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.

I am indebted to Lieutenant-Colonels E. G. Wright and A. D. R. G. Wilson for their willing co-operation, to Dr. R. A. Zeitlin for a supply of coated slides, to Dr. C. Cameron for his help with the third trial, to Dr. J. Wallace for the supply of liquid anti-A serum, and to the various laboratory technicians and Private McCormack for their assistance.

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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.

Method.—The cases had been fully investigated as in-patients, and the site and supratentorial situation of the space-occupying lesion was already established. Under general anaesthesia 50 μ c of 32 P (as carrier-free solution in 0.005 ml. of HCl) in 10 ml. of saline was injected into the appropriate common carotid artery. In most cases carotid angiography had already been performed, but in all cases a low puncture was made in the neck to diminish the possibility of external carotid injection. A trephine disk or bone flap was then raised and the probe study performed at an interval after isotope injection varying from 30 to 90 minutes. The probe used was a 3-mm. type N 1 b (20th Century Electronics). Counts were passed to a rate-meter and displayed on a pen-recorder.

RESULTS

The site and nature of the 12 cases studied by this method are given in the Table. In the two non-tumour cases the clinical diagnosis, after angiography and ventriculography, lay between an intracerebral haematoma and a cystic glioblastoma.

The differential count between tumour and brain followed the pattern described by other investigators in that the highest contrast occurred with secondary tumours (Fig. 1), meningiomas (Fig. 2), or anaplastic glioblastomas (Fig. 3). The poorest contrast, and the greatest difficulty in diagnosis, occurred in the low-grade astrocytomas—an example is shown in Fig. 4. Record "a" was obtained from uninvolved cortex in the frontal region. Record "b" was obtained from the white matter of the temporal lobe, which, after lobectomy, was confirmed as being scantily infiltrated by protoplasmic astrocytoma (grade I). In "c" is shown the record obtained with the counter in the medial part of the temporal lobe in the region of the uncus. After lobectomy this area was found to have the histological character of a gemistocytic astrocytoma (grade II). The count-rate is much higher than in the less cellular area of the tumour. Both the non-tumour cases studied presented a large, relatively smooth-walled cyst. In one, symptoms had been present for 12 months, with ictal deterioration four weeks before the probe study was made. No increase in uptake of 32 P was detectable in the wall of the cyst in this case. In the other case, where symptoms had been present for only 10 days before the probe study, there was a greatly increased uptake of 32 P in the cyst wall as compared with normal neighbouring white matter (Fig. 5). Histological examination of the cyst wall showed vascular granulation tissue with numerous reacting astrocytes, but no evidence of tumour.

DISCUSSION

The use of a dose of 50 μ c by intra-arterial injection—that is, one-tenth to one-twentieth of the dose suggested for intravenous use—avoids the necessity for isolation of the patient or special methods of disposal of the urine. It also accords with the present trend severely to restrict the dose of radioactive isotope in purely investigative procedures, and greatly reduces the difficulty of handling the isotope in a neurosurgical unit where such material is used only occasionally. In the first 48 hours after injection it is wise to have a catheter *in situ*, particularly if there is a risk of incontinence, but the urine may be disposed of in the usual way.

Adequate uptake for tumour location is obtained only within the field of supply of the injected artery. In the cases described, only the carotid field has been injected, as for practical purposes this includes the majority of tumours in which an operative probe study by any method is of use.

Bender (1959), using a gamma-emitting isotope by intravenous injection, suggested that for some weeks after cerebral angiography uninterpretable increases in activity in the hemisphere injected by contrast medium occurred. In the present small study there was no evidence that alteration in the pattern of uptake of 32 P occurred soon after carotid angiography.

Location and Pathological Nature of Cases Studied

Case No.	Site	Histological Diagnosis
1	Right superior parietal	Reticulum-cell sarcoma? metastatic
2	Septum pellucidum and head of right caudate nucleus	Glioblastoma
3	Right temporo-parietal	Intracerebral haematoma
4	Right temporal	Astrocytoma grade I-II
5	Left parietal	Glioblastoma
6	Right	"
7	Left frontal	Meningioma
8	Right fronto-temporo-parietal	Astrocytoma grade II
9	Left post-temporal	Metastatic adenocarcinoma
10	Right fronto-parietal	Astrocytoma grade I
11	Left mid-parietal	Intracerebral haematoma
12	Left parietal parasagittal	Meningeal fibrosarcoma

FIG. 1.—Case 9. Count-rates obtained from normal cortex (a) and from tumour (b).

FIG. 2.—Case 7. Change in count-rate obtained as the counter was advanced from tumour at left of figure into normal brain at right.

FIG. 3.—Case 5. Count-rates obtained from normal cortex (a) and from tumour (b).

FIG. 4.—Case 4. Count-rates obtained from normal cortex (a) and from two areas of astrocytoma of differing cellularity (b and c).

FIG. 5.—Case 11. Count-rates obtained from normal white matter (a) and from the wall of a recent intracerebral haematoma (b).

SUMMARY

Brain tumours have been successfully located by probe-counting after the intra-arterial injection of $50 \mu\text{C}$ of ^{32}P .

The pattern of uptake of various tumours has been the same by this method as after intravenous injection of isotope.

The inconveniences of handling the larger quantities of ^{32}P necessary for intravenous use are reduced.

I thank Sir Charles Harington, F.R.S., for facilities provided in the National Institute for Medical Research, and Mr. Valentine Logue for permission to study cases under his care.

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Medical Memoranda

Cyanosis During Anaesthesia: An Unusual Case

The following case is described because of the unusual cause of cyanosis occurring during anaesthesia and because the patient suffered from two conditions the treatments of which are apt to cause trouble if an anaesthetic is given.

CASE REPORT

The patient, a woman aged 40, was admitted to a surgical ward for repair of an incisional hernia after hysterectomy. She was a thin pale woman with marked rheumatoid arthritis of both hands, elbows, and knees. No obvious cyanosis or jaundice was detected. Her blood-pressure was 210/110 and there was a systolic murmur at the left sternal border. There were some basal crepitations. Moderate anaemia (Hb, 9.16 g./100 ml.) was present and she also had symptoms of peptic ulceration, for which she had been in hospital four years before.

The patient suffered from a peptic ulcer, anaemia, hypertension, and rheumatoid arthritis, apart from the condition for which she was admitted. She took an alkaline mixture for the relief of the pain from the peptic ulcer. She had had various forms of treatment for rheumatoid arthritis but had never had steroid therapy. She was receiving treatment for anaemia and was having a preparation of reserpine for hypertension. Two days after admission she developed a temperature of 101°F . (38.3°C .) with "aches in her bones." Because of this and because she had been on hypotensive therapy the operation was postponed and the therapy stopped. She was given sodium phenobarbitone 30 mg. t.i.d. and was kept in bed. Five days later her blood-pressure was 150/90 and she was feeling quite well. After a further three days she was taken to the theatre for repair of her incisional hernia.

Premedication was by morphine sulphate 10 mg. and atropine sulphate 0.6 mg. Anaesthesia was induced with 300 mg. of thiopentone sodium followed by 120 mg. of gallamine triethiodide. A No. 10 cuffed endotracheal tube was passed and anaesthesia was maintained by nitrous oxide, oxygen, and 0.5% halothane, using a Fluotec vaporizer with

a flow-rate of 3 litres of nitrous oxide and 1.5 litres of oxygen. Controlled respiration with carbon-dioxide absorption through a Waters absorber was used.

When the operation was started it was noticed that the blood was blue and the patient looked slightly cyanosed. Although oxygenation and ventilation appeared adequate the concentration of oxygen was increased and the tidal volume raised. This did not produce any improvement. Auscultation of the chest revealed equal and adequate inflation of the lungs and no abnormality could be detected in the heart action. The systolic blood-pressure was about 130 mm. Hg.

As I had previously heard of two cases of sulphaemoglobinemia during anaesthesia and had recently discussed these cases with others I thought that the patient might also have sulphaemoglobinemia. Accordingly blood was withdrawn and sent for spectroscopic examination. The report, which was obtained within minutes, stated: "Sulphaemoglobin was detected and was visible in dilution up to 1:40" (Dr. R. G. S. Leask).

The operation and anaesthesia thereafter continued uneventfully although cyanosis persisted. On questioning the patient later she said that she had been accustomed to taking large amounts of a proprietary analgesic containing phenacetin.

COMMENT

This patient had two conditions, rheumatoid arthritis and hypertension, the treatments of which are known to cause so-called iatrogenic disease which can complicate anaesthesia (Dundee, 1958). She managed, however, to avoid both these pitfalls, but instead complicated the anaesthesia by self-medication. By taking a proprietary analgesic containing phenacetin she developed sulphaemoglobinemia, producing cyanosis, which, though not detected pre-operatively, became obvious during anaesthesia.

I thank Mr. W. Gray, surgeon, and Dr. R. G. S. Leask, biochemist, for their co-operation.

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A Joint Expert Committee on Food Additives of the Food and Agriculture Organization and W.H.O. has been studying the amount of certain natural and synthetic additive compounds that can be consumed daily without harmful effects. Earlier meetings of this joint committee, concerned with more general aspects of the problem, had stressed the need for an evaluation of the toxicological risks in the use of food additives. They recommended that a beginning be made on assessing the biological properties of a number of substances used as antimicrobials and antioxidants which are widely used to prevent wastage, especially in tropical countries where heat destroys the keeping qualities of many foods. The present meeting of the committee prepared a monograph on each of the 35 antimicrobials and antioxidants under review. These monographs will probably be published in the W.H.O. Technical Report Series and should prove to be especially useful in the developing countries to help officials and technicians who are framing laws and regulations for the protection of the public. Throughout the eight days of the discussions it was constantly stated that each country would ultimately have to find its own solution to the problem of any particular food additive, because conditions of life, food habits, and dietary patterns vary so greatly. The committee believed, however, that baby foods should be prepared without food additives at all, if possible.