

## Selected Articles.

SUBMAMMARY INFUSIONS OF SALT SOLUTION  
IN PRIMARY ANEMIA FROM HEMORRHAGE  
IN SHOCK AND IN SEPTIC INFECTION.\*

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*Hemorrhage and Shock.*—For the last two years we have employed in the gynecological department of the Johns Hopkins Hospital submammary saline infusions in every case where there has been the slightest symptom of depression after operation, or of shock from the loss of blood in surgical or puerperal cases. The first case in which we had occasion to use this means of reviving a patient from the effects of a profuse hemorrhage demonstrated its value as a certain and rapid stimulant. The patient was admitted to the gynecological ward one afternoon, suffering with light labor pains and a slight hemorrhagic flow from the uterus. Examination—Vaginal mucosa of a slight purplish hue; cervix soft and slightly dilated; uterus enlarged to size of a three months' pregnancy. Diagnosis—Pregnancy; threatened miscarriage.

The patient was put to bed and a small dose of codeine administered in the hope that rest and sedative remedies might avert a miscarriage. The pains ceased towards evening and she slept well in the early part of the night, but was awakened about midnight with severe labor pains, which terminated, before an interne could be summoned, in the expulsion of the fetus and a portion of the placenta. Immediately after the miscarriage the nurse observed a profuse flow of bright red blood from the vagina. By the time I reached the ward, twenty minutes after the miscarriage, the patient was in a very serious condition, her pulse being 140 and feeble, and there were many signs of severe anemia. The cervix was dilated only enough to permit the introduction of the tip of the index finger. It was at once evident that nothing could be accomplished in removing the retained membranes without instrumental dilatation of the cervix and curettage, so the vagina and cervix were hastily tamponed and the patient was hurriedly transported to the operating room. No time was lost in the operation, but at its completion the patient was in extreme collapse. Her pulse was almost imperceptible, the respirations were short, jerky, and irregular, and the mucous membranes were excessively blanched.

Previous to this case, infusion of salt solution into the radial arteries had been used in offsetting the effects of hemorrhage, but in this instance it could not be employed. The pulsations of the artery were so feeble that they could not be felt, and therefore no guide to the location of the vessel. After a tedious search the artery was found, but its lumen was so small that neither the infusion canula nor the smallest aspirating needle could be inserted.

In this extremity Dr. Edebohl's plan of infusing salt solution beneath the breasts came to my mind. An aspirating needle was inserted well under the

mammary gland, and the reservoir containing the salt solution, 0.6%, was elevated six feet above the bed. The pressure was not sufficient, however, to force the fluid into the tissues, and we forced air into the closed reservoir with the reversed aspirator. Seven hundred centimetres of solution were forced in under one breast, after which a similar amount was injected beneath the opposite breast. Within twenty minutes from the time the salt solution began to flow into the first breast the patient's pulse began to show a marked improvement, and in one hour and a half her condition was so much better that we felt relieved of all anxiety about her.

The plan worked with such signal success in this case that Dr. Kelly at once abandoned the radial infusion, and we have now employed submammary infusion in 41 of the last 225 cases of abdominal section. In many of these cases there was very slight indication for stimulation of any kind, but the simplicity of the procedure and its freedom from bad results of any kind have so commended it that no patient is allowed to suffer from symptoms of depression or shock without its employment. Of the forty-one cases thus infused, none of them have suffered with so much as cellulitis.

*Puerperal and General Infection.*—While our experience has not been extensive in the treatment of infectious cases with saline infusions, I think the following report of a case, taken in conjunction with the recent favorable literature on the subject, especially in the French papers, points very strongly to it as a highly useful remedy. In observing the case, one of puerperal sepsis, there was no doubt in my mind as to its value from the time the first infusion was given, and each infusion thereafter only confirmed this opinion. The patient was a robust colored woman, who had been a patient in the hospital once before, when she was operated upon for a ventral hernia, which recurred soon after her discharge from the hospital. The hernia grew in size, and the patient again returned to the out-patient department, where she was examined by one of the junior assistants, who found a wide diastasis of the recti muscles, which was filled in by a hernial sac containing a pyriform tumor lying almost entirely outside of the peritoneal cavity. The case was sent into the hospital for further examination, and the tumor proved to be a five-months pregnant uterus. The patient was given a supporting bandage and asked to return to the hospital for her confinement, as we wished to see what progress labor would make without the assistance of the recti muscles. She entered the hospital in December, 1895, and was delivered in a few days of a large, dead, macerated child, which came in breech presentation. The great diastasis between the recti muscles, which prevented their active participation in the expulsive efforts, did not seem to retard the labor in the least. The placenta came away intact, but the uterus was still very large, the top of the fundus being situated above the umbilicus. The uterus did not show any tendency to contract for several days. The day subsequent to her labor the patient had a temperature of 100° F., which ranged for the next three days between this point

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and 101° F., and then suddenly ascended to 104° F. in the morning, but again went up to 105° in the afternoon. That evening the patient was taken to the operating room and anesthetized. On examination the uterus was still found very large, and the cervix easily admitted the index finger. A thorough digital exploration of the interior of the uterus showed it to be perfectly smooth, and there was not the slightest trace of pathological tissue detected. Consequently, with the exception of a very thorough irrigation with sterile salt solution (0.6%), nothing further was done. For the next two days a continuous current of sterile salt solution was kept flowing in and out of the uterus, in the hope that it might facilitate the elimination of the infection, but it did not seem to affect the temperature in the least and was discontinued. While the temperature would rise as high as 105.5 F., and at one time to 106.5 F., the patient's pulse remained moderately good, considering the grave infection from which she was suffering. The seventh day after she was anesthetized, however, it showed marked evidence of failure, becoming rapid and intermittent, very feeble, and at times almost imperceptible.

By this time the patient's general condition had become very bad. She vomited all of her nourishment, her eyes were sunken, and she presented all of the appearances of impending death. At this time we decided to employ submammary saline infusion as a cardiac stimulant and for its diluent effect upon the toxins. A litre was first given, and the improvement was most gratifying. The patient felt much more comfortable and her pulse dropped from 100 feeble, intermittent beats to 76 good, full regular beats. Little or no change, however, was noticed in the temperature, which continued high for three subsequent days, when it began to fall; but the relief was so perceptible, even to the patient herself, that she requested a repetition of the treatment. A litre a day was given for seven days, and each time a marked improvement in the pulse was observed. The patient from the first infusion began to improve and finally recovered perfect health.

My attention was called to the subject by a recent editorial in the *Medical News*, in which the work of Claisse\* and Bosc† was reviewed. I quote from the editorial, in reference to septic infection cases, as follows: "Take a patient suffering from severe infection—puerperal, for instance; all organs are affected and are working badly, the temperature is about 104° F; in ten minutes 1,300 to 1,400 grammes of saline solution are injected subcutaneously. Before half that amount has been reached the improvement is manifest. The pulse becomes more regular, fuller, and stronger; respiration is deeper and less hurried, and possibly the temperature falls a degree at the end of the injection. The patient feels better, is brighter, and possibly desires to urinate, but not any great amount. Usually the patient now enters what is known as the critical stage, which comes on generally in four or five minutes, though it may be delayed to half an hour. There is a violent chill, with sensations of extreme

cold, strong, rapid pulse, and a rapidly rising temperature. Following this the patient goes through a fevered stage, from which she emerges, the temperature falls, and she may have no further trouble."

In the case which I report, the symptoms correspond to those which Bosc narrates, with the exception of those of the critical stage, which we did not observe. The patient was so extremely ill that these symptoms may have been masked and thus escaped notice. Her temperature showed only the slightest signs of improvement at first, but the pulse became decidedly better after each infusion.

So far we have seen none of the toxic effects which can be produced in dogs by the injection of large quantities of saline solution, and I do not think they need be considered, as in the experimental studies very much more of the saline solution, compared with the bodily weight, is used than in the human being. Certainly there is no occasion for fear of untoward symptoms from the injection of one or even two litres of saline solution at one time.

*Method of Infusing Saline Solution.*—Graduated glass infusion jars of one thousand cubic centimetres capacity, made according to Dr. Kelly's designs, are used as reservoirs for the solution. The bottles are connected by five feet of rubber tubing to a long, slender infusion needle, the calibre of which is two millimetres in diameter, similar to an aspirating needle. The entire apparatus is sterilized and kept in a sterile envelope, and is available for use at any moment. Before giving the infusion the breast is carefully disinfected, especially well in its dependent area. It is then grasped with one hand and lifted well up from the thorax, while the needle, with the fluid flowing from it, is quietly thrust beneath the gland. Usually, simple elevation of the reservoir is sufficient to force the fluid into the loose cellular tissue, and the breast quickly begins to distend until even a flabby and atrophied organ will reach the size of the puerperal breast, and in a few instances I have seen the fluid shot from the rubber when the breast is quite tense. The needle is quickly withdrawn and the puncture is closed with rubber tissue or adhesive plaster. If the fluid does not flow by its own pressure it can be effectually forced in by stuffing the tube. The hands and tube are well anointed with vaselin; the upper portion of the tube is tightly pinched, and from this point down the tube is gently stripped between the fingers of the other hand, driving the column of fluid ahead into the tissue. The lower portion is then pinched between the fingers and the upper is released, allowing the water to fill the collapsed intermediary portion of the tube. Seven hundred cubic centimetres of solution may be injected under each breast. If care is observed in the cleansing of the breasts and the injection of the fluid no untoward results will follow, which certainly cannot be said of the infusion into the radial artery or vein.—*American Journal of Obstetrics.*

\* *Revue de Chirurgie*, 1896.

† *La Presse Medicale*, 1896.