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RAPID SELECTION OF GROUP A RECIPIENTS AMONG MASS CASUALTIES

BY

P. D. STEWART, M.D., D.T.M.&H.

Consultant Pathologist, Vale of Leven Hospital, Alexandria, Dunbartonshire; Major, R.A.M.C.(T.A.)

One of the major advances in medicine in the 1939–45 war was the development of an efficient blood transfusion service which was able to provide an adequate supply of group O blood for the emergency treatment of casualties. In the event of another major conflict, the use of atomic and nuclear weapons is likely to result in much heavier civilian and military casualties with consequently a much increased demand for blood.

The use of suitable group O blood only for the emergency transfusion of casualties has one great advantage—namely, that the blood can be given without knowledge of the patient's blood group and without prior cross-matching. In the 1939–45 war disasters from incompatible blood transfusion were almost unknown (Whitby, 1953), and in Korea most of the recorded transfusion reactions followed the use of locally procured blood instead of the doubly checked group O blood which was normally supplied (Crosby, 1955). A major criticism of restricting blood used for casualties to group O only is that it results in an unbalanced utilization of the donor panel; for, in the United Kingdom, only some 47% of the population belong to group O and 42% are group A, 8% group B, and 3% group AB (Dobson and Ikin, 1946).

From the distribution of the ABO groups, it can be seen that if group A blood could be used, it would be possible nearly to double the supply of blood available for the emergency treatment of mass casualties. The essential requirement for such a scheme is a rapid yet reliable method of distinguishing group A and AB casualties, who could receive group A blood (A recipients), from group O and B casualties, who would still require group O blood (O recipients).

Zeitlin (1954) described a method of selecting group A recipients by a simple test which consisted of adding one drop of tap-water and one drop of patient's blood to a slide coated with potent anti-A serum and watching for microscopic agglutination, which occurred within one minute with groups A and AB. For urgent cases,

especially obstetrical emergencies, Zeitlin suggested the use of O and A rhesus-negative blood for O and A recipients respectively. He also suggested that the method of dividing emergency cases into two major groups according to the reaction obtained with a single test serum had an obvious practical application in large-scale emergency work—for example, in dealing with civilian or military casualties, rail accidents, and the like. Akeroyd and Crosby (1955) have discussed the advantages of using Zeitlin's method to increase the supply of blood in the event of war or a major disaster.

This paper describes three trials which were carried out to test the feasibility of rapidly selecting A recipients under field conditions. Similar trials have been conducted by J. H. Akeroyd (1958, personal communication) in America, and by H. C. Jeffrey (1960, personal communication) with British troops in Germany.

The Trials

Trials 1 and 2.—These trials were carried out in 1957 with the co-operation of a field ambulance which organized two night exercises involving the admission and documentation of "casualties" at the rate of approximately one a minute. Blackout conditions were observed. The reception tent was lit by pressure lamps and hurricane lamps only. Blood-grouping was carried out by two teams, each consisting of two laboratory technicians with considerable experience in blood-grouping. Blood was obtained from each "casualty" by finger-prick. One drop was placed on a Zeitlin slide together with one drop of water and the slide examined for agglutination after one minute. In addition, a few drops of blood were added to a tube containing normal saline. The cell suspensions were ABO blood-grouped next day in the laboratory by the tube method.

In the first trial the personnel reading the slide tests often experienced difficulty in deciding whether or not agglutination was present, and this difficulty was greatest in those parts of the reception tent where the lighting was poorest. For the second trial electric head-lamps were used; these gave satisfactory illumination, making agglutination, if present, obvious.

Trial 3.—This was carried out in 1960 at a Territorial Army training camp. On this occasion liquid anti-A serum was used. Fingers were swabbed with iodine in 70% alcohol and a separate sterile disposable needle ("seralet") was used for each individual. A drop of blood was collected on to a clean slide and one drop of anti-A serum added. The blood and serum were mixed by means of the disposable needle and the slide was examined for agglutination after one minute. An electric head-lamp was used for illumination when the tests were carried out after dark. At the same time a few drops of blood were collected into glucose-citrate solution. The slide groupings were performed by day and by night under a variety of conditions—that is, in tents, huts, vehicles, and in the open. The first few tests were read by me, but most were carried out by a nursing orderly and an infantry private soldier, neither of whom had had any previous experience in blood-grouping. The only instruction these two men received was a short explanation at the beginning of the trial and a demonstration on the first few groupings carried out. The cell suspensions were forwarded to the East of

Scotland Blood Transfusion Service, Dundee, where the ABO groups of the cells were determined under laboratory conditions.

Results

The results of the slide agglutinations and of the grouping of the cell suspensions in the laboratory are compared in the accompanying Table.

The errors in the reading of the slide tests have been divided into two categories: (1) major errors which would result in an incompatible transfusion—that is, reading agglutination where none should have been present and

Comparison of Slide Test with Laboratory Grouping

Trial	Total	Agreement	Major Errors	Minor Errors
1	84	72	10	2
2	100	96	1	3
3	178	178	—	—
Total	362	346	11	5

thereby labelling an O or B patient as an A recipient; and (2) minor errors not likely to prejudice the safety of a transfusion—that is, where agglutination was missed and an A or AB patient was labelled as an O recipient.

Discussion

It is considered that most of the major errors in the first trial were due to difficulty in reading agglutination under unsatisfactory lighting conditions and to faulty planning and recording of results. This opinion is supported by the results of the second and third trials, where electric torches were used and where the recording of results and the labelling of the control samples were more satisfactory. No technical explanation can be offered for the one major error in the second trial, and it is assumed that it must have been the result of a clerical mistake.

It would appear, from these trials, that, provided certain simple precautions are taken, distinguishing between group O and A recipients under field conditions by the use of a slide agglutination, using anti-A serum, is a practical proposition. If we exclude the first trial, where the methods, especially the illumination, were unsatisfactory, we find that the serious error in 278 tests was 0.3%. The method is therefore not free from risk, but it is possible to imagine circumstances where it would be justifiable to take this risk in order to increase the amount of blood available. The technique is simple and can be learned quickly by an intelligent person with no previous laboratory experience.

If this scheme were to be used in circumstances where casualties might include females, it would be important to incorporate a proportion of rhesus-negative blood in the supplies of groups O and A blood allotted for the emergency treatment of the injured.

There would appear to be little advantage and an obvious disadvantage in expanding the scheme to include the use of B and AB blood. Approximately 11% of the population belong to groups A and AB, and the inclusion of these groups would necessitate more elaborate blood-grouping procedures, with an increased risk of error without any great resulting increase in the amount of blood available. If, however, such a step were contemplated then grouping by Eldon (1955) card might prove to be the method of choice.

It would be possible to dispense with any form of testing when selecting A recipients in the case of casualties who carried reliable documentary evidence—that is, a National Blood Transfusion Service donor card showing their blood group, although the slide test with anti-A serum could still be used as a check before transfusion.

The method of selecting A recipients by the use of anti-A serum alone, first suggested by Zeitlin (1954), is an emergency procedure designed to conserve blood supplies and one to be used only in circumstances where full blood-grouping and cross-matching cannot be performed.

Summary

The supplies of blood available for the emergency treatment of mass casualties, either civilian or military, could be almost doubled if group A blood as well as group O blood were to be used.

A simple method of selecting group A recipients has been tested under field conditions. When used under these conditions it carries a slight but probably justifiable risk.

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Preliminary Communications

Small Doses of Intra-arterial ³²P in Location of Cerebral Tumours for Biopsy

The ability of cerebral tumours to take up radioactive salts or protein to a greater extent than normal brain has been known for some years. One use of this property has been the locating of tumours at operation or biopsy after intravenous injection of an active isotope of phosphorus, using a probe-pattern geiger-counter to explore the brain at operation. The recommended dose of isotope for intravenous injection in such a study has been variously given as 1 millicurie (Morley and Jefferson, 1952), 0.5 to 1 μ c (Selverstone and White, 1951), or "1 μ c or less" (Selverstone and Moulton, 1957).

In the course of blood-flow studies in the cerebral cortex, using smaller quantities of isotope by intra-arterial injection, a differential count, adequate for location, was obtained in a number of tumours. This small series annotates the study of 12 space-occupying lesions after the administration of 50 μ c of ³²P into the common carotid artery, undertaken to discover whether such a small dose of isotope could give consistently reliable results.