

The Promise of an Ideal Suture Material

—Marlex (Blue Linear Polyethylene)

AMOS R. KOONTZ, M.D., AND ROBERT C. KIMBERLY, M.D., BALTIMORE

The need for better nonabsorbable non-metallic suture material has long been felt. Either silk or cotton would be ideal except that in the presence of infection they frequently cause persistent sinus tracts which are very troublesome. Linen is more offensive in the presence of infection than silk or cotton. Nylon also causes trouble and the knots tend to slip. Tantalum and stainless steel wire do not cause trouble in the presence of infection, but they have the disadvantages that any wire suture has; patients frequently complain of sticking pain, especially if the sutures are placed close to the skin.

Over a period of years we have tested experimentally many types of nonmetallic sutures to determine their behavior in the presence of infection. Marlex, when placed in an infected wound, causes no more delay in healing than if it had not been there.^{1,2} Wounds healed perfectly with Marlex present, in spite of the infection, and in no cases were there left persistent buried granulomata, abscesses, or persistent sinus tracts. We now wish to report the results of further experiments done along the same lines as those already reported.

Chemically, Marlex is a polyethylene derivative. It is chemically inert and shows high resistance to acids, alkalies, and most organic solvents. Its biological properties will be demonstrated in the experiments described. Suf-

fice it to say that it causes practically no tissue reaction unless infection ensues and that the infection clears up in a very short time without leaving any trace of a sinus tract or buried granuloma.

We have now completed a total of 72 experiments which have confirmed the results previously reported. Two such experiments using materials not previously reported are presented here in detail.

Dacron.—In 11 dogs the abdominal fascia was sutured under tension with 4 sutures of No. 4-0 blue linear polyethylene (Marlex) on the right side and 4 sutures of mersilene (Dacron) on the left side. In some of these cases tension was created by resecting a piece of rectus sheath and fascia on each side through a longitudinal incision and then suturing the fascial edges with interrupted sutures of Marlex on one side and of Dacron on the other. In other cases the incisions were transverse and the incisions in the muscle and fascia were sutured similarly with 4 sutures of Marlex on the right side and 4 of Dacron on the left. These animals were killed in periods varying from 1 to 8 weeks after operation. All animals had been grossly infected at the time of operation in order to test further the durability of knots in the suture material, and also to determine the difference between the Marlex and Dacron in resisting infection. All but 3 were killed in more than 3 weeks after operation. In those killed earlier, there was some infection remaining in the wounds on both sides, as expected. In those killed later, no infection was found around any of the Marlex sutures. Buried granulomata, buried abscesses, or sinus tracts were found associated with

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From the Department of Surgery of the Johns Hopkins University School of Medicine.

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37.5% of the Dacron sutures. Two of the Marlex sutures and 2 of the Dacron sutures had become untied. It was felt that these sutures had been cut too close to the knot. As a rule the sutures were cut 2 or 3 mm. from the knot.

Supramid.—Experiments were performed to compare Marlex (blue linear polyethylene) with Supramid sutures, using the same type of experiments as those described in the preceding paragraph to compare Marlex and Dacron sutures. Ten animals were used in the experiments, and 4 sutures of No. 4-0 Marlex were used on the right side and 4 of Supramid on the left. All wounds were sutured under tension as before, and all wounds were, of course, infected. These animals were killed, 3 before 3 weeks, and 7 between the third and eighth week after operation. In the 3 there was again some infection remaining in both wounds. In those surviving longer than 3 weeks after operation, there was no evident infection around any of the Marlex sutures. Buried granulomata, buried abscesses, or sinus tracts were found associated with 54% of the Supramid sutures. One of the Marlex sutures had become untied, but none of the Supramid sutures had done so.

Marlex Knots.—Of 374 knots examined from 2 to 16 weeks after operation, the knots had become untied in only 5 instances. It is well known that the knots of silk and cotton also sometimes slip.² Everyone who has done experimental work, in opening wounds at later dates has found some of his silk sutures untied. Because of the slightly greater tendency of the Marlex knot to slip,² we recommend that all sutures should be cut at least 2 mm. from the knot, and preferably 3. There is no objection to leaving these sutures cut long, as the material does not act as a foreign body in the presence of infection as does silk or cotton. The knots of braided Marlex thread have slightly less tendency to slip than do those of monofilament thread.

Sterilizing Marlex Thread.—In the operating room at the Johns Hopkins Hospital the material autoclaved is kept at 270 degrees, 30 lb. pressure per square inch, for 7 minutes. Our results were not constant in autoclaving

Marlex thread. We found that it would withstand 240 degrees at 18 lb. for 7 minutes; also 250 degrees at 18 lb. for 8 minutes; then 265 degrees at 27 lb. for 10 minutes without loss of tensile strength. In another experiment the material withstood 270 degrees at 20 lb. for 20 minutes with very little decrease in tensile strength. On the other hand, we did occasionally get coalescence of the thread wound on a spool in similar experiments. For these reasons it would be better to follow the admonition of the manufacturers of blue linear polyethylene and not to exceed 240 F at 15 lb. pressure for 30 minutes when autoclaving. This causes no diminution of tensile strength.

Of course the material may be sterilized by boiling. It is also available commercially in sterile packages.

Summary

The experiments here reported have shown that the presence of Marlex sutures in an infected wound does not deter healing nor result in buried granulomata, buried abscesses, or in sinus tracts. This is not true of any other nonmetallic nonabsorbable suture material we have tried, including silk (both capillary and noncapillary), cotton, Nylon, linen, Dacron, and Supramid.

The knots in Marlex thread have been found to be reliable, provided the suture is cut 2 or 3 mm. from the knot.

Wound healing is excellent with very little tissue reaction.

Marlex thread may be sterilized by boiling, or by being autoclaved at 240 F at 15 lb. pressure per square inch for 30 minutes.

Amos R. Koontz, M.D., 1014 St. Paul St., Baltimore 2.

REFERENCES

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