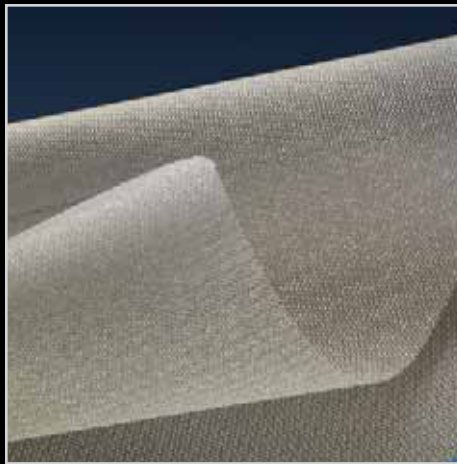
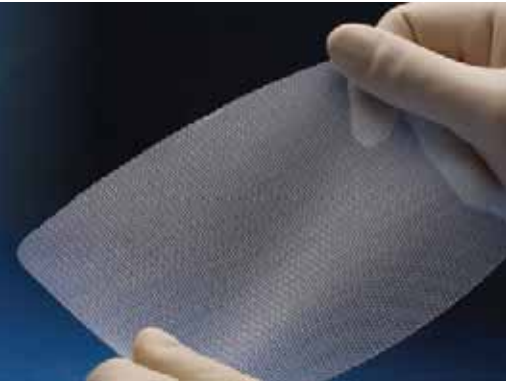


C-QUR LITE™ TECHNICAL DATA REPORT

Healing Benefits of the 30-Day Omega-3 Coating Technology



Healing Benefits of the 30-Day Omega-3 Coating Technology



Executive Summary

Objective: The objective of this pre-clinical, small animal study was to compare the level and duration of the inflammatory response and the quality of complete healing between bare polypropylene mesh and the 30-day Omega-3 bioabsorbable coated mesh, C-QUR Lite™.

Background: The inflammatory response is a necessary and natural part of the healing process. However, overall tissue strength of a wound is essentially zero during the inflammatory phase and an excessive or prolonged inflammatory response to foreign body material, like mesh material, can affect overall healing.¹

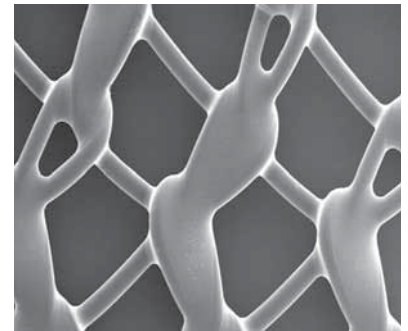
Methods: A pre-clinical evaluation was performed using well accepted small animal models in an open surgical procedure. A full thickness abdominal wall defect was made and mesh samples were then implanted to repair the defect using 4-0 Prolene sutures. Five samples of both bare polypropylene and C-QUR Lite™ were evaluated and all mesh was explanted at approximately 30 days.

Results: C-QUR Lite™ demonstrates excellent tissue incorporation with minimal inflammatory response when compared with non-coated bare polypropylene mesh. The formation of a visible “scar plate” was only observed on the bare polypropylene, while the C-QUR Lite™ demonstrated a less fibrous “scar net” surrounding the filaments of the mesh after coating absorption.

Conclusion: C-QUR Lite's™ less severe inflammatory response stimulates a more uniform incorporation in the formation of a less fibrous “scar net” surrounding the filaments of the mesh. This results in minimal folding and contraction of the mesh resulting in improved shape retention following implantation.

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30-DAY COATING



Each monofilament of C-QUR Lite™ is coated with O3FA.

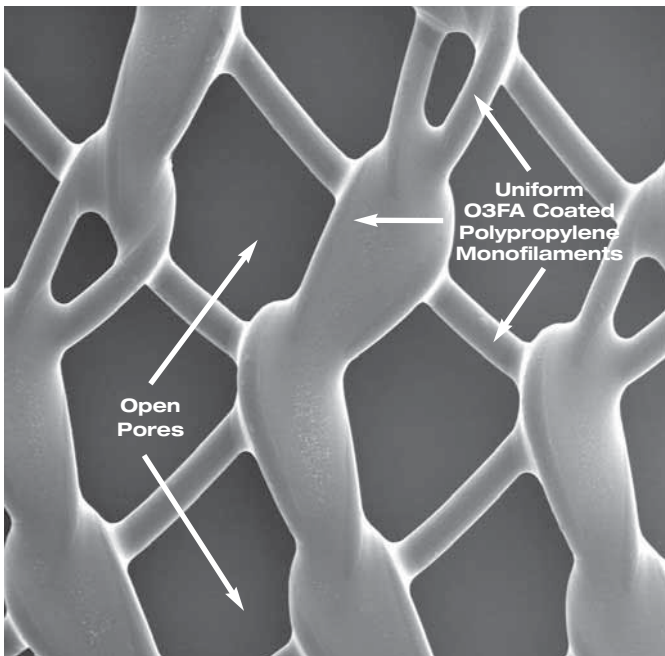
SMALL ANIMAL STUDY



A preclinical evaluation was performed using well accepted small animal models in an open surgical procedure. The 30-day Omega-3 bioabsorbable coated mesh, C-QUR Lite™, and un-coated polypropylene mesh were tested to compare the quality of complete healing.

Introduction

Atrium Medical Corporation has developed a novel, biological coated mesh that provides preferred initial stiffness for improved handling during implantation, combined with all the benefits of a more durable polypropylene mesh. C-QUR Lite™ utilizes both of Atrium's clinically proven ProLite™ and ProLite Ultra™ polypropylene mesh platforms, which have been shown in independent studies to have excellent biocompatibility and healing characteristics.² Each monofilament of the C-QUR Lite™ polypropylene mesh is uniformly coated with Atrium's proprietary Omega-3 fatty acid coating, resulting in a thin, low profile material that is easier to handle and position during implantation. The pharmaceutical grade fish oil coating does not bridge or web across the individual pores of the mesh, allowing for rapid incorporation of the reinforcement mesh by the tissue. Additionally, the Omega-3 coating consistently demonstrated significant reductions in inflammatory cell recruitment in all pre-clinical animal studies.



Atrium's advanced 30-day Omega-3 fatty acid coating technology consists of a fully bioabsorbable, thermally cross-linked gel derived from highly purified pharmaceutical grade fish oil. The thermally cross-linked coating undergoes simple

hydrolysis in vivo and is easily broken down into smaller, naturally occurring fatty acid groups, fatty alcohols, and glycerides. These hydrolyzed lipid components are readily absorbed by local tissue and are consumed by the local tissue via normal lipid metabolism.

C-QUR Lite™ has been evaluated in several preclinical models prior to clinical use, with direct comparison to currently marketed products, in addition to in-depth testing for FDA and ISO 10993 standards for safety and biocompatibility.

Mechanical testing was also conducted on the mesh and showed that no mechanical strength is lost after the Omega-3 coating absorption. C-QUR Lite™ Mesh has the same high suture retention and burst strength as the underlying ProLite™ or ProLite Ultra™ substrate material. C-QUR Lite's™ initial mesh stiffness facilitates easier placement and handling during implantation, but as the coating absorbs, the soft and supple nature of the ProLite or ProLite Ultra™ mesh material remains.

C-QUR Lite™ Mesh received US FDA 510 (k) approval in March 2007 with the following indications for use:

Indications:

Atrium C-QUR Lite™ Mesh is indicated for use in soft tissue deficiencies including hernia repair, chest wall reconstruction, traumatic or surgical wounds and other fascial surgical intervention procedures requiring reinforcement with a supportive material.

C-QUR Lite™ Mesh is available in a wide range of sizes and preferred anatomical shapes to accommodate the needs of the patient.

Objective

A preclinical evaluation was performed using well accepted small animal models in an open surgical procedure. The 30-day Omega-3 bioabsorbable coated mesh, C-QUR Lite™, and uncoated polypropylene mesh were tested to compare the quality of complete healing, the level of inflammation in and around the polymer monofilaments, and the 28-day ingrowth characteristics.

Methods

A full thickness abdominal wall defect was made by removing approximately 2cm x 3cm of muscle and fascia. The mesh samples were then implanted to repair the defect by suturing them over the defect site using 4-0 Prolene sutures. An overlap of approximately 2-3mm of mesh was placed over the defect to ensure proper repair, with the mesh samples being 2.5cm x 3.5cm in size. Suture knots were made on the abdominal wall side of the implant rather than the visceral side as to not interfere with tissue attachment. All mesh implanted was explanted at approximately 30 days. Five samples of each type were evaluated.

At gross explant, each mesh sample was evaluated for visceral tissue attachment, abdominal wall incorporation, and inflammatory cell recruitment, as well as for signs of infection and other complications. Tissue samples were then placed in fixative, and slides were prepared for histology. Histological evaluation including inflammatory cell reaction, completeness of tissue incorporation, and foreign body response was performed in a blinded manner.

Results

Upon gross examination, the Atrium C-QUR Lite™ Mesh demonstrated similar or less visceral tissue attachment with lower connective tissue tenacity than the uncoated polypropylene on the visceral side of the mesh. There was no evidence of visceral organ entrapment, infection, necrosis, or other complications observed with the non-coated control materials. Excellent tissue incorporation was

observed on the "abdominal wall surface" of the mesh without extensive inflammation markers present. Some folding of the mesh was observed with the bare polypropylene samples due to minimal wound contraction and minimal mesh overlap at the defect site.

Histological evaluation using H&E stain of all test articles indicated complete incorporation into surrounding tissue. The Omega-3 coated C-QUR Lite™ Mesh explants exhibited minimal inflammatory response at all fiber locations (Fig 1). All non-coated test samples exhibited pronounced inflammatory cell presence associated with the bare polypropylene mesh fibers (Fig 2). The bare polypropylene and C-QUR Lite™ samples exhibited a vascularized tissue capsule in association with the mesh. This newly organized tissue formed a smooth, well-defined interface with the abdominal wall. The C-QUR Lite™ Mesh supported the formation of a thin, well vascularized, adipose enriched tissue capsule. The newly formed tissue-abdominal contact interface was distinct, uniform and appeared to support significant formation of a mesothelial cell lining.

Sections from each of the mesh types were examined using Masson's Trichrome stain to evaluate collagen deposition. All three test articles exhibited the formation of predominantly a scar net with fibrous capsule formation in association with each fiber. The formation of a visual scar plate was only observed with the non-coated bare polypropylene mesh. The scar plate formations on the bare polypropylene explants were variable. On the other

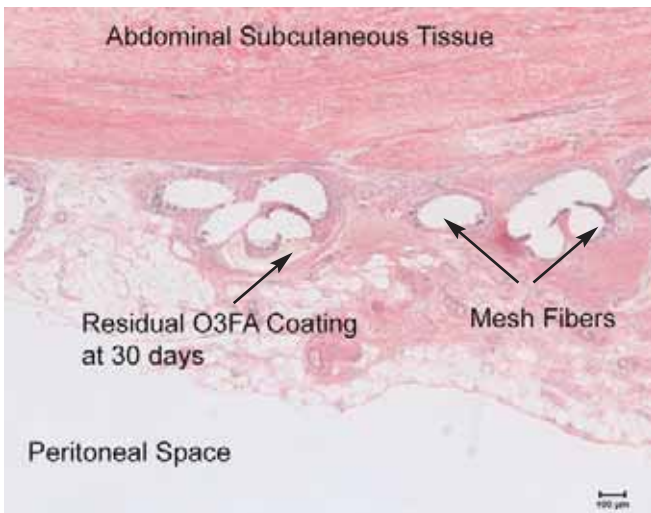


Figure 1. C-QUR Lite™ 30-day histology

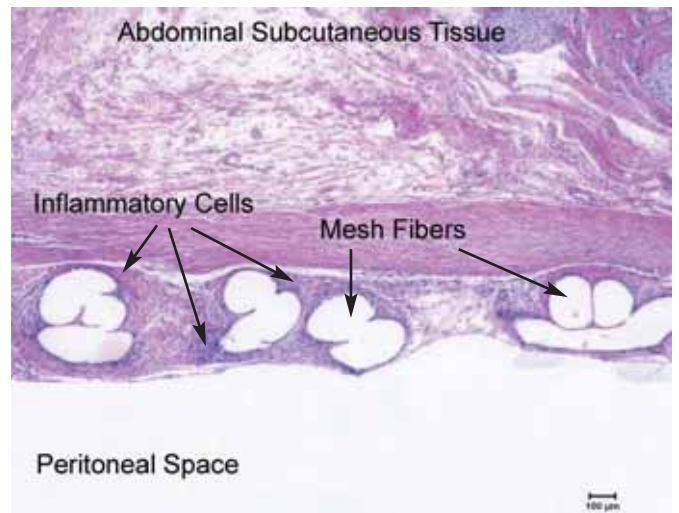


Figure 2. Non-coated mesh 30-day histology

hand, the C-QUR Lite™ Mesh exhibited a consistent lack of scar plate formation and the consistent observation of adipose tissue content between the mesh fibers.

Conclusion

It is concluded that the lack of formation of a dense fibrous scar plate in association with the C-QUR Lite™ Mesh test articles provides a mechanism underlying the observation that this mesh exhibits minimal folding and contraction resulting in improved shape retention following implantation. The infolding observed with the bare polypropylene

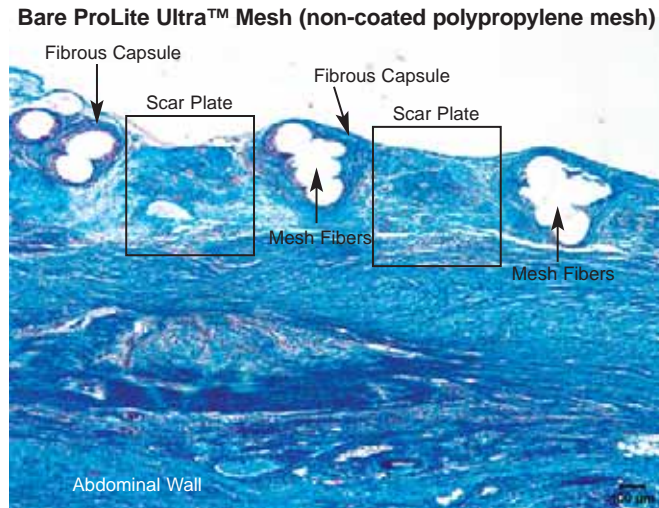


Figure 3. ProLite Ultra™ stained with Masson's Trichrome after 30 days in an intraperitoneal small animal model.

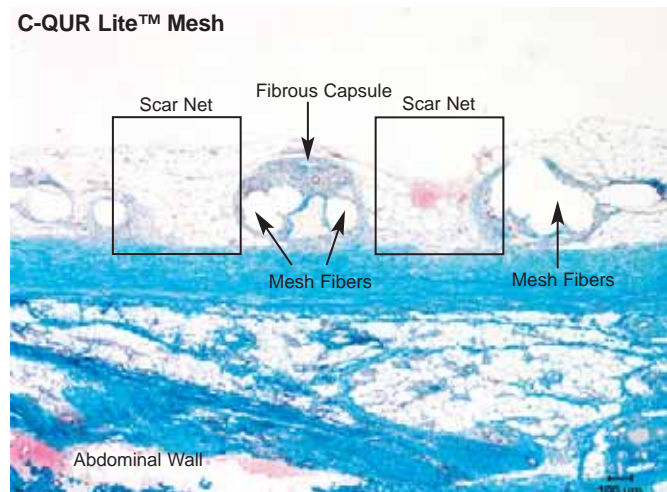


Figure 4. C-QUR Lite™ stained with Masson's Trichrome after 30 days in an intraperitoneal small animal model.

mesh is most likely due to the localized formation of fibrous scar plate (Fig 3) resulting in the contraction of the fibrous tissue. The C-QUR Lite™ Mesh stimulates a more uniform incorporation in the formation of a less fibrous scar net (Fig 4) surrounding the filaments of the mesh, with formation of adipose tissue in the area between fibers resulting in more uniform retention of the mesh's original planar shape.

References

1. Franz M.G. (2008) The Biology of Hernia Formation. Surg Clin N Am 88 (2008) 1-15.
2. Klosterhalfen B, Klinge U, Schumpelick, V (2000) Pathology of Traditional Surgical Mesh for Hernia Repair after Long-Term Implantation in Humans. Der Chirurg 2000, Clinic and Research, 48.

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C-QUR LITE™
MESH

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