Q&A: Knotless Wound Closure

Michael Tarnoff MD, FACS is an Adjunct Associate Professor of Surgery at Tufts Medical Center. He also works as Vice President of Medical Affairs and Global Chief Medical Officer of Surgical Devices at Covidien. Here, he discusses his role in developing a new knotless wound closure device, V-Loc, and what knotless wound closure could mean for surgeons in the future.

Surgical Products: Can you discuss your use of knotless wound closure?

Dr. Tarnoff: I have used knotless wound closure in the product development lifecycle for the V-Loc. I've used it in pre-clinical [applications]. I haven't used it clinically.

Surgical Products: Can you discuss the development process of this new knotless wound closure technology? Was there a certain issue that you saw in the OR that wasn’t being met?

Dr. Tarnoff: There are several points of interest. The knots themselves that we tie for any kind of wound closure are thought to be a potential source for wound closure. I can’t say that that is proven fact, but that’s been something on the mind of the surgeons that the various mechanical barriers that develop within knots can potentially seed bacteria. On the theoretical level, it could potentially contribute to the formation of wound infection. However, whether or not we show any kind of benefit with respect to infection is something that remains to be seen.

More commonly and perhaps more proven—I’ve certainly experienced this myself in practice—is the fact that the knots from a cosmetic standpoint frequently are the point of what we call “spitting sutures.” So in other words, it’s not uncommon for a patient to come back a week, ten days, two weeks out after surgery with a little segment of sutures coming out through the skin. That almost always is at the point of the knot. So from the cosmetic angle on this, and from the patient comfort and patient satisfaction point of view, elimination of the knot I think would be beneficial in that regard.

Then there's the factor of time savings. I do a lot of minimally invasive surgery and actually don't spend a lot of time tying knots. But, plastic surgeons in particular, who do complex abdominal wall reconstruction or general surgeons who tend to do more open procedures, they may in fact spend some quantity of time during that given surgical procedure tying knots and securing suture. When that process goes well, [using knotless wound closure] is probably minimal time savings. When you get into a situation where you get into tying knots and the sutures break, and you now have to basically re-do a suture line that can certainly translate into significant time savings with a knotless device.

We have done some time motion studies and explanted tissue, having surgeons come in and literally doing time motion analysis of knotless versus knotted suture lines and we clearly see a reduction in overall time when you talk about a knotless technology.

Surgical Products: Why is this time-savings factor so important?

Dr. Tarnoff: Time savings nowadays comes into play in a bunch of different areas. From the standpoint of the amount time the patient is under general anesthesia when you talk about patient safety, if you can translate the use of a device to a reduction of OR time, from a patient safety outcomes perspective it's always beneficial. The least amount of time a patient is positioned on the OR table under general anesthesia is certainly advantageous. There are risks just from being in a given position or being under general anesthesia itself.

From a health economics and reimbursement perspective, the efficiency of the operating room is a significant factor. So, if in fact, over the course of an entire day in an operating room, you can find an extra half-hour or even more in reduced OR time related to technology or a device, that may open up the possibility of doing additional cases or the utilization of any given operating room. That can have enormous impact for a hospital relative to revenue. It can also have an impact for surgeons who might be able to make better use of their time doing more cases and helping more patients.

We don't know that we have a device that can deliver to that degree, but we are interested to see if over the course of a day, does the elimination of knots in particular types of procedures enhance the efficiency of the OR? Such that perhaps other cases can be done, patient OR time can be reduced, things like that.

Surgical Products: Does using knotless technology change a surgeon's procedure when closing wounds? How does it impact their overall technique?

Dr. Tarnoff: We tried to develop a device that keeps surgeons in their comfort zone and not change their practice, because that's always difficult to accomplish, but there are some subtle changes relative to where the first bite of the suture line might be taken. So, for instance, instead of starting at the corner of the wound, you might actually start beyond the corner and bring the suture into the wound. And then, just the general principles of wound closure, are your sutures equally spaced

from a both depth point of a view and a distance point of view? Obviously, it is as important with a knotless technology as it is a conventional approach. But overall, I would say the process to close a wound with a knotless technology would be similar to what surgeons are used to.

Surgical Products: Are there certain surgical procedures knotless wound closure is especially suitable for? Are there other surgical procedures knotless wound closure is not suitable for?

Dr. Tarnoff: In my clinical world, where I do a lot of minimally invasive surgery, it's probably less useful because the incisions I deal with are typically a centimeter in length, they're fairly small. As much as I can do without tying the knots, it may turn out that the barbs [on the knotless wound closure V-Loc device] don't sufficiently engage the smaller wounds. It remains to be seen whether it is beneficial in laparoscopy.

Where it's clearly beneficial, in my opinion, is in plastic surgery, particularly in abdominoplasty, or "tummy tuck" as it's more conventionally called, where the plastic surgeon is looking for a superior cosmetic result typically do use large quantities of some particular suture to get the wounds closed, and so in that setting, it think knotless suture might really find a home.

Surgical Products: Why would surgeons consider using knotless suture technology?

Dr. Tarnoff: Surgeons are well aware that the tying of knots, from a technical time perspective can be an issue. From the standpoint of breaking suture, of having to re-do suture lines can be an issue. From the impact of a knot post-operatively, whether it's a cosmetic issue where the knots tend to spit, or whether they become the focal point for infection, are all things that I think surgeons aware. So, on a theoretical basis alone, I think there will be considerable interest in at least giving this a try, if it's not only preferable from a technical standpoint, but from the patient outcomes perspective.

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