



## 3- dimensional mesh implantations to prevent and to repair parastomal hernias– operative techniques

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**rezime** The objective of this article is to present the operative techniques used by us for preventing and repairing parastomal hernias with specially designed 3- dimensional mesh implantations. We present the operative techniques using two kinds of meshes: the SURGIMESH WN<sup>®</sup> Parastomal and SURGIMESH<sup>®</sup> XB Parastomal (Aspide Medical). The operative techniques are presented in 4 sections: prevention of parastomal hernias by the time of Miles operations and repair of parastomal hernias with these two kind of meshes. These techniques are applicable for open procedures, but at each section we refer to the laparoscopic approaches, too.

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Key words: parastomal hernia, prevention, repair, 3-dimensional mesh

### INTRODUCTION

Parastomal hernias are frequent complications of stoma surgery. Creating a hole in the abdominal wall's structure means by itself a constant enlargement tendency of the trephine opening<sup>1</sup> and causes disturbance in the wound healing pathways at the aperture<sup>2</sup>. Biomechanical studies demonstrated that the so- called tangential forces, acting at the edge of the aperture have the main role in enlarging the trephine opening and thus the potential parastomal hernia formations<sup>3</sup>. For this reason, strengthening the edge of the aperture is crucial for repairing parastomal hernias or even for preventing them at the time of primary operation. This recognition led to many mesh- based reinforcements around the orificium, either this mesh was placed in the onlay, sublay or in the intraperitoneal onlay plane, (keyhole technique). Other techniques, such as the Sugarbaker technique,

extraperitoneal path or component separation techniques, try to solve the problem from various different views other than the aperture reinforcement. Comparative controlled studies cross-checking these techniques are still missing. Simple fascial sutures or stoma transpositions for repairing parastomal hernias were proved ineffective or implicate serious complications and are advised to be used only in selected cases<sup>4</sup>.

Admitting the concept of aperture reinforcement with mesh, several new questions have to be answered. First, the aperture of the mesh must have functional integrity, since every cut made here might lead to potential hernia recurrence due to periaperture mesh fiber distortions<sup>5</sup>, or eventually mesh penetration into the wall of the bowel. On the other hand, pure onlay mesh reinforcements seem to have insufficient results not just in ventral hernia repair but even in parastomal hernia repair, it is still to be answered that in which plane (onlay, sublay, intraperitoneal onlay) would mesh insertion be preferable. The choice of mesh material is again another question.

Facing these dilemmas, we tried to find the ideal techniques and materials which would solve the above mentioned problems. During a period of time lasting more than 10 years, we came to realise how to develop and to simplify the procedures presented hereinafter.

The original idea was to use meshes designed primarily for inguinal hernia repair: PHSL (Polypropylene hernia system large; Ethicon inc. Johnson and Johnson, USA) or UHSOV (ULTRAPRO Hernia System Oval; Ethicon inc. Johnson and Johnson, USA). This method was developed further, firstly to SURGIMESH WN<sup>®</sup> Parastomal and later to SURGIMESH<sup>®</sup> XB Parastomal (Aspide Medical). These developments were carried through in strong cooperation with the manufacturer.

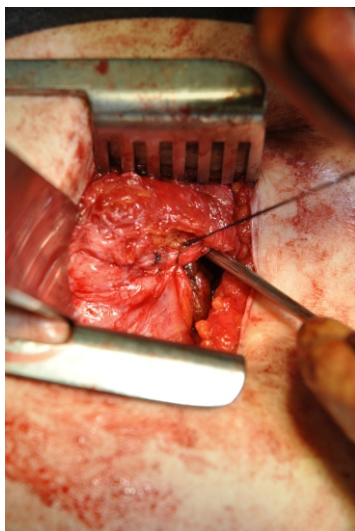


FIGURE 2A:  
SUTURING THE ANTERIOR AND POSTERIOR RECTAL SHEETS

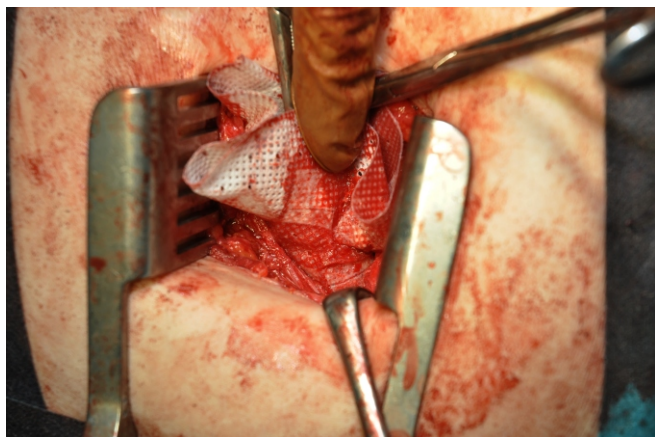


FIGURE 2B:  
THE INFERIOR PATCH OF THE MESH IS LAID BETWEEN THE POSTERIOR SHEET AND THE PERITONEUM

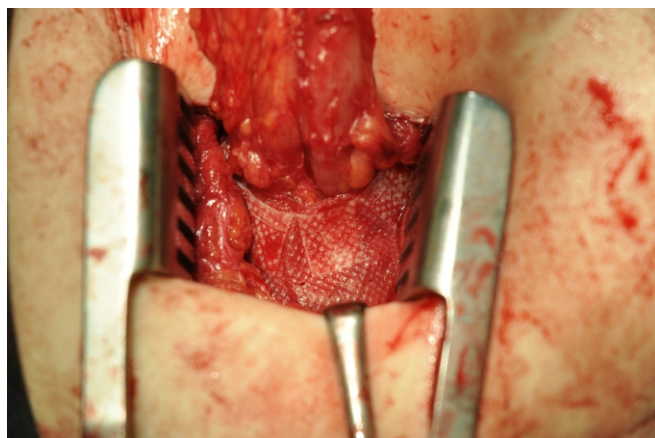


FIGURE 2C:  
THE SUPERIOR PATCH OF THE MESH IS LAID ONLY

SURGIMESH WN<sup>®</sup> Parastomal and SURGIMESH<sup>®</sup> XB Parastomal are composed of 2 parallel circular patches linked together by a central tube open at each end (tridimensional structure). SURGIMESH WN<sup>®</sup> Parastomal is composed entirely of non woven, non knitted polypropylene with mass per unit area of 80g/m<sup>2</sup>. SURGIMESH<sup>®</sup> XB Parastomal's superior patch has the same characteristics; the inferior patch is composed of non-woven, non knitted polypropylene layer with mass per unit area 50g/m<sup>2</sup> coated with a silicone layer.

The central tube is assembled by ultrasound welding, the superior circular patch is assembled to the central tube by ultrasound welding, and the inferior circular patch is assembled to the central tube by sewing with USP5/O PVDF (Polyvinylidene fluoride) anti-adherent yarn. The external diameter of the circular patches is 10 cm, the height of the central tube is 1,3 cm. The central tube is available in both series in 3 diameters: 3 cm, 3,5 cm and 4 cm respectively.

These devices were used with very good long term results for preventing and treating parastomal hernias at our institute, either in open or laparoscopic procedures, and these results were presented at the annual ESCP meeting in Belgrade 2013 and on other forums<sup>6,7</sup>. Enrolling patients and evaluation of these products is under way at our institute.

We present hereinafter the operative procedure of inserting SURGIMESH WN<sup>®</sup> Parastomal for preventing and for repairing parastomal hernias and then a comparison of these techniques with the implantation of the silicone-coated SURGIMESH<sup>®</sup> XB Parastomal meshes. These techniques are presented for the open procedures and we will make short allusions for the laparoscopic techniques at each section.

#### OPERATIVE TECHNIQUES

*Prevention of parastomal hernias by implanting SURGIMESH WN<sup>®</sup> Parastomal at the time of abdomino-perineal extirpation by Miles*

Initial phases of the operation (ligating the IMA, transecting the colon) are made in the standardized way. It is important that the colon desired to form the end stoma must be transected with linear stapler or endostapler respectively, in order to avoid any contamination during the pulling out procedure. The ideal site of the stoma in the left lower quadrant of the abdomen must be pre-marked before the operation. A 2,5- 3 cm circular skin incision is performed at the pre-marked site. Subcutaneous tissue is left in place, except in obese patients, and with sharp and blunt method, an approximately 10 x 10 cm plane is dissected above the anterior sheet of the rectus abdominis muscle. A longitudinal incision is made on the anterior sheet, muscle fibres are divided and again, by sharp and blunt dissection an approximately 10 x 10 cm plane is created above the posterior rectus sheet, between the muscle and the posterior rectus sheet. (*Care must be taken to avoid damaging the inferior epigastric vessels running in this region*). The space between the



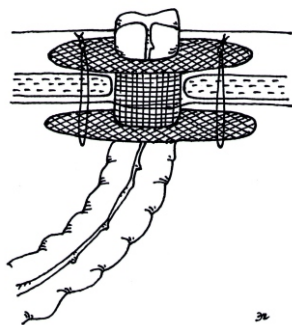


FIGURE 3:  
POSITION OF THE SURGIMESH® XB PARASTOMAL AT  
THE END OF PROCEDURE THE POSITION OF 3D MESH  
IN SITU

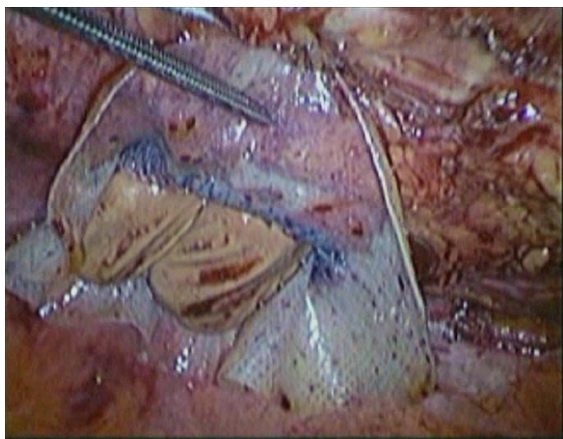


FIGURE 4A:  
AVOIDING AIR LOSS IN CASE OF LAPAROSCOPIC AP-  
PROACH

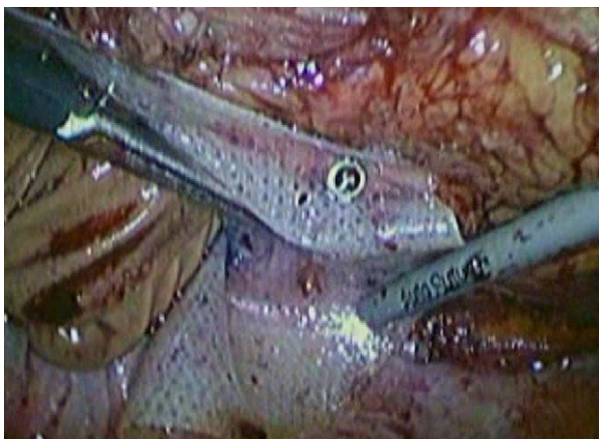


FIGURE 4B:  
LAPAROSCOPIC FIXATION OF THE MESH

posterior rectus sheet and peritoneum is not dissected. The hole is washed liberally with antiseptical solution (Povidon-iodine). Selection between the meshes with different internal diameters is made considering the diame-

ter of the transected colon. Once the mesh is selected, it is introduced in the hole, in a way that the superior patch of the device is laid on the anterior rectus sheet (onlay), and the inferior patch gets into the space created between the rectus muscle and the posterior rectus sheet (sublay) (Fig. 1). The mesh must fit properly in the created spaces. The mesh is fixed at the four corners with non-absorbable 2/0 monofilament sutures placed transfascially with Stamey needle, in a way that sutures are going through all the layers of the mesh and of the rectus abdominis muscle and the knots are placed above the superior layer of the mesh. A little incision is made on the peritoneum and the sigmoid trunk is gently pulled out through the central tube of the mesh.

In case when the operation is performed laparoscopically, at this step, a 10 mm trocar is introduced through the central hole of the mesh in order not to lose air and the bowel is pulled out with an endoscopic forceps.

Through this procedure and at the end, when the bowel is taken out sufficiently, the operator gently passes one little finger around the bowel to be sure that the tunnel is not too close. The colon is brought 3-4 centimetres above the skin level; measurement of length is done at the mesenteric site of the bowel. The bowel is sutured to the skin only, with interrupted 3/0 non-absorbable sutures. The sutures are going through the corium and the sero-muscular layer of the intestine. The bowel is not opened at this stage; it will be opened in the next day. Next steps of the abdominoperineal extirpation are done in the conventional way.

In open cases the midline abdominal wall closure includes where it is appropriate, the medial border of the mesh.

The stoma opening is closed with running 2/0 absorbable suture. A circular skin incision is performed around the stoma, and the subcutaneous plane is dissected along the bowel, which is gently pulled up during this procedure. The hernia sac is identified and opened. Possible adhesions are solved and the hernia sac is resected with sharp dissection. If it's possible, the colon is mobilized with sharp dissection in a way that it could be pulled out above the skin level few centimetres more than it was before. Then it is dropped down, inside the abdominal cavity. The distal edge is secured with a long string.

Note: in cases of bigger or multilocular parastomal hernias laparoscopic or midline incisional exploration may be needed!

The hernia content is pulled back into the abdomen, possible adhesions are solved and mobilization of the distal colon is performed by one of these approaches.

Another alternative method in case of medium sized parastomal hernias, is managing the hernia sac from a semicircular incision 3-4 cm around the stoma, so thus the midline incision can be avoided. The stoma bag can be applied afterwards around the stoma without getting in contact with the skin incision.



FIGURE 5A:  
PARASTOMAL HERNIA

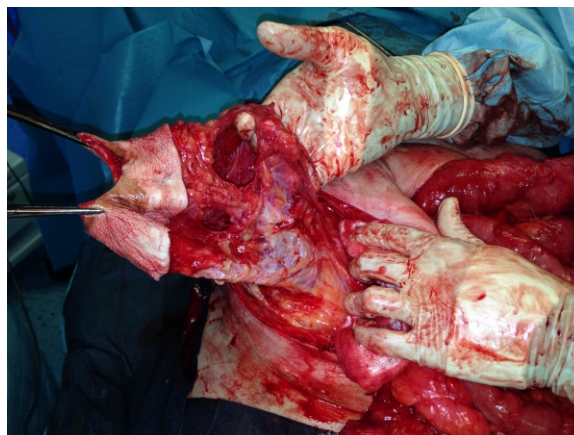


FIGURE 5C:  
RESECTION OF THE HERNIA SAC



FIGURE 5B:  
CLOSING THE STOMA OPENING



FIGURE 5D:  
NARROWING THE HERNIA GAP

Next steps of mesh placement are the same, as it follows.

The peritoneal sac of the hernia is resected 2 cm-es above the hernia opening. A space is created between the posterior fascia of the rectus abdominis muscle and the peritoneum so that the extension of the dissection is around 5 cm in every direction. (*Difference to the preventive mesh implantation technique!*) In most of the cases this manoeuvre is easy, because by pulling the hernia sac, which is in fact the extension of the peritoneum, one can easily get into the right plane. The onlay plane is dissected with sharp and blunt technique approximately 5 cm concentrically from the margins of the hole. The abdominal wall defect caused by the parastomal hernia is narrowed by suturing the anterior and posterior rectal sheet with interrupted 2/0 absorbable sutures. 2-3 sutures are needed, leaving a central gap that admits leisurely the bowel. (Direct fascial repair.) The hole is washed liberally with antiseptical solution (Povidon- iodine). Selection between the meshes with different internal diameters is made considering the diameter of the transected colon. Once the mesh is selected, it is introduced in the hole, in a way that the superior patch of the device is laid on the anterior rectus sheet (onlay), and the inferior patch gets

into the space created between the posterior fascia of the rectus muscle and the peritoneal sac. Insertion of the mesh can be facilitated by introducing 2 or 3 instruments through the central hole of the mesh and grasping the edges of the peritoneum. The mesh must fit properly in the created spaces. Fixation of the mesh with the 4 transfascial sutures is described in the previous section. Once the mesh is properly placed, the colon is pulled out from the abdomen through the central hole of the mesh with the help of the long string secured to its distal edge.

**PREVENTION OF PARASTOMAL HERNIAS BY IMPLANTING SURGIMESH® XB PARASTOMAL AT THE TIME OF ABDOMINO-PERINEAL EXTIRPATION BY MILES**

Operational steps are the same as described at „Prevention of parastomal hernias by implanting SURGIMESH WN® Parastomal” section, except that the sublay plane between the rectus abdominis muscle and the posterior rectus sheet is not dissected.

Once the mesh is selected, it is introduced in the hole, in a way that the superior patch of the device is laid on the anterior rectus sheath (onlay), and the inferior patch





FIGURE 5E:  
POSITION OF THE MESH- THE SUPERIOR PATCH



FIGURE 5H:  
END OF PROCEDURE



FIGURE 5F:  
POSITION OF THE MESH- THE INFERIOR PATCH



FIG. 5I:  
30 DAYS AFTER THE PROCEDURE



FIGURE 5G:  
PULLING OUT THE BOWEL THROUGH THE MESH

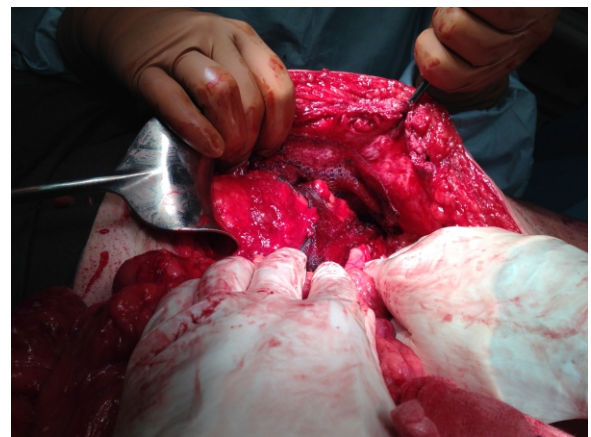


FIGURE 6:  
ADDITIONAL IPOM

inserted through the hole of the posterior rectus sheet and of the peritoneum inside the abdominal cavity is laid on

the parietal side of the peritoneum in a way that the antiadherent covering of this patch is facing the abdominal cavity (Fig. 3). This patch with silicon can be identified thanks to the blue sewn yarns. Transfascial fixation of the mesh is again the same as the fixation of the non siliconized mesh described above.

In cases of laparoscopic procedures placing the transfascial sutures can be a demanding step of the procedure, because of the loss of insufflation. Note: SURGIMESH WN<sup>®</sup> Parastomal was placed totally extraperitoneally (see above), thus there was not kind of this problem. Nevertheless implanting SURGIMESH<sup>®</sup> XB Parastomal is still more an easier procedure, than insertion of SURGIMESH WN<sup>®</sup> Parastomal, since there is no need for dissecting the sublay plane! Fixating it in laparoscopic cases was solved sometimes by abandoning the transfascial sutures and fixing with Endotacker the inferior patch only. For this action the inner tube of the device is plugged with the surgeon's two fingers, facilitating this manoeuvre by lifting the abdominal wall (Fig. 4a-b).

The steps of this procedure are the same as described in the „Parastomal hernia repair by implanting SURGIMESH WN<sup>®</sup> Parastomal” section, except that, here again, there is no need for the demanding dissection of the inframuscular planes. After narrowing the hernia gap with fascial sutures to the desired diameter, the mesh is simply introduced in this gap and laid with its superior patch above the muscle, and with its inferior patch laid intraperitoneally onlay. This mesh again, can be fixed with transfascial sutures (especially in the open procedures) or with Endotacker.

Sometimes the hernia gap is too wide, so that simple fascia sutures don't seem to be safe. In these cases we covered the defect with another intraperitoneally onlay placed mesh (Fig. 6).

### CONCLUSIONS

With these devices a simple and effective solution can be reached to treat or to prevent parastomal hernias. Due to the construction of these meshes the aperture of the stoma is reinforced and the tangential forces acting here are neutralized, and there is no chance for further enlargement of the aperture. At the same time by covering both faces of the abdominal muscles a secure strengthening of the muscle sheets is achieved, minimizing the chance of mesh penetration during the normal abdominal wall movements. The SURGIMESH WN<sup>®</sup> Parastomal can be used exclusively extraperitoneally. The SURGIMESH<sup>®</sup> XB Parastomal- while not contradicting the concept of tridimensional structure-, can be handled more easily and can be inserted partially intraperitoneally.

### SUMMARY

#### TRODIMENZIONALNA INPLANTACIJA „MESA“ U PREDOHRANI I REPARACIJI PARASTOMALNIH HERNIJA – OPERATIVNA TEHNIKA.

Prikazane su operativne tehnike za prevenciju i repariranje parastomalnih hernija uz pomoć posebno dizajniranih trodimenzionalnih „mesh“ implantata. Autori su koristili dve vrste „mesha“: SURGIMESH WN<sup>R</sup> parastomalni i SURGIMESH XB<sup>R</sup> parastomalni (Aspide Medical) Operativne tehnike su prikazane u četiri dela:

prevencija pojave parastomalnih hernija za vreme operacije po Majlsu i reparacija istih pomoću navedenih implantata.

Ove tehnike su primenljive u otvorenim hirurškim postupcima, mada autori, takodje, prikazuju i laparoskopске pristupe.

Ključne reči: trodimenzionalna mrežica, parastomalna, hernija

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