesh Failure (CMF) after abdominal wall repair (AWR) is uncommon but should be considered in case of recurrence. The mechanism is unclear and different theories are actually proposed, as the action of opposite forces acting in the abdominal wall on the prosthesis, and the characteristics of the device to be implanted. The use of lightweight meshes in some cases could be inadequate to withstand the bursting strength of the abdominal wall. Three cases of incisional hernia recurrence due to central mesh failure are here reported.

KEY WORDS: Abdominal wall repair (AWR), Central mesh failure (CMF), Hernia recurrence, Lightweight mesh

Introduction

Despite prosthetic repair of ventral hernia significantly reduces the recurrence rate when compared to simple suture hernioplasty, recurrence after mesh implantation can occur in about 10% of cases and constantly seems to rise over the years of follow-up^{1,2}. Reinforcement of the closed hernia defect by mesh is based on the concept of the ingrowth of fibrous tissue into prosthetic material, thus forming a scar-mesh compound. The mesh manufacturers claim that the tensile strength of synthetic meshes exceeds the maximum tensile strength of the abdominal wall (16 N/cm²). The recurrence, in fact, most frequently occurs at mesh edges, due to many factors such as mesh shrinkage, site of the implant, inad-

equately mesh fixation and poor mesh-tissue overlapping. Surgical site infection and obesity can also play an important role. Recurrences due to a central mesh failure (CMF) are rare and involve different mechanisms. Here we present three cases from our series of abdominal wall repair (AWR) in the last ten years.

Case Report

CASE N. 1

R.C., a 71 year-old Caucasian woman, smoker, who previously underwent three laparotomies for uterine cancer, gallbladder stones and coecum cancer, was admitted to our unit for a large xifopubic incisional hernia. Patient's BMI was 29.4. We performed a sublay retromuscular (prefascial) prosthetic repair using a monofilament polyester mesh with resorbable antiadhesive barrier (Parietex™, Covidien), due to thinness of the posterior fascia of the rectus muscle. Because of the size of hernia defect, the posterior layer of the abdominal wall was reconstructed with an absorbable surgical mesh made of polyglactin 910 (Vicryl®, Ethicon). Finally the anterior fascia was completely closed. Three years later, during

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Correspondence to: Prof. Paolo Negro, UOC Chirurgia della Parete Addominale, Dipartimento di Chirurgia, Paride Stefanini, Policlinico Umberto I°, Università di Roma Sapienza, Viale del Policlinico 155, 00161 Roma, Italy (e-mail: pal.negro@libero.it)

the follow-up, a clinical exam showed a small symptomatic periumbilical recurrent incisional hernia. At reoperation, a central 3 x 4 cm defect due to fracture of the mesh was observed while the prosthesis appeared peripherically uninjured. Abdominal wall onlay prosthetic repair was then performed, using a 15 x 15 cm macroporous partially absorbable surgical mesh, composed of a monofilament layer of polypropylene and poliglecaprone (Ultrapro®, Ethicon). Postoperative course was uneventful and the patient was discharged after 7 days. At 1 - year follow-up neither complications nor evidence of hernia recurrence were observed.

CASE N. 2

G.P., a 40 year-old Caucasian man, with a history of previous laparotomy for epigastric and umbilical hernia followed by an incisional hernia was treated with a preperitoneal prosthetic repair, referred to our unit for a recurrent incisional hernia. Patient's BMI was 32, 65. At operation, a defect at the edges of the previously implanted polypropylene mesh, which appeared shrunken, was found. The prosthesis was removed and a sublay retro-muscular (prefascial) mesh repair was performed, using a 30 x 30 cm macroporous partially absorbable mesh, composed of a monofilament layer of polypropylene and poliglecaprone (Ultrapro, Ethicon). Finally the anterior fascia was closed. In the postoperative period, the patient gained weight, reaching a BMI value of 34.94. At 6 - month follow-up, a 2 cm abdominal lump in the mesogastric region was observed and the patient was scheduled for surgery. At operation, a small recurrent incisional hernia due to a fracture in the central part of the mesh was found. The mesh was removed and an anterior prosthetic repair with component separation, according to Carbonell Tatay-Bonafé technique, was performed, using a 30 x 45 cm lightweight porous combined mesh, PVDF + polypropylene (DynaMesh®-IPOM, FEG Textiltechnik mbH). Postoperative course was uneventful. At 1 - year follow-up, neither complications nor evidence of hernia recurrence were observed.

CASE N. 3

B.C., a 75 year-old Caucasian man, BMI 29.4, with a surgical history of midline laparotomy for peritonitis, was referred to our unit for a periumbilical hernia. Four years before he underwent open colectomy and mesh repair for an incisional hernia, according to Rives- Stoppa technique, using a prosthesis with resorbable antiadhesive barrier (Parietex™, Covidien). The posterior layer of the abdominal wall was not completely closed but reconstructed with an absorbable surgical mesh made of polyglactin 910 (Vicryl®, Ethicon). At admission into our unit, the patient was submitted to US and CT scan,

then he was scheduled for laparoscopic surgery. At operation, a fracture of the previously implanted mesh was revealed leaving a central defect through which the hernia sac came out. A 20 x 15 cm composite mesh (Symbotex™, Covidien) was used to repair the abdominal wall defect. The postoperative course was uneventful. At 1 - year follow-up neither complications nor evidence of hernia recurrence were observed.

Discussion

Recurrent incisional hernias due to central mesh failure are rare and they should be differentiated from the more frequent recurrences occurring at the edge of shrunk meshes. The first CMF was described in 1993 by Gautier-Benoit related to a polyester mesh (Dacron), 6 months after a preperitoneal prosthetic repair of a ventral hernia (3). At reoperation, a 3 cm CMF surrounded by good tissue ingrowth was found. Since then, only few cases have been reported in the medical literature. Blazquez Hernando's review collected 19 CMFs following open prosthetic AWR. (4). To these, the Morris-Stiff's case, reported by Langer, and 7 more cases, from Petro's series must be added (1,5). There is only one report of CMF following laparoscopic IPOM repair, due to the tackers used for mesh fixation (6). Usually, follow-up of hernia repair is not very careful and patients are often re-examined for recurrence only some years later, when the previous mesh is well integrated into the tissue host, thus distorting anatomy and making the possibility of detecting a fracture more difficult⁷. So the real percentage of CMF, among all recurrences of incisional hernias could be underestimated.

Actually the mechanism of CMF is not well defined. Since there is no reason to believe to a production flow of the mesh, technical faults during mesh implantation seem to play a role. Two steps should be investigated, the choice of the mesh and the site of implant. With respect to the expected maximum physiological stress of the abdominal wall due to tension and pressure, meshes now in use are mostly oversized (8). However, chemical composition of the mesh, its partial degradation over time and its textile structure are the properties that should be considered by the surgeon when repairing large hernias, mainly in obese patients. Petro showed that lightweight monofilament polyester mesh (Parietex, Covidien) appears to have a high incidence of mechanical failure in the context of open incisional hernias (5). In 19 cases but 2 of CMFs reported by Blazquez Hernando, a lightweight large-pore sized polypropylene mesh was used, in 10 cases mixed with absorbable polyglactin or poliglecaprone multifilaments⁹⁻¹¹. All patients except one were overweight or obese. For CMF occurring after the implant of medium or heavy weight polypropylene, Langer proposes a theory that takes into account the

imbalance between different forces acting at the transitional zone, from the muscular planes to the free position of the mesh, which could be able to damage the stiff mesh over the years⁸. During the abdominal wall movements, the two parts of the mesh, the central one mobile and the lateral immovable, suffer opposing forces which could lead to mesh damage and mesh rupture in the transitional zone. This theory emphasizes the role of restoring the midline with a real linea alba. In fact, lacking the complete closure of the anterior fascia, only the lateral parts of the sublay positioned mesh will be incorporated into the rectus muscles. According to this theory, some Authors believe that the heavy meshes are at greater risk of damage than the lighter, more flexible variants^{8,12,13}. Blázquez Hernando's review does not confirm this conclusion⁴. In 14 out of 15 patients submitted to AWR using a lightweight mesh, surgeons were unable to close the anterior fascia of rectus muscles due to the size of the hernia defect and/or the numerous previous operations. So part of the prosthesis in the midline region was covered only with subcutaneous tissue. In these cases, the lightweight mesh could have been not sufficiently strong to withstand the bursting strength of the abdominal wall. However, the cautionary note by Petro warns us that also lightweight mesh, even if placed in retrorectus position with complete posterior and anterior fascial coverage, can undergo a central mesh fracture and refers the cause presumably to the durability of monomer components of the mesh and their degradation over time⁵.

In our series, all patients were overweight or obese, and they have been submitted to multiple previous AWRs. In all cases, we were able to reconstruct the anterior fascia of rectus muscles, but in two patients the posterior layer was uncompletely sutured due to loss of myofascial tissue. A resorbable mesh was used to fully close the posterior fascia. In all patients a lightweight or partially resorbable mesh was implanted in the retrorectus plane. Now, we believe that medium or heavyweight mesh would have been more appropriate in these patients. Moreover component separation technique, we routinely use since five years, generally allows the complete closure of the rectus sheet.

Conclusion

Despite rare, CMF is a very concerning cause of hernia recurrence after AWR. Closure or non-closure of the midline with the reconstruction of the linea alba seems to play a role in the mechanism of mesh rupture. The proper choice of the mesh depends also on this surgical moment as well as the characteristics of hernia and patients' risk factors. In obese patients with large ventral defects, lightweight meshes should be avoided¹⁴.

Riassunto

La rottura della protesi usata per la riparazione dei difetti della parete addominale è un evento poco comune che andrebbe, tuttavia, considerato tra le cause di recidiva. I meccanismi alla base di tale evento, che si verifica solitamente nella parte centrale della protesi, sono ancora poco chiari. Sono state proposte diverse teorie che considerano le forze antitetiche che agiscono sulla protesi impiantata nella parete addominale e le caratteristiche strutturali dei materiali impiantati. Protesi "leggere", potrebbero essere insufficienti, in alcuni casi, a resistere alla tensione che si sviluppa a livello della parete addominale. In questo lavoro vengono presentati tre casi di ernia incisionale recidiva causata da una rottura centrale di protesi.

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