A SHORT NOTE ON THE SURGICAL USE OF SUBCUTANEOUS INJECTIONS OF CARBO- HYDRATES IN EXHAUSTING DISEASES,

AND AS A PRELIMINARY TO SEVERE OPERATIONS.

By ARTHUR E. BARKER, F.R.C.S.,
Surgeon to University College Hospital; Professor of Surgery at
University College.

To all surgeons who have frequently to operate upon patients in a condition of great exhaustion, to whom subsequently it is necessary for a time to deny food in any considerable amount, some means of supplying their systems with materials which shall in some measure, at all events, make up to them for their hourly tissue waste must have often suggested itself as a serious desideratum. To some extent this waste may be replaced by rectal injections of fluid and peptonized foods. But this is a slow and imperfect method and only too frequently leads to irritability of the bowel, with rejection of the foods employed.

For many years some of us have sought help in these cases from copious subcutaneous injections of normal saline solutions, and have had the best results from the practice in most cases. But I now desire briefly to draw attention to a method of introducing compounds into the circulation which may be looked upon in the light of foods, and not merely an innocuous addition to the blood of the water which is so rapidly lost by the lungs, skin, and kidneys, and sometimes by the intestine or by vomiting.

This is the addition to our normal saline solutions of pure glucose. I learnt this from Professor K. Lennander, of Upsala, when he was my guest the year before last on the occasion of his receiving the Hon. F.R.C.S. of England. Since then I have constantly used it both at University College Hospital and in private with much satisfaction. I confess that when I began to do so I had certain misgivings on at least two points. In the first place I found that the introduction of so much glucose into the circulation and the tissues generally might possibly have the same injurious effects on the reparative processes in the latter which we see in diabetes. And though I was assured by my informant that in his large experience no ill-results had followed, it was not until I had employed it in several cases and seen my wounds heal in the most perfect manner, and until I had watched the urine of these patients and seen that no sugar was excreted in any, that I was reassured.

Another point seemed to me to demand careful consideration, namely, the osmotic effects of a saccharine solution on the parts into which it is injected. It is well known that even sterile and otherwise innocuous fluids, if injected subcutaneously above or below a certain concentration, produce in the first place intense pain through their effects on the sentient nerves; and, secondly, in concentration rapidly withdraw water from the living tissues by osmosis, and so lead to extensive necrosis, as in the case of a solution of 5 per cent. of sodium carbonate. Now if a solution of sugar had either of these effects it would be clearly inadmissible. The strength given to me by Professor Lennander was 5 per cent. of glucose added to normal saline solution = 0.6 per cent. It struck me in thinking over the matter that if 6 per 1,000 of NaCl. was "indifferent" to the tissues 5 per 100 of glucose might not be so. But on referring to tables giving the freezing-points of various solutions as determined by Beckmann's apparatus, I found that a 5 per cent. solution of sugar freezes at the same point as the serum of the blood and as normal saline solution, and, in the terms of the botanical physiologists who first investigated these phenomena, was "isotonic" or "isosmotic" with the latter. It ought therefore to be "indifferent" to the tissues, and this proved to be the case on employing it subcutaneously; no reaction or pain has followed.

This whole question of "isotonic" or "isosmotic" fluids in relation to human tissues is an interesting one, and should always be borne in mind in injecting subcutaneously. But it is only necessarily here to remember that fluids (exclusive of corrosives) of the same freezing point as serum are

"isotonic," and produce neither pain nor other change in the tissues into which they are injected.

Reassured on this point I have largely employed this saccharo-saline solution both in preparing exhausted patients for operation, and in supporting them during and after the latter. The only point remaining to be ascertained is the amount of glucose which may be introduced into the body at one time.

So far, I have limited myself to 25 grams in twenty-four hours as advised, equal to a litre of 5 per cent. solution, and have never seen any sugar in the urine. The mode of its employment has been simple. An ordinary aspirator needle of about 1 mm. in transverse section of its lumen attached to 3 ft. of rubber tubing, and with a glass funnel at the other end, is all that is necessary. This apparatus is, of course, carefully sterilized by boiling, and is filled with the sterilized and warmed saccharo-saline fluid; the needle is introduced under the sterilized skin of the arm near the axilla, and the funnel is raised 2 ft., when the transfusion is found to proceed easily as a rule, until the whole half litre is seen to distend the subcutaneous tissues of the arm and axilla. In preparing, say, for a gastro-enterostomy in an exhausted patient, I do this with 500 c.cm., morning and evening if possible, for some days before and up to the time of operation; and on the table again another 500 is injected. Possibly more might be used, but for the present I have been using only the half litre at a time. Again, for days after, while the stomach only receives a limited amount of food and fluid, the same course is pursued. The effect of this treatment has been uniformly good as regards pulse, general strength, and relief of thirst.

There is another effect which I think ought to be taken into account in septic cases; for example, appendicitis with septic peritonitis. This is the increased secretion of urine, which is rendered possible by the free use of saline injections. We believe that some, if not all, of the toxins in such cases, are eliminated from the system by the kidneys. If this is so the presence of abundance of water in the body ought to render the work of the kidneys easier. The toxins would be excreted in more abundance if there were plenty of water to be excreted and in greater dilution. The saving to the kidneys in eliminating dilute poisons rather than concentrated ought to be great, and we ought to see less of renal complications. In a case of very extensive peritonitis following on gangrenous epityphlitis I recently gave subcutaneously half a litre of the fluid mentioned above morning and evening for a fortnight, with, I believe, good results in many ways.

But in the preliminary treatment, the operation, and after-treatment of exhausted patients, the use of the saccharo-saline subcutaneous infusion is beyond doubt of great value, and ought to be more widely known and practised. A concentrated solution is now made for me sealed up in glass capsules, which can be diluted to the proper strength in a moment with the corresponding amount of boiled water. Such capsules can be carried about for every serious operation, and will, I believe, in the future be found of much use.

INTRAVENOUS INJECTION OF NORMAL SALINE SOLUTION IN A SEVERE CASE OF HAEMATEMESIS: RECOVERY.

By H. E. BRUCE-PORTER, M.R.C.S.E., L.R.C.P.LOND.,
Windsor.

Mrs. A., aged 40, had for some two years devoted her life to the care of her husband, who was in a very precarious condition, being the subject of serious cardiac trouble. On December 15th, 1901, at about 10 p.m., I was called to her. I was shown the vomit which had been brought up at 6.30 p.m.; there was about a pint and a-half of bright-coloured blood, and I was informed by the patient that she had brought up a larger quantity the day before, but had said nothing, as she was afraid of frightening her husband. She was very weak and blanched to an alarming degree; there were the usual symptoms of gastric ulcer and a history of previous haemorrhages, though not severe. A teaspoonful dose of extract of hamamelis with a dessertspoonful of water every fourth hour was the only thing given by the mouth,

with the exception of *m x tinct. opii* after the first dose of hamamelis. For feeding, recourse was had to nutrient enemata. There was no return of bleeding during December 16th or 17th up to midday; there was a patch of hardness in the mid-epigastric region about the size of a crown-piece, but not much tenderness.

At 1.30 p.m. on December 17th, while standing by the patient's bed I noticed her look a little more pinched about the nose, her pulse began to quicken, and she said, "I must be sick." I at once pulled away the pillows, but at the same moment she vomited some bright blood, about 4 oz. Fortunately I had warned the nurse that haemorrhage might recur, and to have some turpentine in the room; the patient was now almost unconscious; I mixed 20 minims of turpentine with a tablespoonful of water and poured it down her throat. Things looked very bad indeed, and it was obvious that the only chance of saving life was to run in some normal saline solution. Captain Power, medical officer attached to the Royal Horse Guards, came at once when sent for, and stood by the patient while I went for the solution, etc. Dr. W. B. Holderness lent me his Aveling's transfusion apparatus, and very kindly tendered his aid should we need further assistance. As the rubber of the Aveling had got hard we were obliged to improvise, so connected one of the needles to a piece of tubing and ran the solution in by means of a glass funnel.

I was not away more than 20 minutes, but during that time, twice Captain Power thought the end had come and had to raise the patient's arms to revive the circulation; the patient was alive and that was all. While I warmed the solution and coupled up the tubing Captain Power set about opening the vein. This little operation reads as though it were the simplest of tasks, but in this case it was one of no mean order as the vessels were empty and the bandage above the elbow made no alteration in the appearance of the vein; it was only by pressure on the forearm that we were able to distend it enough to make sure that we were opening the vein which looked like a strip of tendon. We ran in a quart of solution, and as we had no special means of keeping it warm and feared to delay, I am sure that towards the end the solution was not of the temperature of the body.

A pad was placed on the opening and a bandage, the patient given $\frac{1}{4}$ gr. of morphine sulphate hypodermically, drachm doses of extract of hamamelis every three hours, a little ice to suck. For the next forty-eight hours she was fed by enemata. The improvement in the pulse was marked, and it steadied. There was, of course, the usual restlessness, but the patient was quite conscious, and had a very comfortable night. After two days, as the patient disliked feeding by the bowel so much, we felt obliged to risk feeding by the mouth, otherwise she would have gone under from sheer exhaustion, and it seemed to us that it would be as well to give the gastric juice something to act on. She was given a teaspoonful of Brand's essence every three hours, and the enemata only every eight hours; the amount of food by the mouth was gradually increased, and the only medicine was the hamamelis in teaspoonful doses every three hours, and silver nitrate pill thrice daily. For the first few days she was given a small hypodermic of morphine, gr. $\frac{1}{4}$. The tenderness gradually disappeared, and, with the exception of a little flatulence, she was quite comfortable.

The wound in the vein healed without causing the slightest trouble, and there was not a trace of soreness along the course of the vessel. The patient improved steadily; when there was a feeling of fullness in the stomach the food was cut down, and a few drops of peppermint water given. The bowels were washed out by simple enemata whenever needed.

On January 4th small doses of haematogen were begun. On January 11th she was allowed to sit up for an hour. There was no return of the bleeding. The progress was steady, and on February 16th she was able to go away to the seaside.

Haematogen proved itself a very valuable preparation, as it was well borne by the stomach. The temperature was subnormal for a few days after the haemorrhage, but when it reached the normal line it remained there.

Since the above was written the husband of the patient died suddenly. She went through the shock and strain remarkably well, and there has been no return of gastric trouble. She is, of course, still very careful with her diet, and continues to take iron.

SINGLE NON-TUBERCULOUS ULCER OF THE BLADDER: SUPRAPUBIC CYSTOTOMY: CURE.

By J. B. CHRISTOPHERSON, M.A., M.D., F.R.C.S.,
Surgeon, Seamen's Hospital Society.

J. H., aged 49, a plumber, was admitted into the Seamen's Hospital Society's Branch Hospital, Albert Docks, on September 24th, passing his urine every half-hour.

History.—He had done only six months' work during the last two years, and this total was made up by adding together a few days at a time. He had had gout (?) twenty-eight years earlier, but gave no history of syphilis. The symptoms dated from October, 1899, when they commenced during an attack of "rheumatism," with pains in his limbs, leaving him with frequency of micturition and pain during and after urination, suprapubic and at the end of the penis; these symptoms had continued since, occasionally improving so that he could work for a few days at a time. He had been an inmate of one of the large London hospitals for two months; he had there been given cod-liver oil. He had been sent to the Royal Sea-Bathing Hospital, Margate, and had returned somewhat improved, but had relapsed.

Condition on Admission.—He weighed only 6 st. 9 lb., though of average height. His face was pale, drawn, anxious. Besides a well-marked blue line on the gums, which coincided with the history of two attacks of lead colic, and some small multiple lipomata on the forearms and thighs, there was no evidence of disease elsewhere. No tubercle could be discovered in any part of the urogenital tract or elsewhere, nor was the tubercle bacillus to be found in the urine, which was examined twice for this purpose. The urine (specific gravity 1012) was acid, cloudy, with one-eighth albumen; it contained no blood or pus. He said that he had only passed blood sufficient to colour his urine on one occasion. The urethra was found to be healthy, and no stone was discovered in his bladder. Rectal examination discovered nothing.

Diagnosis.—As there was no evidence of tubercle elsewhere, it seemed to be a case of primary tuberculous ulceration of the bladder.

Operation.—On October 1st a suprapubic cystotomy was performed. The cavity of the bladder was found to be small and the walls hypertrophied, but otherwise healthy except for a small ragged irregular ulcer with granular surface and thin edges, and about 1.9 cm. in diameter, between the two ureters on the post part of the trigone. When it was brushed over with swabs of wool wet with carbolic acid (1 in 20) the surface bled readily. There were no signs of caseation or tubercles anywhere, and the ulcer looked more like an anal ulcer than anything else. There was no sign of malignant disease; the bladder was drained suprapubically and washed out with a solution of borax and iodine for twenty-eight days.

After-History.—On December 4th he could hold his urine four or five hours, and was not disturbed during the night; the urine, specific gravity 1011, was acid, and contained a trace of albumen and a few pus cells on microscopical examination. Between the date of the operation and December 4th he gained 2st. in weight. He left the hospital apparently cured.

REMARKS BY DR. CHRISTOPHERSON.—I believe this to have been a case of a single simple ulcer of the bladder analogous to an anal ulcer, produced perhaps in much the same way, namely, by some traumatic influence, over-distension or straining to urinate, for instance, prevented from healing for similar reasons, that is, muscular action and contact with irritating material (urine). There seems to be no reason at all for the diagnosis of tubercle. It differs only from Mr. Fenwick's cases in the slight amount of haematuria and in the age (49). Simple ulcer of the bladder has not yet a recognized permanent place in textbooks; amongst the four most frequently read in London there is no mention of it in two. In one a simple "perforating" ulcer is mentioned as described by Rokitsansky. The other textbook makes the same observation. I think the case is worthy of record for this reason. This ulcer was not round, indurated, or perforating, and quite unlike a "gastric" ulcer.

REFERENCE.

1 *Ulceration of the Bladder*, Hurry Fenwick, F.R.C.S., 1900.