pulse was 116, and he said he felt a good deal better. There had been a very good result from the enema.

I decided to operate for the following reasons: (1) The history of a very severe injury. (2) The increase in the pulse-rate. (3) The presence of dullness in the left flank.

The remarkable feature about the case was that the man did not look ill; he was not at all collapsed, and did not appreciate the seriousness of his condition; he was able to describe his accident in detail, and laughed at times during the recital. During the afternoon he said, "I suppose I shall have to be operated on, but I'm as strong as an old toad and shall pull round all right."

Operation.

At 8 p.m. the patient was anaesthetized with chloroform. The skin was first shaved and then painted with tincture of iodine. A vertical incision was made about 1 in. to the left of the middle line, extending from just below the costal margin to the level of the umbilicus. The left rectus muscle was then split in the same direction. Tetra cloths were then clamped to the edges of the wound, so as to exclude the skin from the operation area. On opening the peritoneum blood gushed out. There was a great quantity of blood and blood clots in the left side of the peritoneal cavity, in fact the haemorrhage was so great that the sister who was helping me was soaked right through to her skin, and I would have been in a similar condition but for a mackintosh apron. There was a rupture in the spleen into which two fingers could be inserted. A transverse incision was made extending outwards from the vertical incision in order to obtain better access to the spleen, which was then brought into the wound and the pedicle clamped with Lane's stomach clamp. The pedicle was ligatured in sections with strong catgut and the spleen removed. After all the blood had been removed from the peritoneal cavity the abdomen was closed. During the operation the patient became pulseless,

and 3 pints of saline was injected into the median basilic vein by the house-surgeon; this improved the pulse somewhat, but he was removed to the ward in a very critical condition. During the night 5 pints of saline were infused into the cellular tissue of both thighs by means of Barnard's apparatus.

The next morning the patient said he was very comfortable except for some pain in the region of the wound. There had been vomiting. His pulse at 6 a.m. was 140, but by 10 p.m. had fallen to 120. During July 21st and 22nd rectal salines were given every four hours.

Result.

The patient made an uninterrupted recovery except for some suppuration which occurred in the wound, partly, no doubt, owing to his great loss of blood, and partly to the hurried character of the operation. He was given during his stay in hospital red bone marrow in the form of virol; also sheep's spleens. He was discharged from the hospital quite well on Monday, September 4th. No enlargement of the lymphatic glands could be felt.

Dr. Langley very kindly made an examination of the patient's blood on two occasions, with the following results:

First Examination, July 28th, 1911.

Red Cells.—Number 2 million per c.mm. Rouleau formation fair. Some tendency to agglutination. Marked poikilocytosis. Macrocytes and microcytes present, and ghosts. Polychromatophilia. Granular and vacuolar degeneration marked. Normoblasts and megaloblasts present. Blood platelets numerous. Coagulation good.

White Cells.—Number 6,000 per c.mm., as follows:

Polymorph. neutrophiles	...	212=70.3 per cent.
Small lymphocytes	...	28= 9.3 "
Large lymphocytes	...	29= 9.6 "
Large hyaline	...	16= 5.3 "
Eosinophile	...	14= 4.6 "
Mast cells	...	None seen
Transitional leucocytes	...	1= 0.3 per cent.

There were 13 normoblasts and 6 megaloblasts seen while counting 300 leucocytes.

Second Examination, August 19th, 1911.

Red Cells.—Number 4 million per c.mm. No nucleated red cells were seen. No granular or vacuolar degeneration. Poikilocytosis and polychromatophilia slight. Rouleau formation fair. Platelets normal. Macrocytes and microcytes still present.

White Cells.—Number 6,420 per c.mm., as follows:

Polynuclear neutrophiles	...	143=47.6 per cent.
Small lymphocytes	...	80=26.6 "
Large lymphocytes	...	37=12.3 "
Large hyaline	...	16= 5.3 "
Eosinophiles	...	20= 6.6 "
Mast cells	...	4= 1.3 "

The photograph shows the site and extent of the rupture in the spleen.

ANAESTHESIA FOR SUBMUCOUS RESECTION OF THE SEPTUM.

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THE subject of anaesthesia in the operation of submucous resection of the septum is an important one to both the patient and the surgeon. The fact that the operator has choice of local anaesthesia or general narcosis complicates the problem, and the decision to limit himself to the one or combine the general with the local anaesthetic can only be arrived at after due consultation with the patient and a careful consideration of his state. With local anaesthesia the aim has been to combine ischaemia, with the object of rendering the area of operation as bloodless as possible for visual definition of the parts dealt with. This has been attained by the addition of a few drops of adrenalin chloride to the solution of the local anaesthetic substance—namely, cocaine hydrochloride, novocain, alypin, etc.—used.

Various methods of procuring local anaesthesia have been employed: (1) The topical application of crystals of cocaine to both sides of the septum (Freer); (2) pledgets of cotton-wool soaked in a 20 per cent. solution of cocaine hydrochloride, or novocain, 20 cent., to which a few drops of adrenalin chloride (1 in 1,000 solution) are added, and, lightly squeezed, are packed against the septum for fifteen minutes or so, and the operation proceeded with; (3) the septum is painted over with a 20 per cent. solution of cocaine hydrochloride to which is added a few drops of adrenalin chloride (1 in 1,000), and subsequently infiltrated with a very weak solution of cocaine or novocain to which a few drops of adrenalin chloride are added (Hajek). The last method in local anaesthesia is the one to which my partner, Mr. Marsh, and I adhere; it certainly gives the best results as regards anaesthesia, and the subperiosteal infiltration facilitates the detachment of the muco-periosteum and perichondrium; moreover, the thickening of the muco-periosteum accruing from the infiltration renders it more resistant to perforation.

The following are the steps of the procedure: (a) About one and a half hours previous to operation a substantial meal is given, the ingestion of which enables the patient to better withstand the effect of cocaine. (b) Both nasal passages are sprayed with a 20 per cent. solution of cocaine hydrochloride, to which an equal quantity of 1 in 1,000 adrenalin chloride is added. This application may be made while the patient is in bed. (c) Both sides of the septum are thoroughly rubbed with cotton-wool mounted on wool carriers soaked in cocaine hydrochloride 20 per cent. and adrenalin chloride 1 in 1,000 equal parts; less cocaine is absorbed in this way into the system than if pledgets of cotton-wool soaked in cocaine are introduced for some time. For this step and throughout the rest of the operation the patient withstands the effect of the anaesthetic much better if he is lying on his back on the operating table; there is less tendency to syncope—a somewhat alarming contretemps which I have seen when I used to perform the operations with the patient sitting erect in a chair as Hajek recommends.

THE TECHNIQUE OF THE INJECTION.

A solution of 0.40 cocaine hydrochloride, 0.60 common salt, 200 distilled water (equivalent to $\frac{1}{2}$ per cent. of cocaine hydrochloride in normal saline), to which is added two drops of adrenalin chloride (1 in 1,000) to the cubic centimetre, is used for injection. The syringe employed is of

1 c.cm. capacity, and two needles are used, a long and a short; the needles have tapering barrels extending the greater portion of their length to give them increased rigidity.

One syringe is injected with a long needle in the upper and posterior parts of the septum under the mucoperiosteum covering the bone, in the neighbourhood of the naso-palatine nerve. This serves to anaesthetize the posterior part of the septum. The second syringe is entered in the anterior and upper part of the septum—that is, in the neighbourhood of the internal twig of the nasal branch of the ophthalmic nerve. A third syringe is divided between the line of incision and the septum near the floor, especially where the anterior palatine canal emerges. The same amount is injected on the other side. The mouth is then covered with a mask of gauze, held *in situ* with adhesive strapping, and the operation proceeded with. After the first syringe is injected, certain circulatory disturbances in varying degrees are noticed, the patient usually becomes blanched, beads of perspiration exude, the heart thumps distressingly, and occasionally, in fatty subjects and persons addicted to much smoking, it beats quite irregularly, intermitting one now and again. Others complain of intense pain in the lower part of the back and abdomen—I am inclined to believe this is due to great and tense pulsation of the abdominal aorta. A good many have headaches which last during the operation or supervene some hours later. All these effects are attributable to the action of adrenalin in raising the peripheral pressure and stimulating the heart. These symptoms shortly subside, and the injection may be resumed. The increased pulsation generally occurs in diminishing degree after each injection; sometimes from fifteen to twenty minutes afterwards there is a reactionary fall of blood pressure, and the patient partially collapses, due possibly to the late absorption of cocaine. I have, however, never seen this phenomenon interrupt the course of the operation since I have placed them supine on the table.

With local anaesthesia properly done one can gain complete insensibility to operative manipulations, but there is always a distressing noise transmitted in a magnified degree to the ears when the bone of the superior maxillary crest and vomer are punched out or chiselled away. It is on this account that one is induced to turn to a combination of local anaesthesia and narcosis in nervous and timid patients. With a combination of general and local anaesthesia the patients are unconscious of the circulatory disturbances, grating of the bone, headache, and manipulation of the nose so distasteful to females. The element of danger is increased, however, as some reported fatalities show, but with a competent anaesthetist, and attentive observation of the effect of the injections, the risk is reduced to a minimum.

With regard to the method in detail, anaesthesia is induced with a mixture of chloroform and ether (in the proportion of 1 to 2); the induction should proceed slowly, and when the patient is barely unconscious, that is, when the breathing is automatic but the reflexes brisk, half a syringe of the $\frac{1}{2}$ per cent. cocaine and normal saline above mentioned, to which is added two drops of adrenalin chloride (1 in 1,000) to the cubic centimetre, is injected in the posterior part of the septum. The effect should be watched, and if increased pulsation ensues wait until it subsides a little before injecting any more. The same sites of injection are selected as in the description given of local anaesthesia. I always regard increased pulsation of the heart-beat and a strong pulse as safe signs. Great pallor and no increase in the pulse tension or strength of the heart's beat should excite suspicion, and the injection must be suspended, the operation being pursued without further infiltration. Irregularity of the beat occurs occasionally, although the heart may beat strongly. This I regard as no deterrent, but intermittent beating associated with a pulse of a weak and feeble character is distinctly interdictory. In this connexion I should like to interpolate a report of 3 cases showing the alarming effect of the sudden absorption of adrenalin on the system—an effect due, in my opinion, to the action of adrenalin on a circulatory system depressed by chloroform, and not the result of a nasal reflex, for the action only supervened after a latent period corresponding to the approximate time of absorption.

CASE I.

A pale and anaemic woman with a feeble circulation was fairly deeply anaesthetized before the submucous injection was thrown in. About a minute after this the patient suddenly became intensely pallid, respiration ceased, and the pupils suddenly dilated. She was promptly inverted, and after about twenty to thirty seconds of anxious waiting she gave a sighing respiration, then a second, and finally recommenced breathing. Artificial respiration was not resorted to.

CASE II.

This case occurred in a woman about a month later almost in the same way, except that the untoward symptoms appeared earlier. Inversion restored her breathing, and the operation was completed.

In both these cases the effect was at first attributed to chloroform overdose, but in the light of a further case which occurred a week later at the Ear and Throat Hospital this opinion was modified.

CASE III.

This was a case of endo-nasal operation for antral suppuration. The patient was rather deeply anaesthetized, and I injected $\frac{1}{2}$ c.cm. of normal saline with a few drops of adrenalin (1 in 1,000) added into the anterior end of the inferior turbinate, with the object of resecting this bloodlessly. Within ten seconds respiration ceased, the pulse was suppressed, and the pupils widely dilated. She was inverted immediately, and respiration gradually restored, the pulse becoming stronger by slow degrees.

The effect was attributable to adrenalin as no cocaine was present in the solution. It occurred earlier in this case owing to the wide venous space into which it was injected and more rapid absorption into the system. One can only conjecture how it acts. Is it by causing anaemia of the bulb, or may there be some slight toxic action on the respiratory centre? Does the heart first fail owing to spasm of the coronary arteries? The whole condition supervenes so rapidly it makes accurate observation difficult. After the injection the mouth, chin, and lips are well vaselined over; a piece of gauze fourfold thick and about 3 in. wide is doubled across a strip of adhesive strapping, this mask is laid across the mouth and affixed by the strapping to the cheeks. The mouth is kept half open by a Doyen's gag, and the anaesthetic administered by dropping it on the gauze, which is kept slightly raised from contact with the mouth by the hand. Very little anaesthetic is required, as the local infiltration numbs all pain and consciousness need only be barely abolished.

CONCLUSIONS.

For *local anaesthesia* (1) all healthy individuals who do not mind slight discomfort; adipose subjects if they will submit to it.

For *combination of general and local*—nervous and timid subjects who prefer abolition of consciousness in whom the heart is quite sound; (2) children if operation is really necessary. Great care should be exercised in anaemic pallid subjects with a feeble pulse. Over a hundred cases have been done with a combination of local and general anaesthesia, and more than five hundred with local anaesthesia, with no fatalities.

A preliminary injection of scopolamine and morphine is to be deprecated as the morphine seems to inhibit the ischaemic effect of the adrenalin.

ATROPINE AND OPEN ETHER ADMINISTRATION.

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In order to facilitate the general adoption of the open method of ether administration I venture to place on record some modifications of technique which contribute towards the ease of the induction and the perfection of the resulting anaesthesia.

An initial communication on this subject appeared in the **BRITISH MEDICAL JOURNAL** for November 23rd, 1907, and a description of the method used in the **JOURNAL** for January 18th, 1908. A paper was also read at the annual meeting of the British Medical Association in London, 1910, and reported in the **JOURNAL** for September 17th, 1910.