

Does Expanded Polytetrafluoroethylene Mesh Really Shrink After Laparoscopic Ventral Hernia Repair?

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INTRODUCTION

Implantation of an abdominal wall prosthesis routinely accompanies laparoscopic incisional/ventral hernia (LIVH) repairs. A major concern of surgeons is how the implanted mesh will respond in vivo in terms of adhesion formation, amount of shrinkage, abdominal wall compliance and tissue ingrowth. Shrinkage of mesh has been cited as a possible explanation for hernia recurrence. Multiple animal studies have been performed with variable rates of mesh shrinkage; however, very few human studies have been performed. Expanded polytetrafluoroethylene (ePTFE) is unique in that it can be visualized on computed tomography (CT). Our aim is to determine the rate of mesh shrinkage in patients who have had implantation of ePTFE for LIVH.

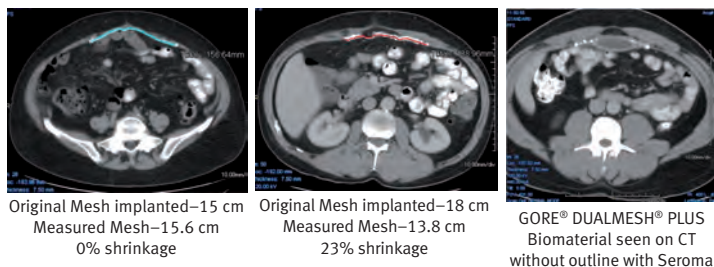
METHODS

At our institution, we performed 815 LIVH repairs between January 2006 and August 2009. The majority of those patients had implantation of GORE® DUALMESH® PLUS Biomaterial (W. L. Gore, Newark, DE). We identified 65 patients who had postoperative CT's of the abdomen with visualized ePTFE and known transverse diameter of implanted GORE® DUALMESH® PLUS Biomaterial (W. L. Gore, Newark, DE). The mesh was measured using the AquariusNet software (TeraRecon, San Mateo, CA) program which outlines the mesh and calculates total length. The technicians who measured the mesh were blinded to the original size of the implanted mesh. The difference in mesh size was determined by subtracting the calculated size of ePTFE in the transverse plane from the known transverse diameter of the implanted mesh. Mesh shrinkage was defined as any decrease in size of the implanted mesh.

STATISTICS	n	Results	p-value
Patients	815		
CT's Reviewed	65		
Rate of Shrinkage		8.4%±7.9%	
Shrinkage unrelated to mesh size			0.84
Shrinkage unrelated to duration of implant			0.58
Shrinkage unrelated to seroma			0.45

TECHNIQUE

Complete adhesiolysis is performed after safe entry into the abdomen routinely with a 5 mm optical trocar. The hernia defect or defects are identified and measured. The mesh size is determined based upon the size of the defect. A 3-5 cm overlap of the hernia is calculated into the choice of mesh size. The mesh is prepared routinely with CV-0 ePTFE sutures at the superior and inferior boundaries prior to insertion into the abdomen. The mesh is inserted into the abdomen through a 5 mm trocar site and unrolled inside of the abdomen. Transfascial sutures are secured superiorly and inferiorly using a laparoscopic suture passer. The mesh is fixed to the abdominal wall with tackers at 1 cm increments circumferentially around the mesh and a second row of tackers in a double crown technique. Transfascial sutures are placed every 3-5cm.



RESULTS

The mean shrinkage rate was 8.4%±7.9%. This result was not statistically different from the previously reported 7.5% rate in the only other human study of ePTFE shrinkage using CT measurements (p=0.36). Duration of implantation ranged from 0.25 months – 78 months with a mean of 17.2 months. The average transverse mesh size implanted was 18 cm. Seroma was seen in 12.3% (8) of patients. No relationship was identified between percentage of shrinkage and original mesh size (p= 0.84), duration of time implanted (p=0.58) or seroma formation (p=0.45). In 27.6% (18) of patients, no shrinkage of mesh was identified. Of the patients who did experience mesh shrinkage, the range of shrinkage was 2.6 % - 25%.

DISCUSSION

Reported shrinkage rates of ePTFE vary widely with one animal study reporting a 43% rate of shrinkage. This was not reproduced in our study. The chemical properties of the mesh and the host's cellular response to the mesh more than likely determine shrinkage rates. ePTFE is chemically inert and has a minimal host inflammatory response. Recurrence of ventral/incisional hernias has not definitively been related to mesh shrinkage. Patient factors such as obesity, inadequate wound healing and nutrition play a significant role in recurrence rates. Technical factors are also implicated in recurrence such as inadequate overlap of mesh based upon the size of the defect or missed defects during initial implantation. Our results are markedly different from animal studies and confirm that ePTFE has minimal shrinkage in a human clinical model.

REFERENCES

1. Bellon, J, Rodriguez M, Garcia-Hondurilla, N et al. Partially absorbable meshes for hernia repair offer advantages over nonabsorbable meshes. *The American Journal of Surgery*. 2007;194, 68-74.
2. Novitsky YW, Cristiano JA, Harrell AG et al. Immunohistochemical analysis of host reaction to heavyweight-, reduced-weight, and expanded polytetrafluoroethylene (ePTFE)-based meshes after short- and long-term intraabdominal implantations. *Surgical Endoscopy*. 2008; 22, 1070-1076.
3. Schoenmaeckers E, van der Valk S, van den Hout H et al. Computed tomographic measurements of mesh shrinkage after laparoscopic ventral incisional hernia repair with an expanded polytetrafluoroethylene mesh. *Surgical Endoscopy*. 2009; 23, 1620-1623.
4. Schug-Pab C, Tamme C, Tannapfel A et al. A lightweight polypropylene mesh (TiMesh) for laparoscopic intraperitoneal repair of abdominal wall hernias. *Surgical Endoscopy*. 2006; 20, 402-409.

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