

The History of Blood Transfusion

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In recent years there has been intense activity amongst workers in the field of blood transfusion. To-day we hear and read much about this wonderful modern method of treatment in selected cases; and, generally speaking, one gets an impression that the technique of blood transfusion is a development which has come into existence during the last thirty years or so. Admittedly the basis for the rational use of blood in therapy has only been appreciated for a short time, but like so many of our modern ideas, it has had its origin in the so-called dark ages. The history of the growth of this procedure is a fascinating story, and speaks volumes for the pertinacity and ingenuity of early medical and other workers.

The blood, by the very fact that it was red, thick and flowed out of a damaged body, was imbued with magical properties in ancient times.

It was natural to assume that it carried vital forces and was perhaps the seat of the soul. As a consequence the exhaustion of the blood was imagined to be the cause of many debilitating diseases. It is interesting, too, to note that insanity was stated to be due to a sickness of the soul in the blood.

The first attempts in the use of healthy blood in the management of the sick were made not by transfusion, but by direct bathing in the blood or by drinking it. Blood baths were prescribed for states of exhaustion, and many of the ancient writers refer to the practice of drinking the fresh blood from the jugular veins of dying gladiators. This latter method was thought to be of particular value in curing epilepsy.

The first authentic transfusion in the sense that an attempt was made to introduce blood into a patient's vein is stated to have been done in Rome in 1490. The Pope, Innocent VIII, lay dying from old age. A physician sought to rescue him by transfusing blood from three small boys. The details of the drama are not clearly recorded. But the finale is tragic and humorous. The Pope died, perhaps of old age or the effect of incompatible blood; the donors one and all died; the physician evaded death by hurriedly leaving the city.

During the sixteenth century there are frequent references to the possibility of transferring blood from one person to another for strengthening purposes. But it was only when the understanding of the processes of circulation was brilliantly conceived and proved by Harvey in 1616 that the history of actual transfusion commenced. Immediate interest was stimulated, not only in the transferring of blood from a donor, but also in the introduction of medicines into the circulation.

In 1656, Christopher Wren, the architect, injected drugs into the veins of dogs, using quills attached to bladders. The successful transfusion of blood was soon achieved. In 1666, in Paris, a successful transfusion of blood from a lamb to a patient, who was lying exhausted from twenty venesections, was carried out. The carotid artery of the lamb was united by quills to the vein of the patient and nine ounces of blood was transferred. There is no mention apparently of how the quantity was measured. Two or three further successful transfusions were performed on insane patients. The tragedies occurred soon afterwards. Two patients died soon after the



Fig. 1. Transfusion from a Lamb.

operation, one apparently from a haemolytic reaction. Murder charges were brought forward and, after bitter legal battles, further transfusions were prohibited in France.

In England, too the method had been adopted, but after the outburst in France, laws were passed forbidding further transfusions, and so for over a hundred years the technique was abandoned. It must, of course, be realised that at this stage there was complete ignorance of asepsis, compatibility and the phenomena of haemolysis or coagulation. Perhaps it was indeed a blessing that the law had made further attempts impossible. It is of great interest, too, to note that indications for the operation did not seem to include the obvious ones of loss of blood or anaemia. There was much writing regarding the possible effect of blood taken from one species to another, for instance, it was thought that a dog which had received the blood of a lamb might possibly grow wool in place of hair. So, too, it was imagined that the temperament of man might be altered by the transference of blood from any particular type of personality.

Interest in transfusion died away for nearly one hundred and fifty years, and it is not until

the end of the eighteenth century that further cases are recorded. Meantime further knowledge had accumulated in the other allied sciences. It soon became apparent that the use of blood from different species was fraught with danger. James Blundell (1790-1877) by careful thought and experiment, soon developed satisfactory techniques. He introduced the first syringe method and established blood transfusion from human to human. The operation was used only as a last resort and the technical difficulties were many, amongst which coagulation seemed to cause the most trouble. It was very soon discovered that defibrinated blood obviated this difficulty, at the same time still being efficacious. So to within a few years the discovery of anti-coagulants, particularly sodium phosphate, gradually made the operation more and more easy of completion. Meantime various methods of transference were devised, and the use of blood therapeutically was enthusiastically developed. Not only in haemorrhage, but throughout the whole field of medicine and surgery blood transfusion was eagerly applied in treatment. Fatalities were common and the natural reaction set in. It was found that the use of physiological saline solution was very often

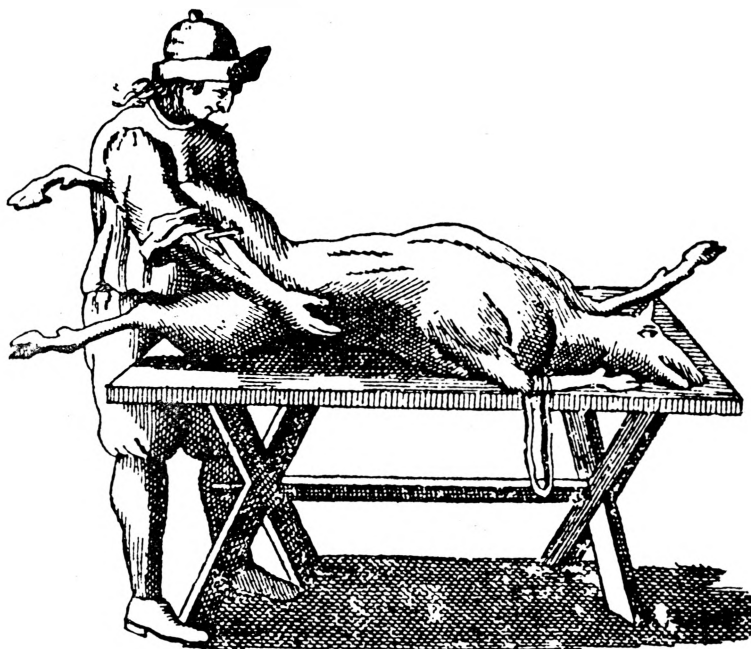


Fig. 2. Transfusion from a Sheep.



Fig. 3. Transfusion from Artery to Vein.

equally suitable and not attended by the same dangers. So once again, though not completely, blood transfusion became suspect in treatment.

The advances in bacteriology and immunology being made at this period threw new light on many of the previous difficulties and gradually a rational viewpoint was adopted. The processes of coagulation were more fully investigated. It was found that if blood did not come into contact with tissue or foreign surfaces it did not clot—so the paraffin-coated vessel technique came into operation. Between the years 1900 and 1902 the all important discovery of blood groups was made and an explanation of many of the previous tragedies became manifest.

During the Great War with its great demand for rapid and safe transfusions, the science made rapid progress, and many and varied techniques were devised. The older method of uniting the artery of the donor was abandoned and the syringe methods were rapidly improved, valves were added to the syringes and to-day this type of apparatus is still in common use. Clotting of the blood was still the great handicap in all these direct methods, and when Hustin, in 1914, first used and described the use of sodium citrate as an anticoagulant, the last great obstacle was removed. The indirect transfusion thus came into its own, and to-day is still, under most circumstances, the method of choice.

In studying the growth of blood transfusion in the post-war period, several interesting advances have taken place.

Firstly, our knowledge of grouping and compatibility has become more detailed and definite. It is now realised that the old group termed the "universal" donor no longer is strictly accurate. It is now advisable, whenever possible, to carry out a direct compatibility between the patient's corpuscles and serum and the donor's corpuscles and serum. This precaution now obviates the recently described danger of an incompatible universal donor's serum causing haemolysis in the patient's circulation.

Another recent advance has been the organisation of blood donors into panels in order to provide the various types of blood at any time and in any district. So we see in all parts of the world the growth of Blood Transfusion Services, some run on a voluntary basis and others offering payment to the donors. All these services undertake to provide a constant source of healthy blood from healthy people at short notice. National Associations are being founded with the view of collecting data on the various aspects of the work—the donors, financial, research, organisation and control, etc.

The most recent and far-reaching work with reference to blood transfusion therapy originated in Russia, where the whole question of the

storage of blood is being investigated. By controlled experiment, it has been found that the storage of human blood for transfusion up to a period of three weeks is a practical project. The advantages of this in the field of transfusion are obvious. In Russia the blood is mainly derived from cadavers, usually of people who have met their death suddenly, either by accident, suicide or execution. The blood is extracted from the jugular vein within two or three hours after death, and stored aseptically at a temperature of 2-3°C. The Wasserman reaction and blood-grouping tests are performed and the blood is then ready for immediate use. As the author points out, there is an inherent prejudice against the use of blood from corpses, but as he rightly says, this attitude is an emotional one, and is really based on the ancient beliefs in the "spiritual and vital" properties of blood. Provided the blood is healthy, then there is no real scientific basis for the objection to its use. At the outset in Russia, the transfusers had the greatest difficulty in developing this method of collection of blood, but by persistent education and practice, it is now an accepted part of their blood transfusion services. In the Western countries the storage of blood obtained from voluntary or professional donors has recently been instituted, and by means of these "blood banks" a great advance in rapid emergency transfusion services has been achieved.

With reference to the techniques in modern use, it is being realised that the direct methods of transfusion are not entirely satisfactory in most instances. By the direct method it is usual only to withdraw up to 500 ccs., as more than this quantity may produce ill effects in the donor, and in the case of a voluntary organisation greater amounts cannot be withdrawn. It is now being appreciated that in those cases where transfusion is imperative, for instance in haemorrhage cases, larger quantities of blood must be given in order to produce an appreciable rise in the haemoglobin content of the blood. The modern principle is to give large quantities (700-1,500 ccs.) slowly by the continuous drip method. The blood is withdrawn by means of suction pumps into an anticoagulant solution, either 3.8% sodium citrate or heparin, and then it is transferred to the patient through a drip apparatus, oxygen being bubbled through the blood to prevent sedimentation and subsequent blocking. By this method these large quantities of blood are injected over long periods, sometimes up to 48 hours, and it has been found that the post-transfusional reactions are greatly minimised and, in addition, a far greater rise in the haemoglobin

content of the blood is produced. The drawback at the present time in regard to this method is that it requires constant attention by an experienced person who must keep a continual watch on the temperature of the blood and on the drip apparatus. Also it is usually necessary to cut down on the patient's vein and use a special cannula which is bandaged to the arm.

There is no doubt that the operation of blood transfusion has come into a permanent place in our armament of therapeutic agents, and in selected cases, particularly in cases of haemorrhage, whether due to ulcers, operation or traumatic accident, it occupies a life-saving position. One anticipates that we shall not suffer from the setbacks which the indefatigable pioneers of the last two or three hundred years were compelled to face. It is true that accidents still do occur, and many aspects of the problem of these post-transfusional tragedies are still obscure; but one feels that the greater part of the battle is over, and that in the very near future the last small obstructions will be removed, and we shall be able to offer our congratulations and thanks to the innumerable workers, now forgotten, or thought of as mere names in historical records, for the things that they made possible.

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