

the side branch brings in the air and the long straight part of the needle holds the stillette.

Different needles vary in size and the nature of the point. Some are blunt, others sharp; some are open at the end, others are closed; some have a lateral opening, others have a stillette which acts as a trocar. The most used needle is Clive Rivieres. There are two types: one for induction and one for refills. My own induction needle is designed so that a reading on the manometer is obtained immediately the needle enters the pleural cavity, before the stillette is withdrawn. We can now consider the technique of the operation. What instruments are necessary:—

- (1) Artificial Pneumothorax apparatus.
- (2) Induction and refill needles.
- (3) Sterilised rubber tubing and glass connecting rod.
- (4) One cc. hypodermic syringe and five needles.
- (5) Local anæsthetic, one moderately large bore hypodermic needle.
- (6) Tincture of Iodine.
- (7) Methylated spirit.
- (8) Ether.
- (9) Sterile towels and swabs.
- (10) Whisky or brandy.
- (11) Strychnine hydrochloride gr. $\frac{1}{10}$ in ampules (with small file).
- (12) Gauze dressings.
- (13) Collodion.
- (14) A scalpel.

An injection of morphia and atropin is given 20 minutes before operation. The patient is placed in a comfortable position, with the site where the puncture is being made conveniently accessible, and the body arched so that the ribs are separated as far as possible by a pillow under the patient's body. During the operation a nurse takes the pulse all the time, and reports on its condition. Sterile towels are placed in position, and the skin prepared in the usual manner. The skin, and parietal pleura are then anæsthetised by local anæsthetic. The reservoir of the A. P. apparatus is filled with air and the needle connected by rubber tubing. The needle is then introduced into the pleural cavity and the stillette withdrawn. If the space is free a reading will be shown on the negative side of the manometer and the column of water or the needle of the manometer will show a suction of 5 to 10 c.m. of water. Air is then slowly run into the pleural cavity until the desired pressure is registered. This pressure is noted along with the amount of air used. The needle is withdrawn, and the site painted with iodine and a small collodion seal applied to the site of puncture.

The needles are kept in methylated spirit and then transferred to ether shortly before use. When taken out of the ether they dry quickly and are sterile.

If the operation is an initial induction it should be performed on the patient in bed, and afterwards he should keep quite still for two hours. The pillows must be gently withdrawn and the cough prevented as much as possible, and his side compressed with a pad of wool if necessary. After remaining still for two hours he is kept strictly in bed.

The first refill is generally done on the following day, and the next on the third, or fourth day. An interval of one day is then allowed, and further refills given at slowly increasing intervals. After two weeks the patient is allowed up if his temperature and pulse are normal, and the interval between the refills is decided by periodically screening the patient under the X-Ray. Some patients hold the air much better than others and are soon able to go two, three and sometimes four weeks between refills.

The dangers and complications are interesting, and important.

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| | Pleural Shock. |
| | Air Embolism. |
| (1) Immediate | Nervous Manifestations. |
| | Surgical Emphysema. |
| | Pain. |
| | Pleural Effusion. |
| (2) Remote | Pyo pneumothorax. |
| | Movement of the Mediastium. |

The immediate complications are not common in fact, the first three are very rare, but when they do occur they are very serious and may be fatal.

Pleural Shock, when it does occur, gives little warning. The patient suddenly collapses, the pulse fails, there is an intense pallor of the face, the pupils dilate and respirations cease. Strychnine should be given immediately and the patient doubled up to compress the abdominal viscera and the splanchnic plexus. To prevent its occurrence, careful anæsthetising of the pleura, and an injection of morphia and atropin are recommended.

Air embolism again is very rare, and means bad technique as the air has been put into a blood vessel and therefore there could not have been a swing on the manometer. Air should never be introduced if there is not a good swing of the manometer.

Nervousness is sometimes very troublesome and it is wise to stop the operation if any signs of serious discomfort or collapse arise.

Surgical Emphysema may appear shortly after the operation from leakage of air into the chest wall. It is generally due to coughing, and may be prevented by stopping the cough, and giving the patient a pad to hold against his side when he coughs. Sometimes it is necessary to strap the side.

Pain may occur during the introduction of the air. It is generally due to stretching adhesions, and often localises itself in the shoulder. If severe the operation must be stopped, and refills given frequently and very gently, small amounts of air being introduced.

The formation of Fluid is the most frequent of the remote complications. It occurs in about 60 per cent. of cases at some time during treatment, and the exact cause is still a debatable question.

Fluid occurs in about 60 per cent. of cases and may appear at any time during the treatment. Sometimes its formation causes considerable constitutional symptoms whilst in other cases no rise in temperature, or any indication of its presence is given. The majority of cases do show a change in the intra pleural pressures just before, and in all cases it rises after the formation of the fluid.

The presence of a simple sterile pleural effusion need not cause alarm. The patient is apt to become alarmed but he should be reassured, and told that it is of no danger. Sometimes the presence of fluid is an advantage and after its formation the patient begins to make good progress.

What should then be done as regards treatment?

If there are any constitutional symptoms the patient must be put to bed until all activity has quietened down. A specimen of the fluid should be sent to the laboratory. If it is sterile the fluid should not be interfered with without good reason. If the fluid is septic then it must be withdrawn and replaced by air. This is done with two needles, one connected to an aspirator and the other to an A. P. apparatus.

An X-Ray photograph and screening will show if the lung is tending to expand under the fluid. If so there is danger of the A. P. being obliterated, which is highly undesirable if there is active disease in the lung. It is therefore necessary to replace the fluid with air and compress the lung. Of course if the patient has any discomfort from the presence of the fluid it should be withdrawn and replaced by air.

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