A skin varnish and substitute for rubber gloves / by Ellice McDonald.

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A SKIN VARNISH AND SUBSTITUTE FOR RUBBER GLOVES.

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NEW YORK.

RUBBER operating gloves are such an article of religion with modern surgeons that he who suggests their elimination is thought heretical; yet they have their obvious disadvantages. They are not easy to operate with, particularly in intestinal operations, where the slippery gut eludes the grasp. The sense of touch is decidedly altered and deadened, not only by the interposition of the rubber itself, but also by the constriction of the fingers by the elastic tissue.

These drawbacks would not be considered were gloves perfectly safe in regard to infection. They are difficult to sterilize and require fifteen minutes' boiling in water, or one hour in the steam sterilizer at 120° with 15 pounds pressure. Braun (*Beiträge zur klin. Chir.*, 1908, LXIV. 2) found that when tightly wrapped rubber gloves required one hour's steam sterilization; three-quarters of an hour did not suffice unless the gloves were loosely packed and the fingers distended by cotton. He favors placing a cotton glove inside the rubber in order that the

steam may penetrate. It is probable that most surgeons are not familiar with the difficulty of sterilizing rubber gloves. With a proper amount of sterilization rubber gloves soon deteriorate in quality.

Then, again, gloves are frequently pricked by needles, and torn, liberating bacteria suspended in the perspiration of the hand—the easiest possible form by which to transmit infection. The hands always sweat, and the sweat collects with the skin bacteria at the loose finger ends. When a needle prick comes the bacteria escape into the wound. Hellendan and Fromme (*La Semaine Medicale*, Dec. 4, 1912) found that in forty-six of ninety operations the gloves of the surgeons after operation contained liquid, sometimes to the amount of several cubic centimeters. Cultures showed that this liquid contained two, three, and even ten times the number of organisms recoverable from the hand before the glove was put on, and in some cases, more than before the hand was treated. Putting on the gloves dry did not alter the result. This is a commentary upon the danger of glove punctures and the inefficiency of present methods of hand disinfection. Bad gloves, or gloves with needle pricks, are infinitely more dangerous than the bare hands, even when these are treated in the customary inefficient manner.

Gloves are used to prevent contamination from the hand to the wound, and if this may be obtained after another fashion gloves may be dispensed with.

This may be accomplished by means of a coating of the skin by a substance which is impervious, smooth and elastic, with all movements of the hands. This is no new idea, and skin varnishes have been described by many others. Weil pasted rubber sheets to the skin of the abdomen and the

surrounding of the operative field was attempted by Murphy with an acetone gutta percha solution. Menge attempted disinfection with paraffin-xylol, and Schleich used wax. Others were Lesai's varnish, Kossman's chirol, Daederlein's guanidin, Wederhake's rubber skin, Dornitz and Klarpp's chirostes, Heusner's iodine-collodion, v. Herff's benzodamar, Dubar's varnish and v. Oettinen's mastisol. I have investigated all of these that I could obtain, and few have any merit save mastisol. Rubber, wax or damar solutions are too soft and pervious for any practical use.

As a result of considerable experiment, I have devised a skin coating which is impervious, easily applied and sterile. It has the following approximate composition, but requires to be standardized at the factory in regard to consistency on account of the strange ways in which soluble cotton acts in solution. It is composed of a base of pyroxylin (soluble cotton of commerce) dissolved in amyl acetate and acetone, with the addition of propyl and ethyl alcohol and saponifiable ester. It contains one per cent. of a strong oil—soluble germicide. The varnish is a golden yellow liquid, having the consistency of maple syrup.

This solution has the following advantages: It is readily applied and removed; it is insoluble in all water solutions and not affected by the heat of the body; it adheres strongly to the hand and penetrates all the crevices of the skin, fixing the bacteria; it goes readily under the nails, where the most organisms reside; it cannot be scraped off the skin with a knife, the superficial layers of the skin itself coming away along with the varnish if pressure is exerted.

After the hands are sterilized, and reasonably

dry, a small quantity is poured in the palm of one hand and then rubbed over all surfaces of both hands, as if it were vaseline or other grease. Care should be taken to coat every part; as soon as stickiness begins, the hands are held quiet and waved in the air for a minute or so, until the varnish dries. If the room is hot, or it is summer, a slight stickiness or "tacky" feeling may persist; but this may be immediately removed by plunging the hands into sterile water. The varnish then is smooth, firm and elastic, and may be removed only by acetone or other solvent of collodion. The best solvent for removal is equal parts of acetone and denatured alcohol, both of which may be obtained from dealers in painters' supplies. Removal is best done by a piece of absorbent cotton and a saucer of the alcohol-acetone solution. An orange stick is useful to work under the nails.

This varnish fixes the bacteria upon the skin, as I have shown repeatedly, by the following experiment: Without any preliminary disinfection or other cleansing whatever, a twenty-four hour broth culture of *Staphylococcus pyogenes aureus* was poured on the hand and allowed to dry in. The hands were then coated with the skin varnish, which was allowed to dry as above described. Cultures were then taken by vigorous scraping with a knife from the coated surface; all were uniformly sterile. To prove that this was not due to inhibition from the germicide contained in the varnish, the plates were subsequently infected, showing vigorous growth after twenty-four hours' incubation. The germicide contained in the varnish is not in a water-soluble form, so there is no danger of it or any of the constituents of the varnish passing into the wound at operation.

The ease and skill which is gained in operating with the varnish is such that once used it is never relinquished. The retention of the sense of touch and the removal of the bonds of rubber gloves will bring to surgeons the dexterity of the old-time surgeons of the pre-anesthetic days, of whom stories of half-minute amputations are still told. I have used the varnish in the place of gloves for more than a year, and it has reduced my operating time for such operations which are technically alike, as hysterectomy for fibroids, by about forty per cent. Operating becomes a pleasure and skill is easily obtained. The skin varnish is also serviceable for many other purposes, such as protecting the skin around an artificial anus or coating over a healing wound at a second operation in another situation.

I am indebted to Mr. John Reilly of New York for much practical advice and assistance in the two years of experiments.

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