SECONDARY HEMORRHAGE FOLLOWING POSTERIOR TIP OPERATION. DESCRIPTION OF SODIUM CITRATE METHOD OF BLOOD TRANSFUSION.*

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During the month of April, 1915, I was consulted by a young man of thirty who stated that for a few weeks he had had a distressing irritation in the throat, particularly on the left side.

Examination revealed an enlarged posterior tip of the inferior turbinate, which I told him it would be best to have removed. As I had removed his tonsils under general anesthesia two years before I hardly anticipated the following course of events.

There was no difficulty in removing the posterior tip which measured about one centimeter in length and breadth and a quarter of a centimeter in thickness. The parts had been well anesthetized with an infiltration anesthesia of cocain and adrenalin, and at the time of the operation there was practically no bleeding. The patient left the office in good condition.

About four o'clock that afternoon I was informed that he was bleeding quite profusely. I immediately went to see him and noted by his pallor and the poor quality of his pulse that the hemorrhage was more severe than usual in such cases. I removed the small packing of bismuth subnitrate gauze which I had put in at the time of the operation and washed out the nostril with a hot saline solution. This treatment stopped the bleeding.

Two days following, the patient was able to come to my office and he underwent treatment daily until the seventh day when at ten o'clock in the morning I was notified that he was bleeding profusely. I was able to get to him within a half hour. When I arrived he was almost exsanguinated. I immediately packed the nose anteriorly and put in a posterior plug. This procedure seemed to stop the bleeding very well. I again went to see him in the middle of the afternoon. I found him very much prostrated but with no evidence of bleeding, except some oozing. At that time I gave him a hypodermic injection of a quarter of a grain of morphine and also a saline of eight ounces per rectum. Later he received a hypodermic injection of a half grain of emetine hydro-

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chloride. This was followed by a deep injection in the gluteal region of 20 c.c. of horse serum. That night his temperature rose to 104 degrees, pulse 130, respiration 26, due no doubt to the serum injection.

No further bleeding occurred but on the following night he complained of pain in his left ear. Examination showed a slightly congested drum. Temperature was 100.4 degrees. About four o'clock in the morning the drum must have ruptured spontaneously for there was a profuse discharge of serum when I saw him later.

During the next few days the discharge from the ear increased and changed to muco-pus. Definite tenderness and pain over the mastoid developed which seemed to increase until the whole mastoid region was involved. There was no sagging of the posterior wall. A culture of the pus showed a pneumococcus infection. Blood examination at this time showed a mild leucocytosis, 12000 white blood corpuscles with seventy per cent of polynuclears. His emoglobin was down to fifty per cent.

On account of his general condition and because it was thought there might be a necessity for performing an operation on the mastoid, it was decided that a transfusion was advisable, and on Wednesday, May 12, a transfusion of 900 c.c. of citrated blood according to the method of Lewison was performed, as described below.

The patient's general condition improved considerably after the transfusion. The coagulation time before transfusion was seven minutes; after transfusion, five minutes. The ear still continued to discharge and the pain was severe but the temperature remained normal. Under the circumstances, it was deemed advisable to defer operation as long as possible. For the general condition, injections of sodium cacodylate were given at intervals of a few days.

Two days later, May 14, (a week after the previous bleeding) there began another profuse hemorrhage which lasted over twenty-four hours. The nose was again packed anteriorly but the posterior naris was left free. In the afternoon I gave the patient a deep injection of human serum. That evening I called Dr. Coakley in consultation. He inspected the part carefully and insufflated some powdered suprarenalin extract. The tissue extracts as prepared by Dr. Hess were also used. None of these remedies seemed to ameliorate the bleeding so it was necessary to do a second transfusion the following morning (May 15). After the transfusion,

the bleeding ceased. By this time the mastoid symptoms had considerably subsided.

The following afternoon a profuse hemorrhage again occurred and after packing the nose with no beneficial result, I called Dr. Yankauer in consultation. The packing was removed and for the first time the parts could be readily inspected. On former occasions I was unwilling to remove the packing for fear of further hemorrhage. Dr. Yankauer succeeded in placing two sutures around the raw area and then packed the nose with sterile gauze soaked in coagulin—a preparation which seems to have a great deal of merit in these cases. Whether the placing of the sutures or the application of the coagulin-gauze stopped the hemorrhage, I do not know but at all events, there was no more bleeding and when the gauze was removed at the end of four days, it was clean and free from fresh blood.

From this time on, the patient rapidly recovered. He developed an arthritis of his shoulder and wrist from the various sera injected but this left no permanent result. At the end of two weeks he was able to get about as usual.

The citrate method of blood transfusion is undoubtedly the simplest of all the different transfusion methods. Coagulation of the blood during the transfer from donor to recipient is absolutely and safely prevented by mixing the blood with sodium citrate. Citrate of soda has been the anticoagulant *par excellence* in laboratory work for many years. It was generally assumed that a one per cent mixture of blood and citrate of soda was necessary to prevent coagulation of the blood. As sodium citrate, however, is toxic when used in large quantities at the one per cent ratio, this drug could not be used in human blood transfusion. Experiments which I published about six months ago, showed, however, that the quantity of sodium citrate needed to prevent coagulation of the blood was much smaller than generally supposed (0.2 per cent instead of one per cent). Thus large amounts of citrated blood (for instance 1500 cubic centimeters) can be transfused without any danger to the recipient.

Blood mixed with sodium citrate at the rate of 2-1000 does not clot outside the body in two to three days. On the other hand, the citrated blood produces a shortening of the coagulation time in the recipient probably by an over-production of prothrombin in his blood. Citrated blood can be used with perfect safety in all cases of hemorrhages and hemorrhagic diseases (hemophilia, pur-

pura, etc.) The coagulation time again becomes normal in about twenty-four hours after the transfusion.

The technic is the following: A tourniquet is applied to the donor's arm and a vein punctured with a large size cannula. While the blood is running into a glass jar it is mixed with a 2 per cent sodium citrate solution at the rate of 1:10. For instance if we want to transfuse 500 cubic centimeters of blood we would mix it with 50 cubic centimeters of the 2 per cent citrate solution. We then introduce a cannula into the recipient's vein and with the aid of a salvarsan flask inject the donor's blood into the recipient's vein.

I have used this method in nearly 50 cases with perfect success, not only in adults but in little infants. The details of this new method (experiments, technic and clinical reports) were published in *Surgery, Gynecology and Obstetrics*, July, 1915.

The advantages of this method are:

1. Utmost simplicity of the technic.
2. No connection between donor and recipient. In fact the blood can be collected in laboratory or office and then carried to the patient's bedside, as was done in the case described by Dr. Hays.

3. Easy application in emergency cases.

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Two Cases of Otitic Extradural Abscess. FRASER, *Edin. Med. Jour.*, January, 1915.

The cases are of interest as showing the misleading nature of the symptoms which may arise in some examples of the condition. The first case presented features closely resembling those of septic thrombosis of the sigmoid sinus; while the second showed symptoms pointing to basal leptomeningitis such as stiffness of the neck, nix's and Babinski's signs, and increased tension of the cerebrospinal fluid with turbidity. "Senious meningitis" was probably present. Both cases recovered after operation. GUTHRIE.