

FIFTY YEARS OF AN ORGANIZED BLOOD TRANSFUSION SERVICE IN SCOTLAND

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The Early Stages

In 1985 when visiting Lahore I was most interested to find that the students at the Allama Iqbal Hospital had organized a blood transfusion service. It was early in 1930 that, in a similar way, a group of students, members of the Royal Medical Society in Edinburgh, had agreed to obtain blood donors from amongst their numbers. This did not continue for long because a larger organization to provide donors was being built up in Edinburgh almost simultaneously and from it there developed in due course the present national service.

Late in 1929 Mr. J.R. Copland, a dentist who lived at GRO-C GRO-C in Edinburgh, was much distressed when the wife of a friend died because a suitable donor could not be provided in time. He was an office bearer in an organization known as the Holyrood Conclave of the Order of Crusaders and persuaded them to set up a transfusion service in the Royal Infirmary with his house in GRO-C as the control centre. Little was known about blood groups at the time and, indeed the A B O nomenclature was just coming into general use, but the Bacteriology Department of the Royal Infirmary was willing to group the blood of the donors from the Holyrood Order, soon to be augmented by volunteers recruited from the public at large by the enthusiastic Mr. Copland. When he began his task the only other ^{organized} service in the country was in London.

In those days the donor was taken to the patient in the hospital or nursing home and Mr. Copland frequently used his own car to collect the volunteer from home or place of work, then on to the hospital and finally back home again. He himself acted

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as a donor, and the decision was taken that donors would not be paid. At first there were only twelve people on the panel and the call on their services was small, but as the numbers of patients and donors increased it became clear that a larger organization was needed. In 1936 the Lord Provost of Edinburgh, Sir Louis Gumley, formed a committee to take over responsibility for the service with John Copland as organizer; he was assisted by Miss Helen White who is now an Honorary Life Member of the local organization.

The Munich crisis in 1938 made it plain to many people that war was likely in the near future and at the beginning of the following year the Department of Health for Scotland set up a Blood Transfusion Sub-Committee under the chairmanship of Sir John Fraser. Blood banks had been in use in the Spanish civil war and the sub-committee recommended that stores of blood should be made available in various centres. The suggestion was taken up by Dr. C.P. Stewart, a biochemist in the Royal Infirmary of Edinburgh and by Prof. Noah Morris of Stobhill Hospital, Glasgow.

When the war commenced on 1st September 1939 with the invasion of Poland by Germany there were small blood banks in Edinburgh and Glasgow while in some other areas of Scotland there were small lists of donors. My own first contact with Dr. C.P. Stewart's blood collection service, already established on a regional basis, was at this time in that although I had graduated in July my first hospital post did not commence until October so I was free to help both in the wards and in the Department of Clinical Chemistry where a laboratory had been converted into a withdrawal centre for donors. There was no Haematology Department and no service for the cross-matching of blood. The blood counts and cross-matching ^{were} ~~was~~ done by the house surgeons, house physicians and junior doctors in obstetrics or paediatrics. The great advance was that no longer was it necessary to take the donor to the recipient; the blood could now be collected into milk bottles (supplied by the Edinburgh and Dumfriesshire Dairy) provided 3.8 % sodium citrate was there as an anticoagulant.

Abstract: The activities of an enthusiastic Edinburgh dentist in recruiting donors in the early 1930s led up to the establishment of a Scottish National Blood Transfusion Association in 1940. From this has developed the present Service with five Regional Centres and a major manufacturing Protein Fractionation Centre.

Key Words; Blood Transfusion; Protein Fractionation

fact the possibility that blood could be preserved in citrate for at least several days had been known at the end of the First World War but had not been adequately followed up. However it was not until January 1940 that Rh factors were first reported; until then clinicians could not understand why repeated transfusions with blood of the correct ABO group frequently gave reactions. There was no understanding of the cause of haemolytic disease of the newborn. In Dundee Prof.D.F.Cappell was one of the early workers on the problems of Rh incompatibility.

Meantime in the wards the nursing staff boiled up the rubber tubing and corks together with withdrawal needles and once the blood was flowing from the milk bottle it was passed through a glass coil in a thermos flask containing water at body temperature. This was discontinued when a nurse used boiling water!

A Scottish National Association is Formed

Accordingly the situation was that there was a major war in progress just at the time when knowledge about blood transfusion problems and techniques was increasing and clearly some form of Scottish national organization was speedily required. Even as regards the Edinburgh regional service there was doubt as to who was officially in charge, but at the end of December 1939 the DHS confirmed the appointment of Dr.C.P.Stewart as Director of the blood bank, while the position of the Edinburgh Transfusion Service with Mr. Copland as its organizer was unclear in relation to this. In any case this was not the main centre of population and in January 1940 the Department of Health for Scotland persuaded Lord Rosebery to chair a national organization. It was on 5th March 1940 that the Scottish National Blood Transfusion Association was formally constituted and its constitution agreed. Those involved in the preliminary negotiations included the Lord Provosts, the Red Cross, the W.V.S., the Royal Colleges and, of course, the Department of Health for Scotland; there were representatives of the Services and of other interested bodies.

In some areas a small payment had been made to donors, but it was decided that this practice would be discontinued. The Secretary of State had said at a preliminary meeting that Treasury funds would be available during the period of the war emergency to provide equipment and meet running costs but made it plain that it was expected that voluntary contributions would also be provided in significant amounts. There was, of course no National

Health Service at the time and the organizers thought in terms not only of public appeals for finance but also of flag days, concerts, notices in the press and house to house visiting. To increase the numbers of donors there were appeals to workers in industry, personal contacts by those who already were donors, requests for help from those in the Armed Forces and for assistance from University staff and students. Mobile teams went to outlying districts and local organizers were appointed. By 1944 there were more than 57,000 volunteers eager to give blood, and by the end of that year a further 10,000 had come forward.

Five Regional centres were established and have been maintained, being situated in Aberdeen, Dundee, Edinburgh, Glasgow and Inverness. Each Region has a Director and a regional organizer. The first Directors were:- Eastern Region, Prof. Cappell; Northern, Dr. H.J.R. Kirkpatrick; North-Eastern, Prof. J. Cruickshank; South-Eastern, Dr. C.P. Stewart; Western, Prof. N. Morris. It was essential to have a national organizer and Mr Copland was appointed to this post. The Secretary from 1940 to 1959 was Mr. C.S. Gumley, W.S.

The Separation of Plasma

Although it was obvious from the start that if a bottle of citrated blood is allowed to stand it will separate out with the plasma layer on top there was a delay in the full appreciation of the value of plasma as a replacement fluid for intravenous use. Dr. C.C. Sturgis at the University of Michigan told me that he was involved in the shipping of unrefrigerated liquid plasma to Britain before the United States entered the war and that there was dismay about the amount that had bacterial contamination on arrival. It was clear that plasma was of considerable value since it obviated cross-matching in an emergency situation and was particularly effective in shocked patients, and there was a considerable demand for plasma from the armed services.

In Scotland as in England it was appreciated that supplies of plasma were essential and that the danger of producing infected material was considerable. In June 1941 it was recommended by a subcommittee of the SNBTA that two plasma filtration units should be organized, one in Glasgow to supply the South West of the country and the other in Edinburgh to serve the rest of Scotland, the possible requirements of the ^{Armed} Services always being borne in mind. Such needs had been brought forcibly to the attention of the staff in Edinburgh ^{on October 1939} in 1939 when HMS *Mohawk* was bombed and

machine gunned in the Firth of Forth. Furthermore it had been shown in Cambridge and Bristol that plasma could be dried and reconstituted and clearly this would be of inestimable value, particularly in the Navy and in the other forces operating overseas.

In 1941 this further development had been recognized by the SNBTA and a decision was taken that there should be one unit in Scotland for the production of dried plasma and that it would be in Edinburgh which was regarded as being in less danger of bombing than Glasgow. There were difficulties about obtaining funds, finding suitable apparatus and constructing the unit in what was merely a basement area of the Royal Infirmary of Edinburgh but early in 1943 it was operational. Most of the output went to the armed forces, some being dropped by parachute not only to regular Allied forces but also to those in the Resistance. This gave particular satisfaction to the Polish troops stationed in Scotland and, of course, many of them were blood donors. The devotion of a technician, Andrew Crosbie, to the operation of this unit cannot be praised too highly. He and the other members of the staff did outstanding work in Dickensian conditions.

Plasma Fractionation

This was only the beginning of something that could not have been foreseen when the SNBTA was doing its planning in 1940, but fortunately in April 1948 Dr. Robert Cumming, who had been a prisoner of war in Japanese hands, took up the post of full time Regional Director in the South-Eastern Region. The time had now come when, largely because of the influence of E.J.Cohn of Harvard, blood was being broken down into various fractions with specific uses. Dr. Cumming was responsible for the development of a Scottish National Plasma Fractionation Centre, first housed in unsuitable premises in Edinburgh Royal Infirmary. In 1971 building operations were commenced at Liberton on the south side of Edinburgh and Mr. John Watt was appointed Scientific Director to this major centre which it was hoped would produce sufficient material to satisfy the needs of Scotland and Northern Ireland. The new centre became operational in 1975 just after Dr. Cumming's retirement. In April 1974 the administration of blood transfusion in Scotland came under the Common Services Agency, so in every way this was a time of great change both in the activities of the service and in its administration.

To illustrate what has developed in relation to protein frac-

tionation it is perhaps best merely to report that in the year ending 31st March 1988 the Centre received the following (measured in Kg):- Fresh Frozen Plasma, 45,315; Cryosupernatant, 3,537; Out-dated plasma, 4,918; Hyperimmune Plasma, 1,533; Plasma from N.Ireland, 13,796.

In that year it issued the following products:-

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| <u>Coagulating Factors</u> | Factor VIII concentrate; Factor IX concentrate. |
| <u>Immunoglobulins</u> | Normal; Anti-Rh (D); Tetanus; Hepatitis A; Hepatitis (HBs); Varicella-Zoster; Rabies; Rubella; Mumps; Measles; Cytomegalovirus. |
| <u>Albumin Products</u> | Human Albumin; Plasma Protein Solution. |

All the products from this centre which itself compares with a pharmaceutical manufacturing establishment are issued to Regional Transfusion Centres and from them to patients, general practitioners or hospital blood banks. Cells grown in what would have been waste products of plasma fractionation are being used in the production of monoclonal antibodies.

Plasmapheresis

In order to obtain sufficient plasma the various centres now make use of plasmapheresis, a procedure in which the blood is removed from the donor and the red cells then returned, usually by a machine which does this as a continuous process.

For the prevention of haemolytic disease of the newborn, a mother who is at risk (because she is Rh negative and the father Rh positive) can be treated with anti-D immunoglobulin. This is prepared from plasma given by Rh negative volunteers, some of whom are deliberately immunized and give their donation by plasmapheresis. It is also possible to remove platelets or white cells by apheresis.

Regional Centres

So far this account has dealt largely with progress in the South-East of Scotland, the area originally chosen for major developments when it was thought that there might be severe bombing raids in the west. In fact, however, the first moves towards a regional centre based on Glasgow occurred in June 1939 when the Lord Provost presided over a meeting of interested parties in the City Chambers and a panel of donors was organized, accommodation being provided by the St. Andrew's Association in North Street. In the following year this became the West of Scotland Regional Service. However as technical progress was made

and because redevelopment took place in the city, the service moved to new premises, the final result being that a Regional Donor Centre was sited at 80 St. Vincent Street while there was established at Law Hospital, Carlisle, the Regional Headquarters and Laboratories: in 1956 the latter took over responsibility for the production of dried plasma for all but the South-East Region. Of all the regions in Scotland the Western Service is responsible for the largest proportion of the population and its area is very much scattered.

The North of Scotland Service is based on Raigmore Hospital, Inverness and the late Dr. I.A. Cook who was the Director there played an important role in introducing to Scotland the production of anti-D immunoglobulin by immunizing male volunteers with ODE/cde blood. This was first done with 34 men, and 23 of them developed Rhesus antibodies. His conclusion from his preliminary study was that if 15 donors were plasmapheresed 12 times yearly to give 90 litres of plasma this should provide sufficient material to protect all Rh negative primiparae in about three million of a Caucasian population. It is of interest too that on 23rd August 1933 when there was a shortage of blood a team of 15 from the North-Eastern Centre sailed to Stornaway in the Western Isles and in a day and a half more than 600 volunteers turned up, some 200 of them being new donors.

Dundee Royal Infirmary already had a list of available donors when it was agreed in 1938 that, as war was likely to occur, Professor D.F. Cappell, a pathologist, should organize a service to cover the city of Dundee: in 1940 it became the East of Scotland Regional Service and is now based on Ninewells Hospital. The clustering of population in the Eastern Region is such that there is less need for mobile withdrawal team sessions than elsewhere.

In Aberdeen the hospitals had a small roll of donors but in 1939 Prof. J. Cruickshank agreed to provide accommodation in the Department of Bacteriology and a meeting of doctors and other interested people was informed by Mr. Copland about the developments in the Edinburgh area. The service in the North-Eastern Region was based from the start at Foresterhill but the area served is one that has had much need of its mobile withdrawal teams. In recent years the accommodation has been most inadequate but a new centre has just been completed, again at Foresterhill.

In Edinburgh the centre is now also a Department of Transfusion Medicine and has organized a three week postgraduate course.

The SNBTA and the SNBTS

It will be clear that what has been described is a Service rather than an Association. When the war ended the need for Government financing became much greater and the coming of the National Health Service necessitated a complete reconsideration of the organization of blood transfusion services in Scotland. It was decided not to make this a responsibility of Regional Hospital Boards but ^{to agree} ~~to~~ that the Association would continue as a charitable body, ^{although} that the Secretary of State would take over all its Centres, equipment, vehicles and paid staff. It would still receive a small government grant and could accept donations from the public. The notion that the Association could continue to administer the Service was not realistic and in 1974 the Common Services Agency of the Scottish Health Service took over the administrative function. The Scottish National Blood Transfusion Association continues as a charitable body which supports the activities of the Service but is independent of it; it has limited funds including a small government grant and can help to provide small gifts for donors and other voluntary helpers who are ill. It provides awards (such as the Armada plate) and badges to donors who have given many donations; in most regions the presentation of badges is customarily done by the Lord Provost of the city. The executive committee includes donors and donor organizers and an annual meeting is held each autumn at an advertised venue. Any donor may attend and if a matter of magnitude is causing concern the Association can communicate with government Ministers, always, in my experience, in relation to matters which are causing equal concern to the Service. The difference between the two bodies is perhaps exemplified by the funding. The total expenditure for the Service to 31st March 1987 was £14,196,690. The total funds of the Association for the same year amounted to £7,063,35. In a short article it has not been possible to name members of the staff but mention must be made of the energetic National Medical Director, Professor John Cash.

Donors and Donor Organizers - A Tribute

From every one of us thanks must go to those magnificent people, the donors, and to those who organize the sessions. Were it not for them there would be no Blood Transfusion Service. Every working day more than 1000 blood donations are collected in Scotland, and our debt of gratitude is huge.