left tube. The patient's condition then improved, but during the night she was seized with colicky pains, evidently the attempt at abortion of the part of the right tube. In both cases she referred the pain to the centre of the lower abdomen. The physical findings were not helpful in aiding the diagnosis of bilateral tubal pregnancy, but in the light of subsequent findings the extreme tenderness on the right side in conjunction with the tumour on the left should have suggested the possibility.

The question of the relative ages of the pregnancies in this case it is impossible to decide. The periods had been regular till six weeks before the onset of the illness, and it is therefore reasonable to assume that both pregnancies were of equal development. Neither foetus was recovered, so help from that source is lacking. Finally, there was only one corpus luteum of pregnancy. It is probable that this was a case of simultaneous bilateral tubal gestation, but further than this it is impossible to go. The aetiology of tubal pregnancy is still *sub judice*. That inflammatory changes are frequent precursors of tubal pregnancy is, however, extremely probable, and in this case the history of three previous attacks of lower abdominal pain is very suggestive of salpingitis being at least a predisposing factor.

Finally, with regard to treatment opinions vary. Lockyer (1917) considers that the possession of a normally menstruating uterus is of great importance to the mental outlook of the patient. Launay and Seguinot (1911) consider that in such cases it is often impossible to tell ovary from tube; that both are grossly disorganized and both may need to be removed. They argue, then, that the uterus is superfluous when both tubes and ovaries are removed, and a subtotal hysterectomy permits of better toilette of the pelvic cavity and reperitonization of the raw areas. Beckwith Whitehouse (1935) advocates conservation of the ovaries when possible and also of the uterus, unless special circumstances call for its removal. Undoubtedly if the condition is diagnosed before rupture double salpingectomy is sufficient. After rupture, when the patient is suffering from shock and haemorrhage, the minimum of surgical intervention necessary to relieve the condition seems indicated, and therefore the author is in favour of double salpingectomy, conserving the ovaries, or at least a portion of the ovaries, whenever possible.

I am indebted to Dr. Fitzgerald for permission to operate and report on this case.

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A special commission for scientists and doctors and others interested in the relation of science and medicine to peace, meeting simultaneously with other commissions on Saturday, May 29, will be a feature of this year's National Peace Congress, to be held at Friends House, Euston Road, London, from May 28 to 31. The chairman of the commission is Professor S. Chapman, F.R.S., of the Imperial College of Science, and the introductory speech will be made by Professor P. M. S. Blackett, F.R.S. The commission will discuss the development of the contribution of the scientific and medical world to the promotion of international peace. All interested organizations, national and local, are entitled to appoint delegates to the congress or to the science commission. Individuals can also attend as visitors. Copies of the programme and full particulars are available from the National Peace Council, 39, Victoria Street, S.W.1.

INTRA-EPIDERMIC VACCINATION

BY

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The vaccination of a large number of individuals speedily and efficiently is a problem which often confronts the medical officers of port health authorities. For instance, in the event of a case of small-pox occurring in a large passenger liner the number of contacts to be vaccinated may amount to several hundreds; the quantity of lymph at one's disposal may be limited, and it is imperative that the method adopted should be simple, speedy, efficient, economical, and, above all, leave as few ill effects as possible.

Intra-epidermic vaccination, which has been in practice for ten or more years in Canada and the United States, and has also been used exclusively by the medical officers of the Liverpool Port Health Authority for the past three years, satisfies all these requirements, and experience has shown it to have many advantages over the scarification method.

It is *simple and speedy*, in that it is merely one intra-epidermic puncture not more than a sixteenth of an inch, and in addition is entirely painless.

It is *efficient*, since when the lymph is good and the technique correct a specific reaction never fails to appear.

It is *economical*. The avoidance of wastage of lymph is sometimes of paramount importance when the amount is limited. By the intra-epidermic method an efficient vaccination is obtained with a minute drop of lymph, so that a tube indicated for one vaccination is sufficient to vaccinate twelve people or even more. As no dressing is required on the arm at the time of vaccination a great saving in gauze or lint, and bandages or strapping, is effected. Dressing is only necessary if and when the pustule appears.

Technique

The usual means by which lymph is transferred from the tube to the arm have never been satisfactory; rubber bulbs for fixing on to the end of the lymph tube after the ends have been broken off do not entirely meet the case, as the bulb is too small to give that delicacy of touch which is necessary for the expression of successive and discrete minute quantities of lymph from the tube, while the unhygienic practice of blowing the lymph out of its tube cannot be too strongly deprecated, and may possibly be the cause of secondary infection.

In the transference of minute drops of lymph from the tube to the arm the following procedure has been found to be eminently satisfactory; the only apparatus required is a soft rubber teat as used in a baby's feeding bottle. At least a dozen persons may be vaccinated with one ordinary small tube of lymph, and this number can be increased with practice. The glass tube, sealed at both ends and containing the lymph, is pushed through the small hole of the teat until about an inch of it is visible (Fig. 1, A). This end (Fig. 1, A) is broken off, and the glass tube drawn back again until about an inch is still left within the teat (Fig. 2). The free end of the lymph tube is then broken off, and by means of gentle pressure with the thumb over the open end of the teat successive and discrete minute quantities of lymph can be expressed (Fig. 3). Whereas by the old methods one tube of lymph was used to vaccinate one or perhaps two persons, it will be found that by the method just described one small

tube of lymph will be sufficient to vaccinate a dozen or more persons. Particular care must be taken to maintain a steady pressure of the thumb when expelling the lymph from the tube. Any relaxation will cause the lymph to be drawn back into the teat and subsequently lost.

If a large number are to be vaccinated at one time it is an advantage to have two medical officers working together, and also a nurse or attendant for the purpose of cleaning the arms with spirit. When the arms have been prepared one medical officer goes down the line,

FIG. 1.

FIG. 2.

FIG. 3.

putting the smallest possible amount of lymph on each arm, followed by the second medical officer, who does the actual vaccinating. In this manner mass vaccination can be carried out speedily and efficiently. The technique is exactly similar to a Schick or a Dick test: a straight, solid, sterile needle is held almost parallel with the skin and the point is inserted gently through the drops of lymph, under and along the epithelial layer for about a sixteenth of an inch, and immediately withdrawn; by this means a minute quantity of lymph is carried into the layers of the skin on the point of the needle, and although so small in amount is sufficient to produce a perfect vaccination, always provided that the individual is not immune. In this way blood is never drawn. It is not necessary to attempt to rub the superfluous lymph into the needle track, and no dressing is required on the arm. The vaccination is inspected after twenty-four hours, and daily afterwards if the exact nature of the reaction is to be recorded. In no case where the technique is correct and the lymph efficient is there failure to react

in one or other of the following forms—namely, (a) immune reaction; (b) vaccinoid; (c) successful vaccination.

(a) *Immune Reaction*.—If the subject be immune owing either to a previous vaccination or to a previous attack of small-pox a faint red spot with slight swelling and some itching will appear over the site of puncture in about twenty-four hours. The reaction reaches its maximum in about forty-eight hours, and usually disappears in about four days.

(b) *Vaccinoid*.—This is a modified vaccination, and appears on either the third or the fourth day in the form of a vesicle or small pustule about a quarter of an inch in diameter. Constitutional reaction is slight and generally unnoticed.

(c) *Successful Vaccination*.—No local reaction appears before the fourth day, and very occasionally may be delayed until the sixth day. The local and constitutional symptoms correspond with those of an uncontaminated successful vaccination by the scarification method. The absence of any reaction within six days is due either to poor lymph or to faulty technique, and in such cases revaccination should be carried out, preferably with different lymph and repeated until a reaction is seen.

Advantages of the Method

From observations carried out over a period of two years on vaccinations performed by this method a number of interesting facts have been elicited:

1. It is extremely rare to get severe local or constitutional disturbances. Two ship's companies, each consisting of several hundred men, were vaccinated, one by the intra-epidermic method and the other by the scarification method. The lymph was of the same origin and the surgeons were experienced vaccinators. In the ship's company vaccinated by the former method there were no "bad arms" and none of the crew was off duty, whereas in the latter there were no fewer than 5 per cent. who suffered from severe local and general reactions and were off duty for varying periods of from two to five weeks.
2. No dressings are necessary at the time of vaccination.
3. There is a great saving in the amount of lymph used, which is an important factor when a large number of vaccinations are performed at one time.

FIG. 4.

4. There is no necessity to rub in the lymph after the needle has been withdrawn (Fig. 4 shows diagrammatically how the operation should be carried out).

5. Many hundreds of intra-epidermic vaccinations have been performed in the Port of Liverpool, and so far there is no history of any case of post-vaccinal encephalitis.

6. There is no trauma arising from the needle puncture, and the immune reaction when present is perfectly definite.

This reaction also occurs when the scarification method is used, but is obscured by the trauma.

In conclusion, there is a tendency on the part of an operator carrying out this method for the first time to think that the small quantity of lymph carried into the layers of the skin on the point of the needle will be inadequate to result in an efficient vaccination, but practical experience will dispel this idea.

I am indebted to Dr. T. Gwynne Maitland, medical superintendent of Messrs. Cunard White Star Limited, for the records of a large number of vaccinations carried out intra-epidermally; and to Dr. F. C. Logan, medical superintendent of the County Mental Hospital, Gloucester, for suggesting the method of transferring the lymph from the tube to the arm.

A NOCIFENSOR LESION OF THE HAND

A SYNDROME FOLLOWING TRAUMA AND ASSOCIATED WITH ADDUCTION OF THE SHOULDER

BY

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During the past two years we have been greatly interested in five patients with peculiar circulatory and sensory disorders of the hand following injury to the upper extremity but not due primarily to injury of the hand itself. Most of us are familiar with cases in which after a direct blow to the carpus with or without fracture a profound circulatory stagnation occurs in the hand with an extreme form of osteoporosis in its skeleton. The present cases are different, however, for, as I shall show, the cause of the circulatory disturbance in them is to be found in the shoulder region. I have thought it worth while drawing attention to these cases because a knowledge of the possibilities may enable one to be on guard to prevent them and because I believe an appropriate demonstration is provided of a type of disorder recently described by Sir Thomas Lewis as of the "nocifensor" system.

Symptoms and Signs

All five patients were women between the ages of 40 and 50 who had suffered some trauma to the upper limb between two and four weeks prior to the onset of symptoms in the hand. The original trauma varied—there were two cases of Colles's fracture, one of fractured olecranon, one of fractured clavicle, and one of traumatic arthritis of the shoulder-joint. In four out of five cases the right upper limb had been injured. In every case the arm had been immobilized by the side since the injury. The symptoms complained of were pain in the region of the shoulder-joint, severe constant burning pain in the hand and fingers with increasing stiffness, and extreme sensitiveness both to touch and to changes of temperature. The signs were practically constant in each case. There was marked limitation of movement of the shoulder, with generalized tenderness around the joint. The patients with a traumatic arthritis of the shoulder-joint and with a fractured clavicle were the only two giving a history of injury in that region.

The skin of the hand and fingers was smooth and shiny. The colour varied from red when warm to blue when cold. There was hyperalgesia to pin-prick and hyperaesthesia to light touch over the affected area, more marked, as one would expect, on the flexor aspect. The

interphalangeal joints were stiff and painful. In the older cases trophic changes were commencing in the nails and the fingers. In short, the general picture was similar to that of causalgia. Further clinical examination revealed several features of interest. In two of the patients the pupil on the same side was larger, suggesting some degree of cervical sympathetic irritation. This was supported by the finding of a blood pressure raised by ten millimetres of mercury in the affected arm in three patients, one of whom had an enlarged pupil. Radiographic examination was made of the cervical spine, shoulder, and hand in each patient. One had evidence of the common mild cervical arthritis. No cervical ribs and no bony changes in the shoulder were demonstrated. In two patients there was definite osteoporosis of the bones of the hand. This is a common finding in any hyperaemic condition of long standing.

Outstanding Features

In these five cases there are three outstanding features. First, they represent only a fraction of the injuries of the upper limb treated in a similar manner; secondly, they showed evidence of sympathetic stimulation at a high level; and, lastly, there were peripheral circulatory disturbances of a constant type resulting from injury at various levels. It remains to demonstrate an organic lesion capable of producing these features, each of which will be discussed in turn.

There can be no doubt that immobilization of the upper limb and shoulder girdle must tend, especially in middle-aged women, to produce not only some drop of the shoulder girdle in relation to the bony thorax, but also some distraction of the humerus from the scapula at a lax joint which is dependent more than any other upon muscle tone. This second factor might well be the cause of the constant periarticular adhesions of the shoulder-joint. This downward drag must tend to put the lowest trunk of the brachial plexus on the stretch as it runs over the first rib.

Telford and Stopford, following the work of Todd, have shown by histological studies that the sympathetic connexions of the lowest trunk of the brachial plexus are generally found scattered within the trunk. They drew attention, however, to the fact that in a certain number of cases these sympathetic fibres may lie close to the periphery and even form a distinct separate bundle in the inferior part of the trunk that is nearest to the first rib. In such a position the sympathetic fibres are more exposed to the risk of irritation or drag across the rib, and give rise to vascular symptoms. We have considered that such sympathetic irritation, with resultant arteriolar spasm, would account for the rise of blood pressure on the affected side in our cases, and that drag upon the inferior cervical ganglion or its branches would result in similar irritation and be responsible for the slightly dilated pupil.

In searching for the cause of the peripheral circulatory changes we are upon even less certain ground. For many years the posterior nerve roots were thought to contain fibres concerned only with sensation. Then it was found that if posterior nerve roots or sensory cutaneous nerves were cut and their peripheral ends stimulated flushing of the skin was produced. Sir Thomas Lewis showed that these antidromic impulses in the sensory nerves produced in the skin a substance like histamine which dilated the cutaneous vessels, a response favourable to trauma and inflammation. He has recently shown that these impulses are not antidromic, but are carried by hitherto unknown efferent fibres travelling to the periphery in the sensory nerves. Stimulation of these fibres produces throughout