# NEW METHODS

## AN OBJECTIVE METHOD FOR DETERMINING THE RATE OF PRIMARY HEALING IN SUTURED WOUNDS

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The lack of simple objective methods with which one may evaluate the rate and strength of primary healing of sutured wounds has handicapped objective estimation of the effectiveness of various methods and substances used to hasten the healing process.

Any usual visual estimate made when changing dressings has a largely subjective character; in addition there is no knowledge as to what occurs under the epithelium, how rapidly the other tissues grow together.

Our aim was to find an objective procedure which would enable us to estimate the strength and the rapidity at which the primary healing of the wound occurred.

The principle of our method consists in the following: in order to determine the cohesiveness of the edges of the healing wound, we inserted between the sutures a fine wire loop, lying at right angles, of such size as to cover a wound area of some 0.5 $cm^2$.

In the postoperative period healing takes place, and the edges of the wound (including the area within the loop) adhere to each other, after which the loop is extracted with the aid of a spring balance. The required force is measured in grams, and this value is a characteristic of the wound's healing power.

The instrument we developed is an ordinary spring balance with a scale and an indicator, having a spring to which a hook is attached and there are right-angled loops with an area of 0.5 $cm^2$ made of bronze-aluminum wire of 0.4 mm diameter with a ring for the hook of the spring balance (see figure).

### EXPERIMENTAL METHOD

Into the closed wound, between the sutures (placed 2 cm from each other) a forceps was used to force a sterilized loop into such a position that only the top loop (for attaching to the hook of the scale) protruded above the epithelial surface (see figure). The loop was fastened in place by a piece of heavy aluminum wire inserted through the loop above the skin surface.

The wire loop was extracted at various times by means of the spring balance (for this the skin around the loop was steadied by adhesive bridges while the spring balance, after attachment to the loop, was drawn smoothly upward), this making it possible to read the scale and so determine the rapidity of healing as measured by the dynamics of the scale.

By comparing the force and rapidity of healing when different pharmaceuticals and different procedures were employed, we were able to reach some conclusion as to the value of these drugs and methods.

In the clinic we removed the loop after 48 hours, this did not result in any discomfort of the patients.

In the laboratory the length of the experimental period can be greatly increased.

In all we made 27 observations and saw no complications. All the work was done on females between ages 20 to 40 who were operated for chronic appendicitis. The same surgical technique was used with all the patients.

The postoperative course of all these patients was smooth. All the wounds healed by primary intention.

Figure. Spring balance with wire loops for use in determining the cohesive strength of a healing wound.

TABLE

Postoperative Healing of Wounds After Usual Handling and After Introduction of Substances Hastening Healing

| | Intensity of healing (in grams) | | |
|---|---|---|---|
| | Control series | 2d series with blood | 3d series with a hemostatic sponge |
| | 100 | 36 | 80 |
| | 40 | 116 | 100 |
| | 88 | 44 | 60 |
| | 60 | 136 | 112 |
| | 100 | 40 | 98 |
| | 104 | 60 | 90 |
| | 76 | 40 | — |
| | 88 | 52 | — |
| | 100 | 38 | — |
| | 76 | 80 | — |
| | 76 | — | — |
| Average | 82 | 64 | 90 |

In the first (control) series the postoperative wound was treated and sewn in the routine manner. Thorough hemostasis was done. When the loop was extracted after 48 hours, the figures obtained ran from 80 to 100, averaging 82 grams. In one patient with hemorrhagic tendencies, the reading was only 40 g.

In the second series we employed a method recommended by O. B. Lepeshinsky—deliberately introducing some blood into the wound which, according to his observations, hastens healing by virtue of some of the noncellular elements present. Before sealing the wound finally, we introduced into the skin wound and the loop area 2 cc of blood taken from the patient's left cubital vein. When the loop was extracted 48 hours after the operation, our average reading was only 64 g, i.e., almost 20 g less than in the first series.

Thus we were unable to confirm the value of introducing blood into the wound.

In the third series we introduced into the wound the hemostatic sponge made by the Leningrad Transfusion Institute. The healing intensity using this objective method appeared to be between 60-112 g, averaging 90 g, i.e., higher than the control group of patients.

The findings of all three series are given int the table above.

Our series are too small for any final conclusions, however, we believe that the method we developed is is a valid one for the objective study of the rapidity with which wounds heal.

This procedure, we believe, is the first objective one for the investigation of the rate at which wounds heal, and therefore we recommend it for further clinical and laboratory studies.

## SUMMARY

An objective method is presented for the purpose of evaluating the speed with which healing takes place in sutured wounds. The method of placing a wire loop and then removing it after 48 hours with the aid of a spring balance is explained. A short series of experiments was performed which attested to the general validity of the method.