Position of the Patient and Donor.

The left hand of donor grasps the arm of the patient just above the elbow, bringing the donor's radial artery in close proximity to the patient's median basilic vein.

THE OPERATION.

An incision about 2 in. in length is made in the patient's arm over the median basilic vein.

The Preparation of the Artery.—A similar incision is made over the radial artery of the donor. The artery is cleaned for about an inch, the lower end of the artery in the wound is clipped, digital pressure is made over the brachial artery, and the radial is cut above the clip. The end of the radial artery is pulled out of the wound, and a traction suture is tied through the wall of the artery.

FIG. 3.—The insertion of the artery. The donor's and patient's arms have been rotated a short distance, bringing the wounds almost into apposition. Traction has been made upon the radial artery by means of the traction suture and the artery has been drawn into the vein. A ligature has been placed in the vein wall ready for tightening.

The Preparation of the Vein.—Two probes about an inch apart are passed under the vein for haemostatic purposes. A small cut is made into the vein (2 mm. in length); through this the needle bearing the traction ligature from the radial artery is passed. The needle emerges from the vein an inch above the incision. A second suture is now passed through the wound in the vein; this suture is used to close the vein when the artery has been inserted. By drawing upon the traction suture the artery is drawn into the vein, the vein suture is tied, and the probes and digital pressure removed.

The blood is allowed to flow until the donor feels faint. The artery is then clipped, pulled out, and ligatured. The whole procedure is carried out under local analgesia.

It may be objected that making use of the radial artery as a cannula involves a serious and avoidable mutilation of the donor. This is not the case; ligature of the radial artery must be performed in any case, and the excision of an inch or so of the vessel makes no difference. The elasticity of the artery renders its use as a cannula easy, and a considerable length of vessel becomes available through a comparative small wound.

A SIMPLE AND RAPID METHOD FOR THE SELECTION OF SUITABLE DONORS FOR TRANSFUSION BY THE DETERMINA- TION OF BLOOD GROUPS.

BY

ROGER I. LEE, MAJOR M.O.R.C., U.S.A.,
U.S. ARMY BASE HOSPITAL No. 5, B.E.F.

TRANSFUSION has now become a very valuable and widely accepted form of treatment in a large group of selected cases. With improved methods, and with increased skill and experience in the technique, there will probably be a very great increase in the number of transfusions performed.

There still exists a good deal of confusion as to the selection of the suitable donors. It has been a common experience that transfusion, without preliminary tests, may be performed in a considerable series of cases without detriment to the patient. On the other hand, promiscuous transfusions inevitably lead to disastrous results, which may be fatal.

It has long been known that all individuals are divided into four blood groups. These groups are not established at

birth, but become so in the first year of life. Apparently, the blood group of an individual follows the Mendelian law. Using the arbitrary classification of four groups, it is found that approximately:

8 per cent. of individuals fall in Group I.
Nearly 40 per cent. in Group II.
10 per cent. in Group III.
42 per cent. in Group IV.

This does not mean, however, that it is necessary that the donor and recipient should be in the same group. There is abundant laboratory and clinical evidence to show that the only important consideration is that the serum of the patient or recipient does not agglutinate or haemolyze the red corpuscles of the donor. The reason for this is that in the ordinary transfusion one adds from the donor only about one-fifth to one-twelfth of the total blood volume of the patient. The donor's serum is therefore diluted, and prevented from acting in a detrimental fashion. Furthermore, as has also been shown, the patient's cells are amply protected in that dilution by his own serum. Consequently, any transfusion between groups is permissible and harmless, provided the patient's serum does not agglutinate and haemolyze the donor's red corpuscles, although the donor's serum in the test may agglutinate and haemolyze the patient's red corpuscles. This is illustrated by the table, from which it will be seen that if a patient is in

		Serum of Group			
		I.	II.	III.	IV.
Cells of Group I	...	—	+	+	+
"	II	0	—	+	+
"	III	0	+	—	+
"	IV	0	0	0	—

+ = Agglutination and haemolysis.

0 = No agglutination and haemolysis.

Group I he can receive blood from any donor, because the serum of Group I will neither haemolyze nor agglutinate the red cells of any group. On the other hand, the cells of Group I are agglutinated and haemolyzed by all other serums except that of Group I (its own group). Fortunately this group is small. A Group I person is therefore known as the universal recipient. In contrast to Group I, we have Group IV, the largest group, whose cells are agglutinated and haemolyzed by no group, but whose serum will agglutinate and haemolyze the red corpuscles of all other groups. Group IV is known as the universal donor group, since the blood of Group IV can be transfused with safety into any patient. Furthermore, if the patient belongs to Group IV, he can only receive the blood of the same group.

One other factor which may prevent disaster is the variation in the strength of the agglutinating and haemolytic power of a given serum. It has been found that persons within the same group vary greatly in the potency of the agglutinating and haemolytic power of their serums. Thus a cross-transfusion may result in an immediate fatality in one instance, in complete destruction of the red blood corpuscles, haemoglobinuria, and marked jaundice, but without death, in another, and only mild symptoms in the third patient. I have seen an accidental cross-transfusion in a patient, with only mild symptoms, followed some weeks later by a second transfusion of the same amount from the same donor, with death. The explanation, of course, is the development of the agglutinins and haemolysins under the influence of the injection of the suitable protein.

In cases of dire necessity transfusion without tests is, of course, permissible, but it would seem to be almost unnecessary. The minimum procedure should consist of the establishment of the fact that the patient's serum does not agglutinate the donor's cells. This can readily be performed as follows:

A small amount of blood is collected from a patient (1 c.cm. from the ear or finger is sufficient), and allowed to clot. The serum is then obtained. One drop of this serum is placed upon a slide and mixed with a drop of a suspension of blood of the donor taken into 1.5 per cent. citrate solution. (A few drops of blood are taken into approximately ten times the amount of 1.5 citrate solution and shaken. It is very important that the blood be dropped directly into the citrate, and should not be partially coagulated.) The test will appear in a few moments,

and is best examined under the microscope, where, in the event of a positive test, marked agglutination will be evident. The test will also be evident macroscopically. In the event of a negative test it is a wise precaution to raise the cover-glass, and after making sure that the serum and cells are well mixed, to examine the preparation again. The only possible source of confusion is the appearance of rouleaux of the red corpuscles, indicating a too thick emulsion. If the test is negative, transfusion may be regarded as entirely safe.

Our own experience in civil practice, and particularly in base hospital work, has caused us to adopt another procedure. We have constantly on hand a supply of serums known to be Group II, Group III, and Group IV. As soon as persons who belong to Groups II and III have been ascertained—for example, among the medical officers or laboratory attendants—it is possible to determine the blood group of any given individual very readily, and these known persons, or test persons, can act as a supply of the known serums. From the table it can also be seen that, if it is known that any individual is in either Group II or III, all the other groups can be established. By using the serum of Groups II and III, one has only to collect the blood of the person to be tested in citrate solution, and the test can be performed immediately. If the serum of unknown blood is tested against the known cells, it is necessary to await the development of serum after clotting. In case a blood of a known group is not available, it is only necessary to test out, in the manner described above, a series of bloods against each other. By referring to the table the bloods will be found to resolve themselves into the several groups. The usual groups will be II and IV. As soon as a blood of Group III is secured, then a supply of serums is obtained from Groups II, III, and IV, and rapid tests can be made. If the serums are sterile, they can be kept indefinitely. The serum of Group IV is simply used as a control.

Routine Method.

With the serums of Groups II, III, and IV a number of donors are tested and their names and groups are posted in the operating room. In the event of adequate time the patients' blood is also grouped, in order to use up the donors of groups other than IV. However, in the case of an emergency no further tests are necessary. A donor from Group IV is taken and transfusion immediately performed. This procedure has been of great value in our work at a base hospital, since sudden, severe haemorrhages often happen at night, and without further delay a safe transfusion from a Group IV donor is performed, without testing the patient's blood.

In view of the above fact, and in view of the very simple requirements of the test to establish the safety of transfusion, it seems evident that whenever possible a preliminary blood test should be made before transfusion in order to avoid untoward results. It has been demonstrated again and again that without tests fatalities occur, and that frequently severe reactions occur, which destroy all the benefit of the transfusion. The test which has been recently advocated of giving a few cubic centimetres of blood and awaiting the appearance of the well-recognized symptoms of agglutination and haemolysis in the patient, does not seem to be necessary, and furthermore, delays the transfusion and permits the changes in the blood to occur that eventually lead to coagulation, and which so alter the protein molecules of the blood that the blood itself may have very toxic qualities.

In a considerable experience, under the conditions set down above, no disastrous effects have been seen from transfusion, and no evidence has ever been found of haemolysis, as indicated by the appearance of jaundice, or the careful testing of the urine for haemoglobin, even when the permissible cross-transfusions were performed repeatedly on the same patient.

In co-operation with the General Education Board the Rockefeller Foundation has turned its attention to the development of medical education in several centres in the United States. They have each contributed £200,000 to the University of Chicago for that purpose. The Rockefeller Foundation is also co-operating with Johns Hopkins University in the establishment of a school of hygiene and public health, towards which it has made an appropriation of \$53,400. The school opened in October with Dr. William H. Welch as director. It offers instruction and facilities for research in hygiene, sanitation, and preventive medicine to doctors and medical students, biologists, chemists, and engineers.

VINCENT'S ANGINA AMONG THE TROOPS IN FRANCE.

BY CAPTAIN R. J. C. BOUTY, R.A.M.C.

DURING the last two years there has been a gradual and marked increase in the number of cases of Vincent's angina among the troops in France, both British and French. In time of peace this disease forms about 2 or 3 per cent. of all cases of throat complaints among the French army (recent statistics). Recent statistics from a British military hospital in France show the proportion to be as high as 23 per cent.

The following notes are based on a number of cases which have come under my observation.

Symptoms.

The disease is characterized by the formation of ulcers on the buccal and pharyngeal mucous membrane, either superficial or deep, covered by a pseudo-membrane; the most common site is the tonsil. The organism is one normally present in the mouth of healthy individuals, but seems to favour irritated conditions of the mucous membrane. Vincent himself considers excessive smoking one of the chief predisposing factors, as also the presence of decaying organic matter, and any irritant fumes, such as those given off from exploding shells. It is a disease prevalent among students working in the dissecting-room, and in hospitals generally, and among nurses.

The onset is sudden, and may be preceded by a few days' malaise. The temperature is raised for the first day or two, and may be high, the membrane often not commencing to form for twenty-four to forty-eight hours after the commencement of the fever. The membrane is rapidly formed, is thick and abundant, and appears, as a rule, on one tonsil at first. After the first two days the temperature may fall to normal, and remain normal, or there may be an irregular slight pyrexia throughout. This more often occurs in the more severe type with complications, such as marked adenitis or albuminuria, etc. The membrane is yellowish-white and abundant, it is adherent, and leaves a raw bleeding surface on removal. Although the tonsil is generally the part affected, the ulcer may be found only on the anterior or posterior pillar of the fauces, or the uvula alone, or the soft palate alone. It may commence on the tonsil, and spread to the uvula, pharyngeal wall, or soft palate, causing considerable destruction of tissue. The breath has an unpleasant odour, worse than in the case of diphtheria.

As a rule, if thoroughly treated, the membrane disappears in a few days. In some cases, however, some days, or as much as a fortnight, after recovery, there is a further rise of temperature, and commencing ulceration of the other tonsil. A chronic or severe form is sometimes seen, persisting for some weeks, and in these cases complications arise, and may be serious. Some cases of death have occurred in French hospitals, in which the primary cause was Vincent's angina.

Etiology.

Microscopically, two varieties of organism are found, the *Bacillus fusiformis* and Vincent's spirochaete.

Two forms of Vincent's angina are met with—(1) the pseudo-membranous, resembling diphtheria in appearance, and (2) the ulcerative form.

In the first we find abundant bacilli mixed with cocci, and in the second, associated with the bacillus, a Gram-negative mobile flagellated spirillum. A coexisting streptococcal infection is not uncommon, and may give rise to serious complications.

The Ziehl-Nielsen method is all that is required, though the silver method demonstrates the spirochaete more clearly. Injected into animals the organisms are non-pathogenic. Injection of impure cultures causes abscesses in which the spirochaete is abundant.

Letulle states that in every case of ulceration in the mouth, whether syphilitic, tuberculous, or cancerous, large numbers of *B. fusiformis* and spirilla are to be found.

Complications.

The complications which may occur are:

Adenitis of the cervical glands in nearly every case, and often very painful.