Medical Product Manufacturing News

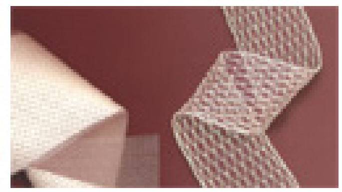
NEED TO KNOW: TREND WATCH

Preserving Movement While Promoting Healing

Textiles offer OEMs a range of flexible, powerful options that can significantly enhance the capabilities of their medical devices

By: Stephanie Steward

The structural characteristics of medical textiles are more similar to the human anatomy than those of rigid polymers and metals. In turn, textiles can promote healing with fewer complications because of the way that the body interacts with them. Because of these attributes, medical textiles are moving beyond their conventional use in sutures and dressings to become the go-to niche material for OEMs whose applications require flexibility, strength, and possibly even the ability to disappear.



Textile technologies available from BMS Biomedical Structures include needle-punched nonwoven composites (left) for wound dressings and cell-regeneration applications and knitting (right) for pelvic floor reconstruction and urinary stress incontinence applications.

Stretching Orthopedics

Orthopedics is undoubtedly the biggest growth area for textile suppliers, according to Jeff Koslosky, director of research and development at Secant Medical (Perkasie, PA; www.secantmedical.com). Orthopedic device manufacturers continue to focus on developing products that help maintain a patient's mobility and range of motion during and after recovery. Textiles offer the functional flexibility and strength that can meet such demands.

Koslosky notes that, in terms of medical device manufacturing, there is an industrywide trend of moving away from rigid plates and screws and toward motion-preserving implantable materials and products. This trend corresponds with another industry trend popular with patients—the increase in minimally invasive surgical (MIS) devices. Less-invasive medical products that employ textiles can help improve recovery time while also enabling a more natural and extended range of motion compared with rigid implants.

Part of what enables this flexibility is suppliers' ability to customize a textile to exhibit different mechanical properties when moved in separate directions. Koslosky uses a shoelace as an oversimplified example of these properties: Pull on the shoelace from each end and it demonstrates limited stretchiness and some strength, but bend it and the shoelace exhibits extreme flexibility. This kind of customization can significantly increase range of motion in orthopedic applications and can be especially useful in spinal devices, according to Koslosky.

In addition to making medical textiles, Secant offers design and production-related services such as yarn preparation, scouring, heat setting, and post-production processing

Bioresorable Scaffolding

In addition to new uses in MIS applications and their traditional role as sutures, bioresorbable textiles are increasingly being employed for implantable devices and cell-growth applications.

Bioresorbable fibers are used to repair internal structures and are then absorbed into the body. Pore sizes can be specified, and bioresorbable fibers can even be combined with other materials to create an implantable product that works in phases. For example, some designs can combine resorbables and nonresorbables so that the device's strength dissipates as the patient's strength improves during healing. "But more people are moving toward using 100% resorbables [so that] there is no foreign material left in the body like there would be with nonresorbable polymers," says John Gray, president, BMS Biomedical Structures (Warwick, RI; www.bmsri.com), which provides concept-to-production textile manufacturing services. "Surgeons love it."

Textile experts are taking advantage of these bioresorbable characteristics to create tissue scaffolds for cultivating cells. “Concordia’s Biofelt has allowed complex tissues and organs to be regenerated from a patient’s own stem cells using the bioresorbable fiber scaffold as the substrate for cell attachment and in-growth,” says Art Burghouwt, executive vice president at Concordia Medical (Warwick, RI; www.concordiamedical.com). This process yields natural tissue implants that can be used to replace diseased tissues and organs. “The advent of bioresorbable polymer sutures, in combination with advanced fiber processing capabilities, have enabled the development of tissue-friendly implants that provide temporary functionality during the critical healing and growth stages,” Burghouwt says.

“The world of medical textiles is rapidly expanding beyond wound dressings and sutures to complex biologic and regenerative implants,” Burghouwt adds. “The exciting shift is toward more tissue-friendly structures made from bioresorbable materials that eventually disappear after their curative function is complete.”

Flexible Metal Textiles

Just as flexible as their nonmetal counterparts, metal textile structures demonstrate suppliers’ ability to offer OEMs the best of both worlds in terms of strength and range of motion. In such cases, the term ‘textile’ refers more to structural style—like weaving, braiding, or knitting—than to material type, thus ending the misconception that textiles are exclusively polymeric components.

Concordia’s Biofelt technology can be used as a scaffold to enable tissues and organs to be regenerated from a patient’s own stem cells.

Koslosky says that metal textiles can offer a range of flexible features similar to more common nonmetal textile materials such as polypropylene, polyester, Dyneema Purity, and PEEK. Nitinol is currently the most popular metal to be incorporated into textile products. Secant, for example, uses nitinol in addition to polyester for an application requiring radial strength and flexibility, like a tube. Another benefit of incorporating a metal such as platinum is that certain radiopaque elements can be seen under fluoroscopic x-ray to help a surgeon properly place a device inside the body. For such applications as endovascular stent grafting and abdominal aortic aneurysm repair, textile structures may consist of a fabric that is packaged within a wire mesh through crimping, pleating, or other techniques, offering shape-transformation capabilities.

Whether such shape-transforming textile structures can be coated or used for drug-eluting applications like their nontextile counterparts remains open to debate—and research and development. “Even in the well-established suture world, there are new products emerging with antibacterial coatings and new polymers being developed to offer novel degradation profiles,” says Burghouwt. But Gray counters that creating a drug-eluting polymer textile catheter won’t be easy. The melt spin process used to turn the polymer into a fiber requires a lot of heat that can affect a drug. However, he acknowledges that people are discussing the possibility and it could be the next wave for textile applications.

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