The Journal of the American Medical Association

VOL. XXVII.

CHICAGO, ILL., DECEMBER 12, 1896.

No. 24.

ORIGINAL ARTICLES.

IDEAL CATGUT STERILIZATION.

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The aseptic absorbable ligature is one of the greatest achievements of modern surgery. In his first communication to the profession on this subject Lister alludes to the advantages of the aseptic ligature as follows: "If the antiseptic ligature be employed it merely inflicts a wound or injury upon the vessel, without introducing any permanent cause of irritation. The injured part, therefore, becomes repaired after the manner of a subcutaneous wound, without passing through the process of granulation and suppuration, which is induced by the employment of the ordinary septic ligature." Perhaps no other surgical procedure has ever enjoyed the confidence of the entire profession throughout the civilized world to the same extent as the aseptic ligature. The universal faith in the reliability and safety of the aseptic ligature is only a natural outgrowth of the superior results following its use. Protracted suppuration in wounds the result of retained ligatures, secondary hemorrhage, and suppurative inflammation of vessels, have been gradually diminishing in frequency, and bid fair under the influence of the aseptic ligature to be almost completely expunged from the future category of wound complications. Nussbaum very appropriately remarks: "Catgut is without doubt Lister's greatest discovery." And again: "How pleasant it is to cut the ligatures short and leave them unconcerned to their fate in the wound! In ovariectomies, etc., their value can not be overestimated. The cases in which catgut adheres to an artery, forming connections with it and the surrounding tissues, assisting at the same time in forming a firm ring around the coats of the artery, are exceedingly welcome occurrences, guarding against secondary arterial hemorrhage in ligating in the continuity of a vessel, and rendering even the application of a ligature in close proximity to a large collateral branch void of danger. All this silk can not do." The advantages of the aseptic animal ligature are now generally recognized. Lister's crude method of rendering catgut aseptic has been variously modified during the last quarter of a century. Different methods have been devised and nearly all of the antiseptic substances have been employed in the preparation of catgut. The very fact that so many different methods of preparation have been employed is the very best and most convincing proof that none of them have proved entirely satisfactory. Kocher abandoned the use of his juniper catgut. Carbolized, sublimated and chromicized catgut have been used very extensively, but every surgeon knows from actual experience that not infrequently wound infection could

be traced to imperfect sterilization of the material. Dry sterilization of catgut seemed to become the general procedure a few years ago, but extensive trial has shown that it can not be relied upon in rendering the material absolutely safe for practical use. The many failures of catgut as an aseptic suture and ligature, as heretofore prepared, are responsible for the substitution of silk for catgut in the practice of many surgeons. Silk can be readily sterilized by boiling, the simplest and quickest method of effecting absolute sterilization.

The ideal sterilization of catgut consists in rendering the material not only absolutely sterile but also mildly antiseptic without impairing its tensile strength. Every surgeon has been anxiously looking for a method by which catgut could be prepared so that it could be sterilized by boiling without impairing its strength. Fortunately this hope has at last been realized. Experiments have shown that catgut and leather immersed for forty-eight hours in a 2 to 4 per cent. solution of formalin undergo an unknown chemico change which alters their texture in such a way that its tensile strength is not impaired but rather increased by boiling. The commercial catgut is subjected to the action of the formalin without any previous preparatory treatment of the raw material.

Hofmeister, who has done such excellent service in perfecting the formalin preparation of catgut, gives the following most recent method: 1. The catgut is wound on a glass plate with slightly projecting edges, so that the gut is free from the sides of the plate and exposed to the circulation of the boiling and flowing water. The ends of the gut are fastened through holes in the plate. 2. Immersion twelve to forty-eight hours in aqueous solution of formalin 2 to 4 per cent. 3. Immersion in flowing water at least twelve hours to free the gut from the formalin. 4. Boiling in water from ten to thirty minutes. Ten to twelve minutes is amply sufficient, as all microbes and spores are killed by exposure to boiling heat for that length of time. 5. Hardening and preservation in absolute alcohol containing 5 per cent. of glycerin and one-tenth of one per cent. of corrosive sublimate.

Experiments on animals with catgut thus prepared have proved that it is absorbable, though not as quickly as the ordinary material. One of the essential conditions of success in this method of catgut sterilization is to wind the gut quite tightly around the glass plate or hollow glass cylinder during the process of sterilization.

The first attempts to sterilize catgut by this method under my own direction were made at the St. Joseph's Hospital by the sister in charge of the operating room. The result of experience has led us to modify the procedure in several ways. Instead of glass plates ordinary abdominal glass drainage tubes have been employed, upon which the gut is wound quite

tightly. These glass drains have been found an excellent substitute for the plates. An ordinary large test tube would answer the same purpose. The remaining directions given by Hofmeister were followed to the letter. Numerous inoculations with fragments of catgut prepared by this method in sterile gelatin invariably gave negative results. The catgut is as strong as the raw material, hard and the knot is less liable to slip than when the ordinary material is used. We have also ascertained that the formalin catgut can be reboiled almost any number of times without impairing its strength.

Catgut to be safe should not only be absolutely sterile but should contain a sufficient quantity of efficient antiseptic to render it unfit as a culture medium for pathogenic microbes. Hofmeister renders it antiseptic by immersing it in an alcoholic solution of corrosive sublimate. Others have substituted carbolic acid for sublimate. Both of these antiseptics unduly irritate the tissues and increase the primary wound secretion, effects which can not fail in interfering to a certain extent with an ideal healing of a wound by primary intention. The valuable and interesting experiments made recently by Lauenstein leave no doubt that it is almost next to impossible to render the field of operation absolutely aseptic by any of our present methods of disinfection. We are forced to admit that nearly every wound inflicted by the surgeon's knife contains some pathogenic microbes notwithstanding that the strictest aseptic precautions may have been carried out. The experiments made by Ewald have also furnished positive proof that sterile catgut often contains a sufficient quantity of an unknown toxic substance which by its destructive action upon the cells engaged in the reparative process transforms them into pus corpuscles, resulting in the production of a limited aseptic suppuration and the formation of sterile pus. Undoubtedly many of the stitch abscesses which occur in the practice of painstaking aseptic surgeons have such an origin. These experimental researches force upon us the conclusion that catgut should not only be sterilized but that it must be made sufficiently antiseptic to at least inhibit the growth if not destroy the pyogenic microbes which enter the wound during the operation or which may reach it later through the circulation. In this part of the preparation of catgut I have modified Hofmeister's method by substituting for the corrosive sublimate iodoform. After boiling the deformalized catgut for twelve to fifteen minutes it is cut into pieces of desirable length, tied into small bundles containing from six to twelve threads, when it is immersed and kept ready for use in the following mixture: Absolute alcohol 950, glycerin 50, iodoform (finely pulverized) 100. The alcohol dissolves part of the iodoform. The bottle containing the catgut should be closed with a well-fitting glass cork and should be shaken well every few days to bring the dissolved iodoform in contact with the threads. The catgut can be kept in this mixture for any length of time without losing its strength. One of the valuable properties of iodoform applied to a recent wound is to diminish the amount of primary wound secretion. It does not destroy pus microbes but inhibits their growth. I have used catgut prepared by these modifications of Hofmeister's method with the most satisfactory results and shall continue to use it until some better method is devised.

In conclusion I would advise hospital authorities

and surgeons to prepare their own catgut by this or similar processes and not rely upon manufacturers for their supply.

THE OCCURRENCE OF LUPUS VULGARIS IN THE WIFE AND DAUGHTER OF A TUBERCULOUS SUBJECT.

Read in the Section on Dermatology and Syphilography, at the Forty-seventh Annual Meeting of the American Medical Association, at Atlanta, Ga., May 5-8, 1896.

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Allow me to make a quotation from Kaposi¹ as an excuse for the following paper: "No experimental proof has been offered that characteristic lupus vulgaris can be produced by inoculation of tubercle bacilli. The inoculation of lupus tissue and of the bacilli derived from it has given rise to inflammatory products, but not to lupus, nor has any clinical proof been found, unless we accept extremely careless statements. This is less true concerning a few published cases such as that of Besnier (lupus in a vaccination scar), Sachs (lupus after piercing the ear), etc. These and other similar, although less carefully observed cases, might demonstrate the occurrence of clinical lupus from inoculation of tubercle bacilli."

The cases to be related are not experimental proof, but rather examples of clinical lupus from probable inoculation of the tubercular germ. There is very little, if any, reason to consider one of the cases (the child) to be of spontaneous origin, while in the other there is none whatever.

To make the evidence of inoculation more convincing, a brief history of the tubercular subject will be necessary:

J. C., a native of Ireland; of his family history very little could be ascertained. He believed his father died of consumption. The cause of his mother's death is not known. The same is true of two sisters who died when he was a boy. The patient was a healthy young man. Denied ever having had gonorrhea or syphilis. Married when he was 20 years of age. He drank a considerable amount of intoxicants since puberty, although not to excess until health began to fail, when he was about 25 years old. At that time he noticed shortness of breath and an annoying hacking cough. A year and a half before his death he had an attack of synovitis of the knee, lasting about six months, resulting in a stiff joint. After that his health began to fail very rapidly and he was unable to work at his trade, that of carpenter. At this time the diagnosis of "lung trouble" was made. He gradually became worse until he succumbed, at the age of 32, from an attack of acute pneumonia. According to the statement of his wife, the cause of death on the certificate was pulmonary phthisis and acute pneumonia. During his illness the patient was very careless regarding personal cleanliness. He generally preferred to expectorate on the floor rather than in the cuspidor. He was also in the habit of wiping his lips, after coughing, on the towel used by his wife. These, with other dirty habits, would make the inoculation of tubercular germs very possible; and as the subsequent history showed, there seemed to be no doubt but that this man, suffering from pulmonary tuberculosis, could easily have been the means of inoculating his wife through the medium of a con-

¹ Disease of the Skin, Kaposi.