uterus went back promptly and smoothly, the douche-can being held two to three feet above the vagina. The accompanying photographs, taken at the time, show (Fig. 1) the inverted uterus, with one of the complete tears; (Fig. 2) the cervix after replacement.

At the end of the operation there was no clinical evidence of any free fluid in the peritoneal cavity and the patient's condition was fair. Her puerperium was febrile for two weeks, but ultimately she made a complete recovery under first sulphanilamide then penicillin treatment.

Synopsis of the Complication

Acute inversion of the uterus means a rapid turning of the uterus inside out *per vias naturales*. This serious complication usually occurs during the third stage, though sometimes it may begin towards the end of the second stage by the pull on a short cord or soon after the separation of the placenta. Various authors put the incidence at between 1 in 200,000 and 1 in 17,000 deliveries. It usually occurs after a full-term labour, but has been reported in a five-months miscarriage.

The condition may be divided into (a) incomplete—including all degrees from a placental dimple to inversion into the vagina; (b) complete—where the fundus is outside the vagina. The common cause is mismanagement of the third stage of labour by: (1) pulling on the cord when the uterus is relaxed; (2) pushing on the fundus of a relaxed uterus; (3) a combination of these two. In the two cases just described one or both were caused by one of these three ways. The catastrophe is most likely to occur if the placenta is attached to the fundus. Careful records of this point would be of great help. Well-authenticated cases of spontaneous inversion have been reported.

The symptoms are usually very severe shock, out of all proportion to the amount of blood lost; a tendency to bearing down after the placenta has been delivered; and, later in the puerperium, a persistent red haemorrhage or oft-repeated small haemorrhages, with obvious signs of anaemia and difficulty in micturition.

The signs are as follows. A complete inversion is self-evident. An incomplete inversion may be mistaken for a large fibroid polyp, but if the bladder is empty an abdominal examination will reveal the absence of the fundus uteri in the abdomen, and in its place a saucer-shaped depression where the fundus has been invaginated into the uterine cavity. Examination reveals a large rounded polypoid mass with a broad pedicle in the vagina. This, with the abdominal findings, renders the diagnosis obvious.

The prognosis is always very grave, the mortality varying between 23 and 80% in different series. If left alone, sloughing and/or sepsis may occur. In some cases spontaneous reinversion in a matter of hours, in others even during the passage of years, has been reported.

Treatment.—(1) Immediate replacement as soon as the inversion occurs, and before shock develops, without attempting to strip the placenta if it is still attached. (2) If the patient is very shocked, first clean the uterus and change the complete inversion into an incomplete by gently replacing the inverted uterus in the vagina, then raise the foot of the bed, put a sterile pad on the vulva, and carry out treatment for shock. (3) When shock is controlled replace the uterus as described above by hydraulic pressure.

My grateful thanks are due to Dr. H. R. England and Dr. H. Mayer for their great help in the second case, and to Dr. L. B. Bourne for the excellent photographs.

Writing on vision and selection of personnel in industry in the July/August number of *Industrial Welfare and Personnel Management* Mr. Joseph Minton, F.R.C.S., expresses concern at the haphazard methods of vision testing in industry, many firms insisting on visual standards which are too high, others having no standards at all. As he says, men and women with all grades of vision can be employed in industry to-day, and he gives a chart for use as a general guide when selecting workers. In the same issue is an account by Col. S. D. Large of the planned exercises, mental and physical, at an Army convalescent depot which enables 85% of the men to leave fit. From his experience 70,000 cases Col. Large concludes that the principles practised at this depot could be applied with gain in civil centres. Dr. J. B. L. Tomblinson describes a scheme operating in Bedford which provides a medical service to 10 firms employing about 7,000 workers.

ADMINISTRATION OF PENICILLIN BY INTRAMUSCULAR INFUSION

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This account deals solely with the clinical aspects of the administration of penicillin by intramuscular infusion as described by Morgan, Christie, and Roxburgh (1944). Experience with 30 patients is summarized and attention is principally focused on three points: (i) whether this method was preferred by the patient to intermittent intramuscular injection; (ii) whether it was convenient for the medical officer; (iii) whether there was any ill effect from its use.

Technique

The instrument used was the Eudrip 2 (see Fig.), briefly referred to by McAdam, Duguid, and Challinor (1944). It is

Eudrip apparatus No. 2 in use.

similar in principle to Eudrip 3, which they describe in detail, but instead of the 4-oz. "medical flat" bottle for reservoir there was a 100-c.cm. burette with 24 graduations. In the top of the burette there is a rubber bung with two holes for the glass tubes. To the tube which passes to the bottom of the burette is attached the capillary air intake, to the other a piece of rubber tubing and a clip for release during filling. This is done by filling the side arm and elevating it. The side arm and other connexions are similar to those of Eudrip 3.

Three types of needle were used: the ordinary needle in an M.R.C. pattern blood-transfusion set; one similar to this but with two side perforations; a needle of the Middlesex pattern.

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Cetavlon was used for skin-cleansing. The needles were inserted without local analgesia.

The penicillin used for the first three or four cases was made by Pfizer, the remainder by Eli Lilly. A drip was not set up on a patient unless it seemed likely that it would be required for at least three days and unless he had had a course of injections previously. All the patients were in a 30-bed ward reserved for men from B.L.A. who had been specially selected as having severe compound fractures—of the leg in most cases. The majority of the drips were started within a week of wounding while the condition of the men was still acute. The usual site of the drip was the antero-lateral aspect of the thigh or the pectoral region, but on occasion both the calf and the trapezius muscle were used satisfactorily.

A drip was set up in 7 to 15 minutes by a medical officer, who checked its speed after an interval of approximately 1 to 3 hours. After that the nursing staff was responsible for its watching and refilling, the medical officer checking it only once or sometimes twice a day. The needles were changed either when there was an indication or every third or fourth day, although at first they were changed more frequently. The later tendency was to leave the needles *in situ* for longer periods—at the most 7 days.

The intermittent injections were administered by the nursing staff. No nurse was allowed to give the injections until she had been instructed by the medical officer and had been seen by him to do this satisfactorily. A subcutaneous needle of the size of a "Record" fitting No. 18 was used. Care was taken to see that the needles were sharp. 16,600 units of penicillin in 2 c.cm. of saline were given three-hourly—always slowly. For 24 hours one thigh was used for the injections, then a buttock for the next 24 hours, and similarly on the other side.

Patients' Preference

Out of 30 patients, 24 were quite emphatic that they preferred Eudrip 2 to injections. The commonest cause of drip preference was that sleep was undisturbed. Only two preferred the drip because of the actual pain experienced from the injections; but many had a considerable dislike of the needle-pricks, while two stated that their "nerves went to pieces" with the injections. Incidentally, these two were severely ill patients who required rest, and both took drips excellently.

In 4 cases in which both pectoral and thigh regions were used the thigh was strongly preferred, but patients disliked frequent changes of site, owing to the sensation on introduction of the needle. Drips were therefore started, where possible, while the patient was still under the influence of general anaesthesia following operation. Hence the indications from the patients' point of view for drip therapy were: (i) inability to sleep while having injections; (ii) fear of injections, which is easily transmissible round the ward; and (iii) pain from injections.

Six patients preferred injections, the chief reason being that these were quickly over and almost painless, while with a drip the needle was always present, which if not actually painful could be felt. That movement was hampered was also a source of complaint. Two had a strong dislike of the drip. Neither of these could give any obvious reason, and one, who was intelligent and bore severe pain without complaint, had such a horror of the drip that it had to be discontinued after a day.

Convenience of Use

The main difficulty in using the drip was the maintenance of a slow and steady supply of penicillin. The common cause of an irregular flow was a leak at the air capillary owing to the rubber splitting or a bung which did not fit perfectly. These resulted in too great a flow to the leg, with pain, to relieve which the delivery tube was sometimes clipped off, with subsequent blockage of the needle. The latter became a serious danger after half an hour's cessation of flow, although it occasionally happened sooner. Out of a total of 11 blocked needles, 8 had some antecedent technical difficulty with the drip. In four cases the blockage was probably avoidable and due to inexperience. A striking feature was that if there were no technical difficulties a drip would run to time almost exactly, with the minimum of interference. The number

of drips going at a time varied, but it was found possible for one medical officer to have seven running simultaneously without interfering with his other duties.

A typical history of such a drip is as follows:

Day 1, 14.00 hrs.: Drip set up. Needle, left thigh. 100,000 units penicillin in 100 c.cm. saline
Day 2, 14.30 hrs.: Refilled. 100,000 units penicillin in 100 c.cm. saline
Day 3, 13.45 hrs.: Refilled. 100,000 units penicillin in 100 c.cm. saline
Day 4, 13.30 hrs.: Refilled. 100,000 units penicillin in 100 c.cm. saline
Day 5, 14.30 hrs.: Discontinued. End of course. No redness or swelling at needle site. Minimal tenderness on firm pressure on site

The following is an account of a not so satisfactory drip, such as was encountered occasionally.

Day 1, 22.00 hrs.: Drip set up. Middlesex needle, right thigh. 100,000 units penicillin in 100 c.cm. saline
Day 2, 09.00 hrs.: Drip too fast all night and had required frequent readjustment. Small leak round bung. Needle blocked. Stylet passed and needle reinserted near by
" 16.30 hrs.: New set put up, as old one still leaked round bung
Day 3, 18.30 hrs.: Refilled; new set running regularly (100 c.cm.)
Day 4, 09.30 hrs.: Slight tenderness at drip site
" 19.30 hrs.: Refilled (100 c.cm.)
Day 5, 20.30 hrs.: Discontinued. Very slight tenderness at drip site

III Effects

Fifteen patients admitted to some tenderness on firm palpation over the needle site after withdrawal, but pain was not a feature of the drips in any instance. In three cases very slight skin redness and in one case a moderate area of reddening were noticed. In eight cases there was a trace of localized oedema, which would probably not have been observed unless specially looked for. Subsequent stiffness of a limb with delayed return to full function was not found in any case, nor was there any abscess formation or pus in the needle track. The effectiveness of the treatment was demonstrated by measurement of blood penicillin levels, by the disappearance of Gram-positive pyogens from wounds, and the steady progress made by patients towards recovery—local and general.

The general impression at the end of the series was that, in a hospital where there are a practised operator and several nurses well acquainted with the technique of continuous intramuscular infusion, it is the method of choice for the patient and no more laborious for the staff than intermittent injection. In some cases in which injections are tolerated badly it is of great value. When it can be alternated with a course of injections it is especially acceptable to those who have to submit to a lengthy course of penicillin therapy. Some time, however, must elapse before a staff becomes proficient in using the apparatus, and, for this, instruction and practice are necessary.

Summary

Out of 30 patients 24 preferred Eudrip 2 to intermittent intramuscular injections.

Local reactions were slight or *nil*. No abscesses occurred.

With an experienced staff the time taken for supervising the accurate running of the apparatus is not considered greater than that required for repeated intramuscular injections.

The brands of penicillin used for both methods of administration were the same.

A further 10 drips have been set up in the same ward with less experienced staff, and they bear out the conclusions drawn in this paper—that it is a practicable form of treatment in a busy ward provided the staff has some instruction and practice.

I wish to thank Lady Florey and Prof. Christie for their great help in the preparation of this paper; and also Drs. McAdam, Duguid, and Challinor for permission to reproduce their illustration of Eudrip 2.

REFERENCES

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It is announced from Leeds that Yorkshire has—apart from the Army Blood Transfusion Service itself—contributed more blood and blood products to the armed Forces than all the other regional services put together. Between January, 1941, and May of this year 25,028 bottles of whole blood and 128,523 bottles of dried serum or plasma were supplied. The number of donors presenting themselves is now falling off, and a warning was issued by the Public Relations Officer that general, maternity, and military hospitals have still to be supplied, and that consignments of plasma are being shipped to the Far East.