

sutures are passed through its divided end, which serve as traction sutures to cuff the vessel back. As soon as the cuff is caught by the teeth the sutures are removed. A slit is made in the vein, and the canula, with the artery over it, is inserted into the slit, just as is done with a salt infusion canula, and tied in place. The adaptability of the canula to any size of vessel is a great advantage over other forms of canula.

In experimental work on dogs, the technic seemed simpler than that of Crile. There are a number of distinct advantages to be gained in the use of this instrument. The larger of the two vessels (the vein) is pulled over the smaller—the reverse of Crile's technic. The lumen of the artery is not stretched by the introduction of instruments, but rather pulled open from the outside, reducing the chances of injury to the intima. There is more space on the canula in which to place the final ligature, uniting the two vessels, and the full benefit of the largest size possible for the artery can be made use of by opening up the canula after everything is in place.

Recently, an opportunity was given to one of the writers to employ this canula in doing an actual transfusion. All the advantages expected in the use of this canula were found to exist. The pulsations in the vein beyond the canula were evident to sight and touch, whereas, with Crile's canula, the stream is so small that it has been hard for the writers, at times, to be sure of pulsations in the vein.

The technic of a blood transfusion is always a delicate piece of nice work, and at times it may be very difficult. It requires great care and patience. Any one questioning the truth of this need but refer to Hartwell's article in the *American Journal of Surgery* for March, 1909. He has collected statistics on both published, and, until then, unpublished, cases, eighty-six in all, of which thirty are characterized as unsatisfactory, only partially successful, or failures. Many of them were done by surgeons accustomed to experimental work on vessels and, therefore, competent.

Of the mechanical aids for direct blood transfusion so far suggested, the writers have found the canula devised by Elsberg to be the most satisfactory.

#### ADDENDUM.

Since this paper was written we have had other opportunities to make use of Elsberg's canula, and have no reason to change our opinion expressed above. We have, however, changed our technic somewhat. No clamps are necessary on the vessels. The canula, when screwed down tight, controls the circulation in the radial artery, and there is not sufficient back flow from the vein, when opened proximal to a ligature, to be of any consequence.

We have followed Elsberg's suggestion, and used his hooks for turning the cuff of the radial artery back over the canula. We have also

found his hooks of use to open up the slit in the vein when introducing the canula.

The situation of the vein has much to do with the ease or difficulty of the operation. The farther down on the arm and the nearer to the ulnar side, the easier the operation.

We have found it advisable, after the canula with the radial artery has been introduced into a slit in the side of the vein and tied in place, to divide the vein distal to the canula to give more slack and to prevent the bending of the vessels at an acute angle as they come out of the incisions. The whole procedure, as carried out above, is much simplified over the one described in the article.

### Clinical Department.

#### LEAD POISONING FROM A SODA WATER FOUNTAIN.

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(From the Neurological Clinic, Massachusetts General Hospital.)

THE following case of extensive lead paralysis is reported because of the relative rarity of the source of the lead and also because of the somewhat unusual character of the paralysis itself.

A. S., a Russian Jew, age fifty-five, married, was first admitted to the accident room of the Massachusetts General Hospital Aug. 22, 1908, in the service of Dr. James J. Minot, to whom we are indebted for the earlier part of the history.

The original history, differing somewhat from that obtained later, was essentially as follows: His wife and one daughter were ill with lead poisoning. Another daughter had suffered in a similar way, but had recov-



FIG. 1. Showing wrist drop and general flabbiness of the muscles.

ered. For the past two years the patient had not been in his former health. He had been generally weak, but not incompletely incapacitated. Two months before entrance to the hospital he had had a severe attack of cramp-like pain in the abdomen, had passed blood in the urine, and had become very constipated, with a continuance of the cramp-like pain. For a few days preceding entrance he had been forgetful, was said to be unable to complete his sentences, and had seemed, in general, mentally abnormal.

The preliminary examination at the hospital showed him to be semiconscious, very difficult to rouse, and apparently incapable of understanding what was said to him. (This latter incapacity might, however, in a measure at least, be accounted for by his imperfect understanding of English.) There was a definite lead line on both upper and lower gums. The knee jerks were normal. There was slight edema over the legs and ankles; there was no evident paralysis. The skin was pasty, mucous membranes pale, pupils equal, small, and slow reaction. The tongue was slightly coated, many teeth were missing, the remainder poorly cared for. There was no glandular enlargement. The heart impulse and dullness corresponded in the fourth space in the nipple line, four inches from the midsternal line. There was no evidence of enlargement to the right. The action was regular, sounds very faint, with the aortic second sound very sharp and more distinct than the pulmonic second. No murmurs.

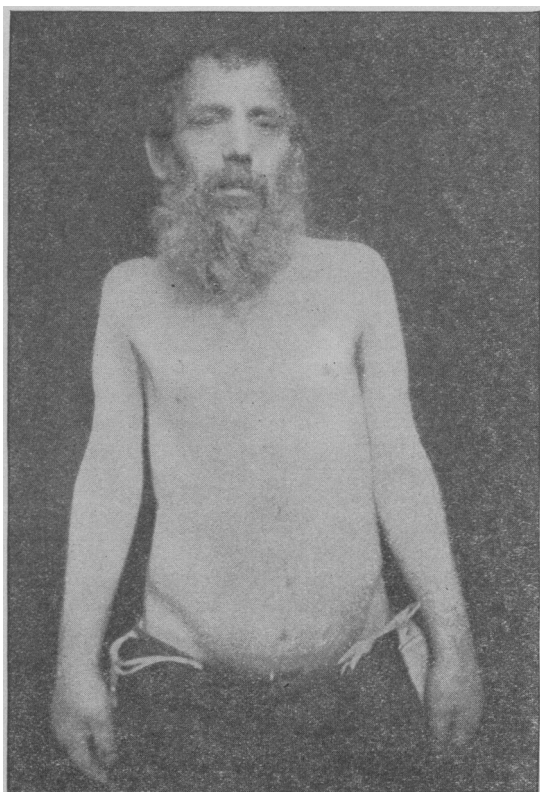


FIG. 2. Showing atrophy of the muscles about the shoulder, especially the deltoid.

The arteries were not palpable, pulses equal, synchronous, regular, poor volume, low tension. The lungs showed fine moist râles at both bases, in the axillary line and posteriorly.

The blood examination on the day of entrance showed hemoglobin, 60%; whites, 10,300; reds, 2,800,000; achromia and stippling. The differential white count gave polymorphonuclears, 71%; large mononuclears, 5%; small mononuclears, 24%; no blasts. A week later, on Aug. 29, the hemoglobin had risen to 80%, and the reds to 4,200,000; the whites were 9,100, and the differential count showed polymorphonuclears, 72%; large mononuclears, 5%; small mononuclears, 20%; eosinophiles, 3%; no blasts. The urinary examination on this date was as follows: High

colored, acid, gravity 1,030, slightest possible trace of albumen; occasional hyalin and fine granular cast; calcium oxalate and ammonium urate crystals. The urine was not examined for lead.

Some wrist drop had developed, and he was unable to feed himself. There was no colic. He was discharged from the hospital Sept. 11, relieved, and has since been coming to the Out-Patient Neurological Department, where the following further examinations have been made:

In October, 1908, the family was seen at home. The wife had a marked lead line on both upper and lower gums, and for some time had been suffering from severe abdominal pain. Her arms had become weak, and she had noticed considerable tremor as she was about her work. She had also had severe cramp-like pains in her arms and legs. One daughter was at a hospital being treated for articular rheumatism; another at home showed a marked lead line on the upper gum and an irregular discoloration on the lower. She had had pain and had felt tired, but had not otherwise suffered. A son-in-law living at home had a lead line on both gums, was constipated, had abdominal cramps from time to time, but was able to work. A grandchild, one year old, showed nothing.

Further details of the patient's personal history, as obtained from the family, were that he had been in Boston five years, and that during that time he had obtained a livelihood from a small "delicatessen." He had lived at his present place of residence for two and one-half years. A year and a half ago, he bought a second-hand soda fountain and soda-water apparatus. In April, 1908, the piping in the fountain became leaky and was replaced. Lead pipe was substituted for blocked tin piping, which he regarded as too expensive. In May, the patient began to feel weak and found he could not lift as he had been able to formerly. The following month he had cramp-like pains in the abdomen and limbs. His family furthermore stated that he had periods during which he "trembled all over." This condition continued through July, becoming gradually worse. He was constipated. Medicine did not relieve him. He was obliged to give up work altogether in July. The only drinking water at the store was soda water. During August he grew worse and became drowsy, forgetful and abnormal mentally. He was unable to carry on a conversation because he could not finish his sentences. "He became very queer." There was no sign of any paralyses. On Aug. 21 he became more drowsy and difficult to rouse, and the following day was removed to the hospital.

Examination at the Out-Patient Department showed a dropped shoulder, gray, heavily-bearded Jew of ordinary intelligence. He was in general well nourished, but there was much evident atrophy of the shoulders and arms. His arms were powerless and limp. He was able to hold his hat in his hand, but could not flex his arm sufficiently to put it on the table. Abduction of the arm at the shoulder was impossible. He had a complete wrist drop; the hands were swollen with edema. There was atrophy of the supra- and infraspinati muscles of both scapulæ and atrophy of the deltoids and biceps. The extensors of the fingers were manifestly atrophied, as were no doubt the intrinsic muscles of the hand. This, however, was difficult to determine definitely, on account of the edema. The pupils were equal, slightly irregular in outline, reacted to light and distance. The tongue was coated, the breath very foul. There was an unbroken lead line along the upper incisor area. On the lower jaw the lead line was less prominent. What teeth remained were very poorly cared for. Examination of the lungs

was negative, and of the heart as previously given in this history. There was some radial sclerosis. Examination of the abdomen, liver and spleen showed nothing abnormal. The knee jerks, Achilles' reflexes and plantar reflexes were normal. Slight edema over the lower end of the tibiae. In general, the legs showed no significant abnormality, in striking contrast to the absolute paralysis of both arms. In general, sensation was not affected. The electrical examination gave complete reaction of degeneration in the extensor group of muscles of both forearms; likewise of the left biceps and deltoid and the supra- and infra-spinati of both arms. There was a partial reaction of degeneration in the right deltoid and biceps. The electrical reaction of the flexor groups of both forearms was normal. The same was true of the pectoralis major. A later electrical examination on May 4 showed general improvement. All the muscles reacted to Faradism, except the extensors of the fingers. He was able to raise his hand to his head and could with some difficulty feed himself. His grip was somewhat stronger but still very weak, due in great measure to the persisting paralysis of the extensors.

The treatment has been the conventional one of potassium iodide, 5 gr. three times a day, with intermissions. Galvanism has been applied to the muscles, and massage with movements given with much faithfulness. The results have been entirely satisfactory, the improvement has been steadily progressive, and the arms, although still weak, are rapidly becoming useful.

In the family of which the patient was a member it was evident that there must have been a common source of lead, since several other members showed signs of poisoning, although of lesser degree. A careful search of the house revealed nothing suspicious. An inspection of the soda fountain, however, showed undoubtedly the source of the lead. The soda water was tested two days after standing in the pipes. No concentration was attempted, but a marked black precipitate was obtained by the hydrogen sulphide test. Further investigation showed that the soda fountain was properly piped from a generator through the fountain, but inside, the cooling coil was of lead piping. The possibilities of harm to others in this apparatus are apparent.

## Medical Progress.

### PROGRESS IN PHYSIOLOGICAL CHEMISTRY.

BY J. BERGEN OGDEN, M.D., NEW YORK.

(Concluded from No. 18, p. 628.)

#### ADRENALIN GLYCOSURIA AND THE INFLUENCE OF PANCREATIC EXTRACT AND JUICE UPON IT.

It was found by C. Frugoni<sup>9</sup> that a quantity of adrenalin sufficient to cause glycosuria is rendered entirely inactive if the animal receives an injection of enough active pancreatic extract. Pancreatic juice obtained from a fistula is equally effective in checking adrenalin glycosuria. The best results are obtained by giving an intraperitoneal injection of the pancreatic extract or juice one and one-half hours to two hours before the subcutaneous injection of adrenalin. If

adrenalin is left in contact with pancreatic juice or sodium bicarbonate solution for ten to sixteen hours, its chemical reaction disappears and its physiological properties change. If, therefore, adrenalin is absorbed by an organism whose blood contains an excess of sodium bicarbonate, its chemical structure is probably modified and its biological activity certainly neutralized. Pancreatic juice which has undergone dialysis is no longer able to destroy the toxicity of the adrenalin in vitro.

#### THE TOTAL SUGAR OF THE BLOOD.

This subject was investigated by R. Lepine and Boulud<sup>10</sup> and their experiments were conducted as follows: 20 gm. of blood are precipitated with sodium sulphate and heated. The sugar in the fluid is estimated and the precipitate is heated on the water-bath for twenty hours in 500 ccm. of water to which has been added 5 gm. of 50% HF. After neutralization a sugar estimation is made; this is the "potential" sugar. In dog's blood this is about equal to the performed sugar, so that the total sugar is about 0.2%. Ingestion or intravenous injection of sugar produces, some hours later, an increase in the potential and often a decrease in the performed sugar.

#### CONCERNING DIABETIC LEVULOSURIA AND THE QUANTITATIVE DETECTION OF LEVULOSE IN THE URINE.

L. Borchardt<sup>11</sup> discusses the various qualitative tests for the detection of levulose, and the conclusion is reached that in none is it possible to exclude the presence of certain substances which give reactions similar to Seliwanoff's. As conflicting reactions there is mentioned Nencki's urorosein and that based upon the fact that ordinary amyl alcohol, which is used in one of the modifications, will give a slight red color with resorcinol and hydrochloric acid (Seliwanoff's reaction). The following test is recommended: A few cubic centimeters of urine are mixed in a test tube with an equal volume of 25% HCl and a few crystals of resorcinol. The whole is boiled for a few minutes. If a red color appears the contents of the test tube are cooled, made alkaline with soda in substance and shaken out with acetic ether. In the presence of levulose the ether becomes yellow. If nitrites and indican are simultaneously present, one or both should be removed before the test. Alone they do not affect the test only in that the acetic ether in removing the indigo becomes colored and thus the yellow color is obscured; the indigo may be first removed by chloroform according to Obermeyer, the concentration of HCl reduced to 25% and then the above test performed. Santonin and rhubarb also gave similar reactions. The urorosein may also be previously removed by amyl alcohol before the resorcinol is added. The examination was made of the urine of over one hundred patients which had been given 100 gm. of levulose. In three cases levulose was detected. Negative results were given by eight cases of diabetes. The fact is mentioned that the amounts of sugar obtained