MassDevice Q & A: OmniGuide chairman Yoel Fink

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When Yoel Fink began his groundbreaking work with mirrors at MIT in the late 1990's, he didn't know he would be creating a material that would be used to carry lasers into areas as hard to reach as the inner ear or brain. He was working on a problem that the Defense Advanced Research Projects Agency, the research and development arm of the U.S. military, wanted solved. For reasons still unknown to Fink, DARPA wanted large-area, low-cost surfaces more reflective than a mirror that could reflect light from all angles. Eventually, his work led to a PhD thesis and OmniGuide, the company where he is currently chairman. OmniGuide, which employs 120 workers, just last week celebrated its 10th year of business.

Since commercializing its technology in late 2006, the company's product lines have enabled it to grow steadily. OmniGuide last year raised $1.84 million in equity financing [1], on top of a $25 million private equity round from the previous year, which the company used to develop new fibers indicated for different clinical applications in laser microsurgery. Late last year, the company won a half-million dollar tax break [2] from the quasi-public Mass. Life Sciences Center to aid in job creation.

From his attempt to create large reflective surfaces, Fink was able to create what are essentially tiny pipes or hoses lined with what his research team at MIT [3] called "perfect mirrors." The mirrors that DARPA wanted to coat what Fink speculates were aircraft, or even aircraft carriers, are now lining the inside of tiny, hollow tubes that OmniGuide [4] creates, in-house, to lengths of several kilometers at a time.

"We're manufacturing products here that are really highly sophisticated and are technologically advanced. In fact we're producing structures that companies like Intel would build in multi-billion dollar fabs, but we're able to do it inside of fiber," Fink said.

Photons from a CO_2 laser glide through the hollow core of these fibers, called BeamPath technology. Unlike other laser products, the hollow core means there is no medium through which the laser must travel, increasing the length of light wavelengths that the fibers can transfer and therefore the type and precision of the device's surgical applications. The photons are emitted by a device that OmniGuide calls a flexible laser scalpel, which is not a misnomer. The beam emitted by an OmniGuide laser is only 10s of microns thick and Fink's optical technology enables the lasers to be sent through conduits as thin as heavy fishing line, into areas of the body not typically reachable by anything other than highly invasive surgery.

Currently neurosurgeons cut brain tissue using bipolar cautery to create an avascular line, then use scissors or a scalpel to cut between it. The most precise technology available has a lateral thermal spread of millimeters. Vice president of clinical affairs and business development Dr. Yair Schindel said that doesn't make sense.

"When you think of soft tissue and ablation tools, everybody prides themselves minimal collateral damage," but "[with OmniGuide lasers], we're talking about 10s of microns, so you're actually two orders of magnitude more precise than the most precise soft-tissue cutting tool out there today. That's really where, if you had to crystallize the value proposition and what we bring is, in terms of precision microsurgery, there is nothing more precise than this that offer bloodless surgery."

CO_2 laser light stops at any surface it comes into contact with, cutting and cauterizing a layer of tissue only a few micrometers thick. OmniGuide's laser scalpel is so precise because "water is a shield," Schindel said, "and surgeons love that," because the human body is about 60 percent water.

"If [surgeons] want to protect a certain area, all they need to do is take a wet cotton wipe or just a drop of saline and they have the ultimate shield."

OmniGuide laser implements are designed for specific surgical procedures.
Photos by Connor Gleason

MassDevice spoke with OmniGuide's Yoel Fink and Yair Schindel about their company's business development strategy.

MassDevice: How did making mirrors for the military turn into a surgical laser business?

Yoel Fink: The company, when it started, had lots of dreams about what you could do if you could solve the problem of manufacturing and making [what DARPA wanted], but at the end of the day, it was very clear to us that before we knew how to make this stuff, there was no markets to be had. It was only in 2002 after the papers that described the process [to create the material] came out of MIT that the company finally had a license to the technology and that got us thinking about practical problems we could solve. One problem we could solve was that of the guidance of CO_2 laser light, which has a wavelength that does not allow it to pass through any materials, so it has to be guided by some other mechanism, and that's where we started the commercialization process realized that the CO_2 is prominently featured in precision microsurgery. That became our key application: Cutting precisely with light, producing optical scalpels that are more precise than anything out there. The key value is that we can cut at a distance and perform surgeries that are minimally invasive. Our technology is used in 1,000 surgeries a month. Four hundred of those are in ontology, 400 are in airway tumor management and the rest are a combination of neurosurgery, spine and some additional markets such as gynecology.

MassDevice: What enabled your latest product release?

YF: For the latest release, two things came together. One was a large scale clinical trial in Causse Ear Clinic in France, that demonstrated superior outcomes in using our fiber versus an incumbent technology. It showed that by using a fiber, you could improve hearing results after a procedure called stapedectomy. That was very exciting for us because it showed on a statistically significant level that patients using our technology have better outcomes. The second thing is that we introduced yet another generation of products into that market that were better, based on surgeon feedback.

Our business model is that of disposable fibers and disposable scalpels, so we have a laser unit that is reusable, hand pieces that are reusable, but the fibers are disposable. What we do is that we have fibers that are optimized for particular surgical applications. If you think about a knife, you think about it as a generic product. In terms of surgery, knives and scalpels delivery different levels of value for different procedures. If someone needs to have a brain tumor removed or a tonsil removed, there is a different value created for each procedure. Our scalpels are designed and optimized for delivering the maximal level of value per procedure. We havent done it for all procedures and in some cases we have just a number of products per market, but were aiming to optimize the fiber for procedure.

OmniGuide chairman and founder Yoel Fink.
Photos by Connor Gleason

MassDevice: Does your work on the structure of the fibers themselves lend to that optimization?

YF: That's exactly it. Why would we want to both design and manufacture? That fact that we're vertically integrated — which is that we receive elements from the periodic table into our [Kendall Square, Cambridge building] and out comes surgical outcomes by the time the product reaches the surgeon and he performs the surgery — gives you an amazing ability to take feedback from the market, condense it down to engineering guidelines and principals, use that to drive your development cycle, and close that loop and on a very frequent basis. That's something that we feel very strongly about and I think it's one of the strengths of the company. Our sales organization is 50-strong and they're doing cases every day. From those cases we get a lot of information about what our fibers are doing well and some of the things they're not. We take that information, it goes into a feedback loop and out comes a new product. Our new otology product came out of a process like that. People used our [gentube] and said certain modifications would make it better and because we were manufacturing and engineering it we could close out very rapidly.

An OmniGuide laser scalpel.
Connor Gleason

MassDevice: What's next for OmniGuide?

Yair Schindel: [The markets for OmniGuides line of lasers] are growing fast. Theres also an ongoing international expansion in Europe and Asia, and were

already CE Mark approved in Europe. Within clinical development at our office in Kendall Square, were also looking at urology for prostate cancer, gastroenterology for intestinal cancer, ophthalmology and gynecology. Really the challenge for OmniGuide, since we do have clinical value in many of these different places, is not to bite off more than we can chew and be the best that we can in a few segments. The clinical potential – the business potential – is also still out there for us. In precision microsurgery, the more technologies are advancing, the more we can see better. Imagine being able to combine the stability of a robot, with the excellent visuals that they have, with the most precise tip of the spear.

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