ON THE PREVENTION OR ANTICIPATION OF SHOCK IN SURGICAL OPERATIONS.

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SHOCK is one, if not the chief, of the difficulties encountered by the surgeon. It is to a large extent impossible to foresee to what degree it will develop in any projected operation, but when once its manifestations are exhibited the case becomes from that moment a serious one.

The exhaustive research of Dr. Crile, published in his essay on *Surgical Shock* has not suggested to us any new remedies or any new method of utilising the old ones. For some twelve or eighteen months I have in all cases which even remotely threatened to exhibit indications of shock undertaken a plan of treatment which, so far as I am aware, is not generally adopted. I look upon shock as a condition to be prevented. For its prevention I use the same remedies as are usually applied for overcoming it when once it has definitely asserted itself. I may best explain my meaning by describing in brief the measures I should adopt in part or wholly according to individual differences in, say, a case of gastro-jejunostomy for malignant disease of the pylorus.

The operation theatre, if in a hospital, would have usually a temperature of 60° to 65°. I should increase this by some 5 or 10 degrees. The patient would be placed on a table warmed by a current of fairly hot water. As an additional though not invariable adjunct to these means for retaining heat, I have several times had the upper and lower limbs of a patient bound in hot cotton-wool and flannel bandages. Strychnine is administered hypodermically before the anæsthetic or the operation commences. The dose is modified according to circumstances. As a general rule, the doses advised in textbooks—for example, Watson Cheyne's *Manual of Surgical Treatment*—are so small as to be ineffective. I usually begin with a dose of 10 minims of the liq. strychninæ. During the operation 5 minims may be given when required. I have altogether given as much as 30 minims, frequently 20 or 25, and I have never in one single instance seen any evil result, or even any physiological manifestation, as a sequel to such liberal administration. I also give 10, 15, or 20 ounces of hot saline solution by the rectum, with or without a small quantity of brandy. As soon as the patient is under the anæsthetic, the transfusion, or rather infusion, of saline solution to the extent of 1 to 4 pints may be begun. If after the operation the patient is at all collapsed I think it is important to postpone the removal to the wards. In some cases, such as severe abdominal cases, operated upon during the night, this can readily be arranged; in others it would be impracticable.

It will be seen from this that there is nothing novel in the means that I adopt; the principle lies in the method of their adoption. Briefly stated my points are:

1. The early use of various agents, so as to prevent, to anticipate shock.
2. The use of larger doses of strychnine than are generally recommended.

I do not necessarily carry out, even in a severe operation, all these suggestions that I have enumerated. Such only would be practised as seemed desirable in each separate instance. The amount of benefit derived from this plan cannot of course be stated in terms of precision, but of its existence I, with others who have practised it, am abundantly assured.

THE TREATMENT OF SURGICAL SHOCK BY LARGE DOSES OF STRYCHNINE.*

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SHOULD anyone be inclined to exult over the resources and triumphs of modern surgery, he will do well to refer to the surgical textbooks of the present day and study the chapters devoted to the treatment of shock. They are depressing, not to say humiliating. There is usually the time honoured anecdote

of the behaviour of the frog under the influence of atropine and a few lines devoted to stimulants, opium, and the application of warmth. As a student one grows to look upon the condition as a fatal but unpreventable interference on the part of the patient in what would otherwise have been a very successful case. In other words, we seem to have arrived at that hopeless state when we regard shock as a reasonable excuse for failure. Certain it is that many deaths are improperly attributed to it, especially those due to acute sepsis, as was pointed out by Treves in his lectures on peritonitis.

The observations I am about to make may be regarded by some as a confession of therapeutic atrocities. I can only say that after a fairly extensive trial of a bold use of strychnine in cases of severe shock, I have yet to see the case that displays any symptom of overdosage. On the other hand, I am confident that the drug has proved of great service in many of the cases in which it has been freely given.

Eight years ago, whilst house-surgeon to Mr. Mayo Robson at the Leeds Infirmary, I gave a patient two hypodermic injections amounting to 15 minims of liquor strychninæ during a period of profound shock after a surgical operation. I was somewhat surprised to find that he suffered no inconvenience from what I at that time considered a rather heroic dose, but, on the contrary, seemed to rally remarkably well under its influence. Since that time I have gradually increased my dosage for use in such conditions and have been much astonished at the large quantity the human body will tolerate without exhibiting symptoms. Seeing what a potent drug strychnine undoubtedly is, I can only suggest that during shock the tissues, or the processes of absorption, are so modified that the drug loses much of its potency. Whatever may be the exact cause, there remains the fact that in conditions of profound shock the body is capable of receiving doses of strychnine which, under normal circumstances, would be poisonous.

Up to the present time I have given injections of strychnine in doses varying from 15 to 25 minims on fourteen occasions, and I have never regretted the largeness of the dose. Most of the cases have been those with which I came in contact whilst a resident in hospital. The following occurred in my private practice, and are the only two in which I have given so much as $\frac{1}{4}$ gr. of the drug.

CASE I.—*Air Embolism during Operation: Collapse and Impending Death: Injection of $\frac{1}{4}$ gr. of Strychnine: Recovery.*—On September 5th, 1897, I removed an extensive recurrent scirrhus of the right breast in a patient of Dr. Yeoman's, of Thornton. The method adopted was that of Halsted. Everything proceeded satisfactorily until air entered a small vein cut across at the apex of the axilla. There were three inspirations of air before the vein was closed. The patient suddenly became pale, gave several inspiratory gasps; the features became distorted and rigid, and the teeth clenched; the pupils dilated widely and the face became covered with sweat. Breathing ceased, but the heart continued beating, at first rapid and tumultuous, then fluttering and feeble, finally imperceptible. A well-marked thrill over the precordium was present for the first few seconds. Artificial respiration was at once begun, and 20 minims of strychnine were injected subcutaneously. After five or six minutes a few inspiratory efforts took place, followed a little later by irregular and spasmodic breathing. At the end of fifteen minutes another 5 minims were injected, as the pulse, which had become perceptible, showed signs of failing again. Regular breathing gradually became established, the pulse improved and remained steady at 120. She slowly rallied and made a good recovery.

I have no doubt whatever that the artificial respiration was largely responsible for the successful issue of this case, but the fact remains that $\frac{1}{4}$ gr. of strychnine was injected into this patient without producing the slightest symptom of poisoning.

CASE II.—*Laparotomy for Ovarian Tumour: Profound Shock: Injection of $\frac{1}{4}$ gr. of Strychnine: Immediate Recovery: Death Subsequently.*—On April 1st, 1898, I operated upon a patient of Dr. J. J. Bell, of Bradford, for a pelvic tumour which proved to be an ovarian carcinoma. The removal was exceedingly difficult, but it was not until the operation was almost completed that the patient showed signs of collapse. She then rapidly went from bad to worse, and became pulseless; respiration almost ceased, only consisting of an occasional jerky inspiration; the face was covered with sweat, the pupils were widely dilated, and death on the table seemed inevitable. Fifteen minims of strychnine were injected and artificial respiration begun; the foot of the table was raised and the limbs were bandaged. In 10 minutes there was a decided improvement; the pulse was perceptible, and respiration was more regular. At the end of 20 minutes another 10 minims of strychnine were injected. Within an hour she was able to be moved off the table into bed, and during the day she rallied well. In the afternoon she was conscious, and her pulse, 118 to the minute, was of fair volume. The same evening she became worse quite suddenly, and died nine hours after the operation. There was no post-mortem examination.

These two cases are the nearest approaches to death on the

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