Aesthetic Plastic Surgery 1:289–293, 1977

Vicryl Sutures

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ABSTRACT / Polyglactin 910 (Vicryl) approaches the desired qualities of an absorbable suture material. Laboratory investigations, clinical studies and the authors' own experience with this welcomed addition to the surgeon's armamentarium are reviewed.

The use of various suture materials including flax, hemp, bark, hair, pigs' bristles, ant heads, and numerous other materials is well documented back to 50,000 to 30,000 B.C. (7). However, in the present day of advanced surgical technology, an ideal, all-purpose suture material is yet to be discovered (11).

All current suture materials are described, classified, and specified in the United States Pharmacopia as either nonabsorbable (nylon, Dacron, polypropylene, silk, cotton, and steel wire) or absorbable (catgut, Polyglactin 910, and polyglycolic acid).

Suture material for wound closure must be selected on the basis of known biologic properties of the given wound, the known interaction of the chosen suture material with the given wound, and the intended purpose of the suture material (12).

In general, absorbable suture material is used to approximate tissues where the necessity of suture removal is not anticipated. The two major qualities desired in absorbable suture material are (a) maintenance of maximum original tensile strength for as long as it is needed for wound healing and wound tensile strength and (b) disappearance as rapidly as possible once the suture material has lost its strength.

As part of the search for a better absorbable suture material, Polyglactin 910 (Vicryl)* was developed. Polyglactin 910 is made by the copolymerization of lactide and glycolide, which are cyclic intermediates derived from lactic and glycolic acids. The intermediates are initially made into a fiber-forming polymer, which is then fabricated into uniform particles. Under precisely controlled conditions of temperature and pressure, the particles are melted and extruded into fibers. The fibers are stretched to properly align fiber molecules in order to strengthen the fibers. After further treatment, the filamentous exudate is braided into sutures and the braid is further stretched while hot to increase suture tensile strength. After additional processing, the sutures are sterilized with ethylene oxide and packaged in an inert gas to prevent the atmospheric moisture from altering the suture. Some Polyglactin 910 is made with a purple colorant added to increase its visibility against tissues in the wounds

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Polyglactin 910 is made as a braided suture because monofilament construction produced a suture that was too stiff for proper surgical handling.

All absorbable sutures go through two stages of absorption as the sutures disappear. First, there is a loss of tensile strength, and second, the suture mass is progressively lost until the suture is completely absorbed. The suture must maintain sufficient tensile strength to support the wound until the processes of healing have reached a level to maintain the wound securely. Catgut served this purpose well for many years. Usually plain catgut sutures are absorbed faster than chromatized catgut. Madsen (8) compared chromic and plain catgut and found that plain catgut produced an early intense inflammatory reaction with fibroplasia and scar formation in 8 to 10 days following placement in the wound. In contrast, chromic catgut was similar to nonabsorbable sutures for the first 30 days after implantation and then rapidly produced a marked inflammatory reaction followed by fibroplasia and scar formation. Complete absorption of catgut occurs between 2 weeks and 6 months depending in part on the type of tissue in which it is placed (5). In general, plain catgut has negligible strength by 14 days and chromic catgut has reached its end point by 25 days (3). Polyglactin 910 retains approximately 55% of its original strength 2 weeks after placement and approximately 20% 3 weeks after placement (in subcutaneous tissues in rats).

Katz and Turner (6) studied Polyglactin 910, polyglycolic acid, and the nonabsorbable suture Mersilene and found the initial tensile strength to be 5.2, 3.9, and 3.7 knot pounds, respectively, for the same size sutures. Horton and associates (4) in rat studies and clinical trials reported the tensile strength of Polyglactin 910 to be greater than that of catgut of corresponding size.

Conn and associates (2) compared Polyglactin 910 with plain and chromic catgut suture in rabbits. Thirty days after implantation, Polyglactin 910 suture had lost 40% of its cross-sectional integrity due to absorption. Although this degree of absorption was similar to that seen in plain and chromic catgut (loss of 50% and 25% of mass, respectively), there was a marked degree of irregular fragmentation in the catgut sutures which was not seen in the Polyglactin 910 sutures. Sixty days after implantation of Polyglactin 910, Conn et al. (2) reported that "microscopic examination revealed a fine, healing wound along the suture tract without giant cells, mononuclear cells or eosinophils. Foreign body giant cells and round cell reaction persisted around the silk and chromic catgut sutures."

A lesser degree of tissue reaction to Polyglactin 910 sutures compared to catgut can be contributed in part to differences in the absorption mechanism. Polyglactin 910 is removed from the wound by controlled hydrolysis of the polymers from which it is made, whereas catgut is digested by lysosomal enzymes produced by macrophages that migrate into the wound as part of the inflammatory process (3). Animal studies have indicated that when the surgical function of Polyglactin 910 is complete and all suture tensile strength has been lost, it absorbs more rapidly than any other synthetic absorbable suture (9).

It should be noted that the suture characteristics of Polyglactin 910 were developed and studied using animal models, and one is justified in questioning the transfer of animal data to humans. However, Postlethwait, Willigan, and Ulin (10) studied 666 specimens containing suture material removed from humans from 1 day to 23 years after implantation. The wounds' suture reactions were very similar to those of animal studies for the various suture materials. This seems to indicate that animal studies appear to be acceptable for comparison with human studies with only moderate limitations.

Clinical use

Some surgeons have reported use of the synthetic absorbable sutures as absorbable skin suture materials. We do not recommend this practice because epithelization of the suture holes will permanently mark the skin in many areas (1). Our main use of Polyglactin 910 has been as a substitute for catgut sutures to approximate the subcutaneous or muscle layers and/or as a subcuticular stitch for skin wound closure during such procedures as breast augmentation, breast reduction, abdominoplasty, thigh and buttock reduction, and scar revision. Most often the skin closure is supported with steri-strips or a few stitches of 6–0 nylon for 4 to 5 days to help ensure maximum skin approximation. We have used Vicryl both as a running intradermal suture and as an interrupted horizontal mattress suture in the subdermal position. The lack of external sutures or the ability to remove the skin sutures early has been especially helpful in cases of closure of wounds that usually have a great deal of tension on the suture line, such as breast reduction, mastopexy, and lower extremity wound closure. It is our opinion that the high tensile strength, rapid rate of absorption, and minimal tissue reaction make this an ideal suture for cosmetic skin closure. Wounds sutured with Vicryl have given us some of our best surgical scars.

Early in our experience with Vicryl, we used the purple dyed suture for approximation of nasal transfixation incisions at the time of rhinoplasty. We discontinued this practice because several patients expressed concern regarding the purple foreign body which was visible just inside the nostril for 3 to 4 weeks or longer following surgery. Likewise, we do not use undyed Vicryl sutures in the nose because they remain too long. Silk causes a great deal of reaction and must be removed from the nose before the tenth day because a stitch abscess will almost surely develop. Chromic catgut also occasionally produces a stitch abscess although it is usually expelled before this happens at 14 to 21 days. Chromic catgut is currently our choice for approximating the transfixation incision.

Polyglactin 910 has been used quite effectively for plicating the parotid-masseteric fascia and /or platysma muscle at the time of rhytidectomy. In a number of patients chromic catgut and some of the nonabsorbable sutures (Mensilene, silk) occasionally produce stitch abscesses that come through the facial skin several weeks to months later. To date, we have not had this problem with Polyglactin 910 with a 1-year follow-up in these patients.

Polyglactin 910 has been used in a few patients as an intradermal suture to take the tension off the skin of the temporal and postauricular incisions of rhytidectomies prior to suturing the wound with stainless steel staples. Wounds closed in this fashion have been satisfactory.

The rough surface of Vicryl produces somewhat more of a drag on tissues than catgut, and this is particularly more noticeable in placing subcutaneous sutures. This has not proven to be of any significant disadvantage, and, in fact, the lack of slippage is helpful in maintaining wound coaptation when used as a subcuticular suture.

Handling and tying qualities with Polylactin 910 are excellent, although it is necessary to make sure that the first knot is set well to prevent slippage. Once the knot is tied, security is assured.

During postoperative evaluations 2 patients with subcutaneous Vicryl closure have shown wound inflammation and small "suture abscesses" 3 weeks following excision of small facial lesions. A patient who had Vicryl placed in the subcutaneous layer during closure of a breast augmentation had extrusion of two knots 6 weeks postoperatively. In 2 patients in whom 4–0 Vicryl was used for intradermal skin closure of (a) a buttock reduction and (b) revision of a thigh scar, several knots came out through the incision 4 to 6 weeks postoperatively. It is possible that the knots were placed too close to the skin surface. Whenever Vicryl is used as an intradermal suture, the knots should be buried deep and cut short. In general, scars have been as well healed with Vicryl as with any other suture material, and so far no keloids or hypertrophic scars have been noted in wounds closed with Vicryl. However, considerably more follow-up is required before any definite conclusions are reached.

Summary

Polyglactin 910 is a welcome addition to the plastic surgeon's armamentarium of suture materials. It meets all the desired criteria for an absorbable suture material. It is less reactive than catgut, either chromic or plain, and superior to both in tensile strength. The aesthetic appearance of wounds sutured with this material has been excellent.

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