ness was produced, and then continued at about 40 drops a minute for the duration of the operation, the rate being increased or reduced according to the individual circumstances.

Severely shocked patients were not touched at the end of the operation, but when circumstances permitted were left on the table for several hours. We considered that lifting a gravely ill patient on and off the table, rolling him to put on bandages, and putting him into bed would have been almost certain to tip the balance in the wrong direction.

Local anaesthetics were never used in this series. Several cases admitted second-hand after having had wounds excised and explored for foreign bodies under local anaesthetics were found to be painful and infected. This unfavourable condition had been caused or aggravated in some measure by the insertion of a local anaesthetic into tissues potentially infected and certainly devitalized.

Summary and Conclusions

100 wounds caused by the projectiles of warfare, the majority of them recent, have been treated.

Excision in early cases, and débridement in later cases, followed by adequate immobilization in plaster-of-Paris, have been successfully employed.

Efficient immobilization lessens the incidence of infection in wounds and materially aids its resolution when once it has set in.

Chemotherapy is not necessary as a routine in the treatment of early wounds occurring in areas where the soil is not heavily contaminated with anaerobic organisms. Its best use is as a prophylactic agent in large wounds which it has not been possible to clean completely. We agree with the suggestion of a Field Ambulance officer, Lieut. E. S. Watson, R.A.M.C., that it should be employed as a first-aid measure at the same time as anti-tetanic serum is given to wounded men for whom adequate surgical excision may not be available for many hours.

The silver-nitrate-tannic-acid-gentian-violet treatment of burns again proved successful. We endorse the defence of tannic acid by Park (1940) and the opinions expressed in Cohen's (1940b) summary.

Pentothal intravenously has proved a safe and satisfactory agent for routine use in war surgery.

The use of local anaesthesia in the treatment of war wounds is strongly deprecated.

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A SIMPLE METHOD OF ESTIMATING PROTHROMBIN IN CAPILLARY BLOOD

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The estimation of the prothrombin content of the blood is recognized as a necessary step in the investigation of the haemorrhagic states in general, and it is of particular value in cases of obstructive jaundice prior to operation and in haemorrhagic diseases of the newborn. The method described by Quick (1938) is usually employed. This entails the withdrawal of 4.5 c.cm. of blood either from a vein, which may be difficult to locate in obese or collapsed adult patients, or from the anterior fontanelle in infants, a procedure which the clinician may be unwilling to undertake in view of the haemorrhagic tendency.

If the prothrombin in capillary blood could be estimated in a simple and satisfactory manner the scope and application of such an investigation would obviously be extended. The following method, employing capillary whole blood and snake venom as a source of thrombokinase, can be performed in a few minutes. We have carried out this test on a large series of normal persons, newborn infants, and patients with obstructive jaundice and liver damage, and have found that it gives results comparable to those obtained by Quick's and other methods.

Method and Materials

A standard white-blood-cell-counting pipette is used to measure the various ingredients. It is better to have a number of such pipettes, but if only one is employed it must be cleaned thoroughly with saline after measuring each ingredient. A solution of crystalline sodium oxalate (13.4 grammes per litre) is drawn up into the pipette, and a quantity equal to one division of the pipette is blown into a clean watch-glass. The skin is punctured so that the blood flows freely without squeezing. In infants the heel is the most suitable site. Blood is drawn up to the ninth division and then transferred to the watch-glass. Thorough mixing of blood and oxalate solution is effected by means of a small glass stirring-rod. The snake venom used is Russell-viper venom, supplied by Burroughs Wellcome and Co. under the name of stypven. The solution is prepared by adding 1 c.cm. of distilled water to 0.1 mg. of the venom in dry form. A freshly prepared solution is best, as the efficacy of the venom in solution decreases after a few days. Stypven solution and a solution of anhydrous calcium chloride (2.775 grammes per litre) are in turn sucked up into the pipette to the tenth division and are mixed with the oxalated blood in the watch-glass. Following the addition of the calcium chloride solution, visible fibrin formation usually occurs within twenty-five to thirty-five seconds as timed with a stop-watch. The change is best seen against a white background. The test is repeated on a normal person at the same time and under the same environmental conditions,

and the prothrombin index of the patient's blood is expressed as a percentage of this normal, as follows:

$$\text{Prothrombin index} = \frac{\text{Normal prothrombin time}}{\text{Patient's prothrombin time}} \times 100$$

With practice a high degree of accuracy can be obtained in assessing the coagulation time. Thus repeated estimations done on the same individual under standard conditions show a deviation of only one or two seconds.

It has been shown by Quick (1938) and by Fullerton (1940) that a marked lengthening of the coagulation time occurs only when the level of the prothrombin in the blood falls to 20% of normal or less. By diluting the blood of both the patient and the control to 20% with normal saline, minor differences in the coagulation time become more apparent. If it is desired to adapt this modification to the present technique, a quantity of normal saline equal to forty divisions of the white-cell pipette are added to the ten divisions of oxalated blood present in the watch-glass. After mixing thoroughly, a quantity of this mixture equal to ten divisions is transferred to a second clean watch-glass, in which the test is completed. It should be noted that the effect of such dilution makes it somewhat more difficult to see the onset of fibrin formation.

Comparison with Kato's Test

Our attention has recently been drawn to a paper by Kato (1940) in which he describes a test for estimating prothrombin using capillary whole blood. He states that many hundreds of such tests have yielded results comparable to those obtained by Quick's method on venous blood. The differences between the method described here and Kato's technique are as follows:

1. The use of a white-blood-cell-counting pipette obviates the need for obtaining the special microhaemopipette designed by Kato (1938).
2. The use of snake venom as a source of thrombokinase as described by Fullerton (1940) eliminates the necessity for preparing a brain extract as used by Kato.
3. The carrying out of the test on a normal control person at the same time and under the same environmental conditions is felt by us to be a fundamental part of the method. In Kato's method no control on normal blood is done, reliance being placed on standardizing the solution of thromboplastin so as to produce a clotting time of approximately twenty seconds. The control eliminates the effect of minor variations in the solutions used and the changes in the clotting time which result from variations in temperature and humidity. In practice we use our own blood as a control, and have found that the clotting time of undiluted normal blood may be as short as twenty to twenty-five seconds in the heated nursery of the maternity pavilion and as long as thirty-five to forty-five seconds in the cooler general hospital wards in winter-time.

One of us (J. I.) was in receipt of the McCosh Bursary and Crichton Scholarship in Medicine during the period of this investigation.

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Dr. Albert B. Sabin and Dr. Joel Warren (*Science*, 1940, 92, 536) point out that the toxicity of most available gold compounds is perhaps the greatest barrier to their more widespread use in the treatment of rheumatoid arthritis. In their search for a compound which does not possess this danger of toxicity they have found in preliminary experiments on mice that calcium aurothiomalate fulfils this desideratum. Whether this compound is equally harmless to human beings has yet to be determined by clinical trials.

MULE-SPINNER'S CANCER

BY

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As a medical referee for industrial diseases I have seen over 150 mule-spinners with epithelioma of the skin in doubtful, early curable, and hopelessly neglected states. Visits to cotton mills, conversations with several hundred men and women spinners over 50 years of age whom I have examined for pensions, and many talks with employers and representatives of the workers' Associations have given me some practical knowledge of cotton-spinning. Frequent visits to the Manchester Cancer Research Laboratories kept me informed on the experimental side of the problem. With such exceptional opportunities for doing so, I have formed certain conclusions on the causes of the disease and on measures which, if

A mule-spinner at work.

systematically adopted by masters and men for its prevention or early recognition and treatment, would greatly diminish its dangers if not avert its onset altogether.

Incidence of the Disease.—Southam and Wilson in 1922 drew attention to the frequent occurrence of the disease, and the numbers of cases notified since then to the Medical Inspector of Factories have been recorded in his Annual Reports from 1923. During the seventeen years ending 1939 its average annual incidence was 64 cases with 21 deaths. In 1939 there were 52 cases with 20 deaths, and as medical referee I saw 16 cases last year. The continuing incidence of a preventable disease is very disappointing.

Seat of Election of Scrotal Cancer

Mule-spinners work in bare feet on a wooden floor saturated with oil. They are constantly walking to and fro along the front of the machine, leaning well over but not actually against its front bar, whilst the carriage is moving outwards towards them, in order to join up very rapidly, or piece, broken ends of the yarn. This is almost invariably done with the thumb and finger of the left hand. In most men the bar is on a level with the pubis and groins, and above the scrotum. In the hot room the spinners, in vest