been necessary. Then by an error of judgement we gave him stovaine in the very case where it is not wise to give it, a patient weak from a continued septic fever and pyaemia, and death was entirely due to a sudden collapse, perhaps stovaine-induced, acting on a fatty septic heart. We have had no further fatalities.

The After-effects of Stovaine Anaesthesia.

After a variable time, generally within an hour or two at most, movements of the legs may be made and sensation returns. Pain in the legs is often complained of, and later headache and backache. The legs may sometimes give more trouble than anything else, but usually recover within two days. I have never seen any serious effects from stovaine, though fever, headache, giddiness, backache, and retention of urine may persist for some days. Once the dangers at the time of the actual injection itself are over no further trouble is likely to occur.

THE CASE FOR AND AGAINST STOVAINE ANAESTHESIA.

In considering the case for stovaine one is naturally bound to compare it for efficiency and safety with chloroform anaesthesia, and in general terms I think we must look on stovaine as a valuable alternative to (either or) chloroform in operations on certain definite areas, but as never destined to replace them. It is true that the accidents of stovaine are generally more alarming than dangerous, but when they do occur there is a dreadful feeling of helplessness, which is particularly perturbing. We have certain danger signals with chloroform which are well recognized and can be immediately replied to, and moreover the administration of the anaesthetic can be immediately discontinued; whereas in stovaine the danger gives very little warning, if any, and the damage is done and cannot be undone, as, though it is recommended, the withdrawal of a quantity of cerebro-spinal fluid in such an emergency is hardly practicable. It is true that only a very small proportion of cases give rise to the least anxiety, but a method must be judged by its possibilities of danger when the question of a human life is concerned. Profound lowering of blood pressure, heart failure, and "air hunger" are the more serious possibilities to be faced, and these can only be avoided by careful selection of cases, the proper grading of doses to suit individual patients and conditions, and the most careful adoption and retention of appropriate positions, to prevent the dissemination of the drug beyond the limits of safety within the spinal canal.

With increased experience naturally there is a greater certainty and security about our results, but we have not yet that perfect trust and confidence we should have in our anaesthetic in the case of spinal anaesthesia with stovaine (in the solutions we have been accustomed to employ).

Briefly, we have, then, in stovaine a reliable anaesthetic for all operations below the costal margins, but one must not expect too much of it, or employ it without careful consideration, especially in cases where any form of general anaesthetic would be dangerous. Moreover, the fallacy that after the injection is given and anaesthesia established it is no longer necessary to trouble about the patient, must be once and for all dismissed. Just as much care must be exercised in the administration of the drug and in the management of the patient after injection as with chloroform, and when this is done the feeling of satisfaction, after an extensive operation under this form of anaesthesia, when the stovaine has acted perfectly and the after-effects have been almost *nil*, must be experienced to be thoroughly appreciated.

If a somewhat pessimistic note has unconsciously crept into these observations, I am, on the whole, content to leave it so, as a well-intentioned protest against the impression that stovaine is entirely devoid of all danger, and that at worst its only drawback is failure, partial or complete, to produce the requisite degree of anaesthesia.

THE Royal Sanitary Institute has established an examination for smoke inspectors. The first examinations will be held in Manchester in April, and in London in May next. The syllabus can be obtained from the Secretary of the Institute, 90, Buckingham Palace Road, S.W.

COMPLICATIONS FOLLOWING THE ADMINISTRATION OF HEDONAL.

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THE discovery of an ideal anaesthetic with ideal methods of administration is a problem amongst the most important that the medical profession has to solve. Even under the most favourable circumstances fatalities from time to time occur on the operating table, whilst post-operative complications on very many occasions are such as seriously to retard the progress of the patient towards recovery, even if life itself be not sacrificed to such a sequela as pneumonia. Indeed, surgical interference is often reluctantly postponed or abandoned on the ground that the risks of anaesthesia are too great. The recent more extended use of the intravenous infusion of hedonal has roused hopes that an anaesthetic has been found which gives a satisfactory anaesthesia, and at the same time is comparatively free from post-operative complications.

Hedonal has now been administered over 300 times in the Leeds General Infirmary in a great variety of cases, and though it is early yet to speak with authority, the number of complications following the administration of the drug is such as to warrant a record of them, in the hope that means in the future may be found to guard against their occurrence.

I have classified the complications as follows:

1. Cutaneous.

(a) *Local Oedema*.—The commonest situations for this are the lumbar and gluteal regions. The manifestations vary from a redness of the skin with slight infiltration to a tender brawny oedematous swelling, pitting on pressure. After a variable time the oedema disappears, occasionally leaving a mark as of a severe bruise. In one case this "bruising" extended across the small of the back, and measured, roughly, 12 in. by 4 in. Unless the greatest care were taken, bedsores would readily develop.

(b) *Blisters*.—These are most commonly found on the heels or outer side of the foot, but they have also occurred on the chest, abdomen, inner side of the thigh, and elsewhere. They resemble closely in appearance the blister raised by the accidental contact of an unprotected hot-water bottle. As regards the explanation of these phenomena, it is to be remembered that hedonal produces an unusually long anaesthesia. Patients, therefore, are apt to remain in one position too long, and local pressure effects are thereby produced. In some of the cases this was undoubtedly so, but now the nurses are on their guard against this complication and every precaution is taken. In spite of this, however, some examples still occur. The blisters have appeared within an hour or two after operation, and on one occasion before the patient left the theatre. They have appeared in the weakly and robust patient alike. They have occurred more frequently in those cases where there has been a large amount of fluid injected. There seems to be a lowering of the powers of resistance in the tissues and trauma or pressure, even slight and temporary, is the deciding factor. In one case—an operation on the jaw—in which a blister appeared on the chest, it is probable that the pressure of the surgeon's or assistant's elbow was sufficient. In all the cases there is a close analogy with those nervous diseases in which even the most trivial pressure can rapidly produce most alarming results.

2. Pulmonary.

(a) *Oedema*.—The mere injection of fluid of itself may produce oedema of the lungs, and clearly this liability bears a direct relation to the amount of fluid injected. I have had the opportunity of examining the lungs of a patient who died a few hours after operation where this method of anaesthesia had been used, and the death was attributed to exhaustion. The case was one of impaction of the after-coming head, and before admission to hospital the patient had been subjected to very severe handling. *Post mortem* the lungs were found to be highly oedematous, whilst there was no other abnormality detected in the rest of the viscera by the naked eye or by the microscope. This oedema doubtless occurs in many cases, and

passes off without giving rise to symptoms. It may, however, be attended with real danger, as the following case shows, for the notes of which I am indebted to the House-Surgeon, Mr. Tatlow:

V. S., aged 19; 1,350 c.cm. of 0.75 per cent. solution injected. The patient was operated upon in the morning for inguinal hernia, the administration of the anaesthetic ceasing at about 10 a.m. On his return to the ward from the theatre it was noticed by the nurse in charge that the patient seemed very "chesty." Between noon and 1 p.m. the patient was pale and the extremities cold. At 3 p.m. the temperature was 100.2°, the pulse 120, and the respirations 35. At 5 p.m. the breathing became more laboured, and the patient was distinctly cyanosed. The throat was full of frothy blood-stained mucus, and was swabbed out. Vomiting was induced by mechanical means, and $\frac{1}{15}$ grain of atropine sulphate injected. The patient soon became relieved; consciousness returned at about 9 p.m., and next morning he was practically free from symptoms. The subsequent progress of the case was uneventful.

(b) *Pneumonia*.—In preanaesthetic days pneumonia was a well-recognized complication of surgical injuries and operations. With inhalation anaesthesia the risk is considerable, especially after the administration of ether. In my series of cases after the injection of hedonal there have been several in which there has been slight bronchitis for a day or two, and others where a severe attack of pneumonia has followed. There have been three fatal results from this complication.

T. W., aged 20. The patient was a well-built young man accustomed to active out-of-door life. Operation on May 9th for recurrent appendicitis; 1,400 c.cm. of 0.75 per cent. solution used. Almost immediately on his return from the theatre the breathing became embarrassed. The pulse was poor and frequent and there was some cyanosis. The patient came round about twelve hours after operation and soon began to complain of pain in his chest. The temperature was raised, the respirations were 40 per minute, and the pulse continued frequent. For a few days the symptoms persisted with little or no abatement. On May 15th the patient began to expectorate with difficulty. The next day the sputum became offensive, and on May 17th I was asked by Sir Berkeley Moynihan to see the case. The patient was extremely ill and presented the anxious cyanosed aspect of a sufferer from pneumonia. On examination a pleural friction rub was detected over the greater part of the left chest, whilst there was dullness at the base behind on the same side with tubular breathing. There were also signs of a commencing bronchopneumonia in the right lung. During the next few days there was some improvement in the patient's condition and the sputum became less offensive, though the temperature, respirations, and pulse-rate still continued high. At the end of a week the patient again became gravely ill. Physical examination at this time showed that the lower lobe of the right lung was extensively involved. The sputum again became extremely offensive and there was a brisk haemoptysis. For several days the condition of the patient caused considerable anxiety, but subsequently he began to improve, and finally became convalescent. He is now quite well.

A. T., aged 31. Cholecystotomy and choledochotomy; 1,300 c.cm. injected; 3 gr. of hedonal were given two hours before operation. As in the previous case, pulmonary symptoms soon developed, and death ensued on the twelfth day. *Post mortem*: Site of operation healthy. The lungs were in an advanced state of confluent bronchopneumonia and honeycombed with small abscesses. No other noteworthy abnormality was found.

(c) *Infarction*.—I have not personally seen this complication, but I have had information of an undoubted case where the embolus was considered to have originated from a thrombus in the vein which was used for the purpose of injection. The complication occurred fourteen days after operation. The patient made a good recovery.

3. Venous.

(a) *Thrombosis at the Site of Injection*.—In the majority of the cases there has been thrombosis in the vein selected for the infusion, usually the median basilic or median cephalic. In many instances this has been shown by a linear staining of the skin along the course of the vein, which could itself be felt as a thick fibrous cord. The thrombosis apparently extended as far as the junction of the vein with the axillary. With the exception of the case of pulmonary infarction already referred to, this thrombosis does not appear to have had any untoward result. The risk of suppuration is, of course, with the usual antiseptic precautions, infinitesimal.

(b) *Thrombosis of the Femoral Vein*.—This is not infrequently met with as a complication of severe illness, and it sometimes follows surgical operation. Thrombosis of the femoral vein has occurred in five of the cases in my series subsequent to the administration of hedonal. I cannot but think that the proportion is too high to be

otherwise than in direct causal relationship to this method of inducing anaesthesia. I quote two examples:

K. D., aged 30. Operation for excision of gastric ulcer; 1,610 c.cm. used. This patient was an unusually long time before coming round. Thrombosis of the left femoral appeared on the fourth day. It should be stated that this patient was very anaemic.

A. E. W., aged 34. Appendicectomy; 1,130 c.cm. injected. Thrombosis appeared on the fourteenth day.

(c) *Cerebral Thrombosis*.—In one of the cases of severe bronchopneumonia a right-sided hemiplegia with aphasia appeared on the sixth day. The symptoms, however, were only slight and after a few days gradually passed off.

SUMMARY.

The technique employed in all the cases has been substantially the same as that described by Mr. Page in his paper read before the Royal Society of Medicine. The usual rate of flow is from 80 to 150 c.cm. per minute until anaesthesia is produced, when the fluid is allowed to run in drop by drop. The best results have been obtained where anaesthesia has been induced fairly rapidly, and it is found that in these cases less of the solution is required.

There is no doubt that hedonal is a very pleasant anaesthetic. Patients with whom I have discussed the matter who have had experience of ether or chloroform much prefer the newer method. Indeed, I have heard of one who, on being told that he was to have ether, declined operation and left the hospital. There is an absence of the feeling of suffocation which patients naturally dread so much, whilst vomiting as consciousness returns is only exceptionally present. Hedonal also provides an excellent surgical anaesthesia.

On the other hand, it is clear that the injection of a powerful drug in large quantities of fluid is not without a very considerable element of risk. When 1,100 to 1,200 c.cm. have been administered the danger zone has been reached. Practically no complications have occurred where a lesser amount has been employed. The oedema of the lungs which results from an overdosage renders them especially liable to infection from the micro-organisms which are constantly present in the mouth and which may readily be inhaled during the period of unconsciousness. Especial care should therefore be given to antiseptic treatment of the mouth and teeth before operation, whilst subsequently, if a large amount of fluid has been given, the upright position is to be recommended. On the slightest symptom of pulmonary oedema vigorous measures should be taken to secure the clearing of the air passages.

In cases in which there has been severe shock or much previous loss of blood—in those cases, that is, in which treatment by venous infusion might be considered—this method of anaesthesia is clearly of advantage.

That especial directions should be given to the nurses in charge of patients who have been anaesthetized with hedonal follows from what I have already said.

Finally, I wish to express my thanks to the members of the surgical staff for kindly granting me access to their cases.

CONGENITAL SYPHILITIC DEAFNESS TREATED BY SALVARSAN.

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THE following case is, I think, of interest, as this form of deafness usually progresses very rapidly in spite of any form of treatment, and usually when the patient has once become deaf no treatment will produce any improvement at all.

A woman aged 22 presented herself on June 8th, 1911, at my out-patient department at the Seamen's Hospital complaining of deafness of five days' duration. Its onset had been sudden, the patient becoming completely deaf within forty-eight hours of the onset of the symptoms. She was brought to the hospital by her mother as she was unable to hear anything herself. Severe tinnitus was present in both ears, but there was no history of vertigo, sickness, or headache. Both tympanic membranes were slightly indrawn and thickened, but there was no fixation of the malleus or impaired mobility of the membrane. Both the nose and throat were normal and no other intracranial nerves were involved. As the patient was