

Effects of Ethylene Oxide Resterilization and In-vitro Degradation on Mechanical Properties of Partially Absorbable Composite Hernia Meshes*

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Abstract

Background and Aim: Prosthetic mesh repair for abdominal wall hernias is widely used because of its technical simplicity and low hernia recurrence rates. The most commonly used material is pure polypropylene mesh, although newer composite materials are recommended by some centers due to their advantages. However, these meshes are more expensive than pure polypropylene meshes. Resterilization of a pure polypropylene mesh has been shown to be quite safe, and many centers prefer slicing a large mesh into smaller pieces, suitable for any hernia type or defect size. Nevertheless there is no data about the safety after resterilization of the composite meshes. The present study was carried out to investigate the effects of resterilization and in vitro degradation in phosphate buffered saline solution on the physical structure and the mechanical properties of partially absorbable lightweight meshes.

Methods: Two composite meshes were used in the study: One mesh consists of monofilament polypropylene and mono-filament polyglycaprone -a copolymer of glycolide and epsilon (ε) -caprolactone - (Ultrapro[®], 28 g/m², Ethicon, Hamburg, Germany), and the other one consisted of multifilament polypropylene and multifilament polyglactine (Vypro II[®], 30 g/m², Ethicon, Hamburg, Germany). Two large meshes were cut into rectangular specimens sized 50 x 20 mm for mechanical testing and 20 x 20 mm for in vitro degradation experiments. Meshes were divided into control group with no resterilization and gas resterilization. Ethylene oxide gas sterilization was performed at 55°C for 4.5 hours. In vitro degradation in 0.01 M phosphate buffered saline (PBS, pH 7.4) solution at 37 ± 1°C for 8 weeks was applied to one subgroup in each mesh group. Tensiometric measurements and scanning electron microscopic evaluations were completed for control and resterilization specimens. *Results:* Regardless of resterilization, when the meshes were exposed to in vitro degradation, all mechanical parameters decreased significantly. Highest reduction in mechanical properties was observed for Ultrapro due to the degradation of absorbable polyglycaprone and polyglactin parts of these meshes. It was observed that resterilization by ethylene oxide did not determine significant difference on the degradation characteristics and almost similar physical structures were observed for resterilized and non-resterilized meshes. For Vypro II meshes, no significant mechanical difference was observed between resterilized and non-resterilized meshes after degradation while resterilized Ultrapro meshes exhibited stronger characteristics than non-resterilized counterparts, after degradation.

Conclusion: Resterilization with ethylene oxide did not affect the mechanical properties of partially absorbable composite meshes. No important surface changes were observed in scanning electron microscopy after resterilization.

Key words: mesh, hernia, composite mesh, resterilization, degradation, mechanical properties, tensiometry, tensile strength, polypropylene, polyglecaprone, polyglactine

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