THE ‘ROTANDA’ THREE-WAY SYRINGE FOR DIRECT VEIN-TO-VEIN TRANSFUSION

A version of this document, written by Phil Learoyd, was originally provided as a hand-out at the British Blood Transfusion Society Annual Meeting of 2014

The ‘Rotanda’ three-way syringe was developed for the direct vein-to-vein transfusion of blood during the 1920s, an example of which (see photograph below) was originally found in old laboratory equipment at the time of the refurbishment of the ‘Leeds Blood Centre’, Yorkshire. It was subsequently displayed at the 2014 British Blood Transfusion Society Annual Meeting together with a description of the instrument and its use, originally published in 1925.

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Wooden box containing a blood transfusion ‘Rotanda’ three-way syringe together with associated rubber tubing, metal needles and fittings (in separate compartment)
Manufactured by Allen & Hanburys Ltd. London
(Photo credit: Phil Learoyd)

The following is a reproduction of an original 1925 document that describes a three-way ‘Rotanda’ syringe method for direct vein-to-vein blood transfusion (using a 1-2% citric soda solution as an anticoagulant), originally published in the journal *Zentralblatt für Chirurgie* (Volume 1925 Nr. 44, Publisher: Johann Ambrosius Barth, Leipzig), a copy of which was included within the wooden box containing the syringe.

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President: Prof. Dr. Perthes

Blood transfusion from vein to vein by means of the 'Rotanda' three-way syringe

By
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There can be no doubt that the method of blood transfusion from vein to vein as evolved by Oehlecker represents a great step in advance and has for this reason been used exclusively here in this infirmary ever since it became known. The change of syringes, however, required by this method is attended by certain drawbacks, inasmuch as the handling, removal and insertion of the empty syringe requires a certain practical training, if the entry of air into the syringe is to be avoided. A technical arrangement obviating the necessity of a change of syringes would hence mean a great improvement and the solution of this problem has been carried out in a very simple manner in the design and construction of the 'Rotanda' three-way syringe.

The new principle of a revolving cylinder, as introduced by the instrument manufacturer W. Haselmeier of Stuttgart, is a great improvement on the construction of the Rekord syringe. The new design has discarded the use of a two or three-way cock, and the contents of the syringe can be injected over two or three ways by a simple turn of the glass cylinder towards the head piece.

The construction is conspicuous by great simplicity. The glass cylinder is shut-off towards the end by a metal cone perforated by a port running at an angle of 1 1/2 R obliquely to the axis of the cylinder. Accordingly the ports has its outlet on the side of the metallic cone (figure 1a). A head piece, with two or three oblique perforations each ending in a connecting piece, is fitted over the metallic cone (figure 1b). The direction of the perforation corresponds exactly to that of the port in the metallic cone. The head piece is pressed hard against the cone by a suitable spring in such a way as to allow of turning the cylinder against the head piece. As soon as the oblique port of the cone comes flush with a perforation of the head piece, a slight snap indicates that this has taken place. The contents of the syringe are then free to pass through this opening while the other two ways are shut off. The syringe is closed in all intermediate positions in which port of the cone and perforations of the head piece are not in line.

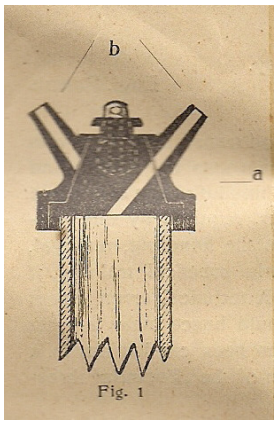

Fig. 1

After using a two-way syringe constructed on this principle for punctures and especially for filling ventricles of the brain with gas, to excellent advantage, it was only natural that we should make use of a three-way syringe like this for blood transfusion on the Oehlecker method. The experiments made in the infirmary proved highly satisfactory and I can thoroughly recommend the modification of the Oehlecker method as represented by this syringe.

Figure 2 shows a three-way syringe with 50 cu cm contents with its parts dismantled. The spring pressing the head piece against the cone can be easily inserted and removed by placing the arrow in the cylinder between two connections. As soon as the snap spring has been taken out, the head piece can be removed. For purposes of cleaning the syringe, which is best done with distilled water, the piston could of course also be taken out, whereupon the syringe may be boiled without any attending risk. After cleaning it is advisable to slightly rub the snap spring with a drop of Paraffinum liquidum. The outlet of the bore in the cone is marked by an arrow on the glass cylinder and the syringe is always open towards the outlet to which the arrow it pointing.

Figure 3 shows the general view of the whole system as required for transfusion of blood. The one connection at the head piece which is specially marked for the purpose with a rubber hose of about 60 cm length, the hose carrying a perforated metal cap at its free end for weighting it. The syringe is flooted through this hose. The two other connections are fitted with bayonet cap on which the Oehlecker glass canulas are fastened by means of rubber hose. The connections are supplied with various bends so that the direction of the glass canulas can be adapted as closely as possible to the position of the vein.

1f a blood transfusion is to be made the whole apparatus is first of all charged with a physiological solution of common salts or, better still, with a 1 to 2% citric soda solution. If use is made of the three-way syringe we always give preference to the latter solution in order to guard against the possibility of any clotted mass forming, if surgeons keep a sterile citric soda solution in stock, its use will not be attended by any complications. It is advisable to place the syringe in such a position that the rinsing connection always points upwards. The hose will then not interfere with operations, as it is running in a curve into the vessel filled with rinsing liquid placed near the arm. It is always best not to use a shallow but rather a relatively small but high vessel so that the rinsing hose may be deeply immersed in the liquid and not rise above the level of the liquid during the manipulation. By setting the arrow flushed with the common salt connection the syringe can be emptied down to 10 cu cm and a slight lateral turn of the cylinder ensures a complete closing of the syringe.

The canulas have to be introduced exactly in accordance with the directions given by Oehlecker. As soon as they have been fastened in the veins the arrow is set to the transmitter, whereupon 5 cu cm of the solution is injected into the vein of the transmitter, and after a turn of the cylinder towards the receiver 5 cu cm injected into the latter's vein. The arrow is then again turned towards the transmitter and 10 cu cm of blood sucked into the syringe to be injected into the vein of the receiver after a corresponding turn of the cylinder. The arrow is then at once set flush with the rinsing connection, the syringe rinsed out by moving the piston forward and backward twice. Thereupon 10 cu cm of citric soda solution are sucked into the syringe, the cylinder turned towards the transmitter who is given 5 cu cm of the solution, then turned to the receiver who also receives 5 cu cm of citric soda. In the meantime it will have been seen whether the two classes of blood agree. If that is the case the arrow is set flush with the transmitter and the blood sucked into the syringe until the piston touches (the clearance in the bore and the canulas has been duly considered in connection with the capacity of the syringe). The cylinder is then turned to the receiver and the contents injected into his vein. It is then connected with the rinsing hose, rinsed out by moving the piston two to three times to and fro, emptied of the rinsing liquid down to 10 cu cm, set to the transmitter who receives 5 cu cm of the solution, swung round to the receiver who also receives 5 cu cm of the solution, etc.

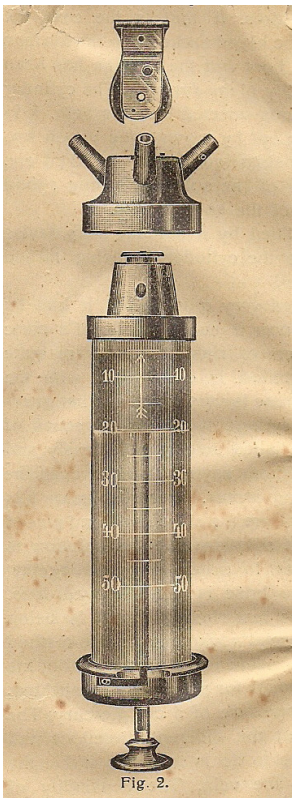

Fig. 2.

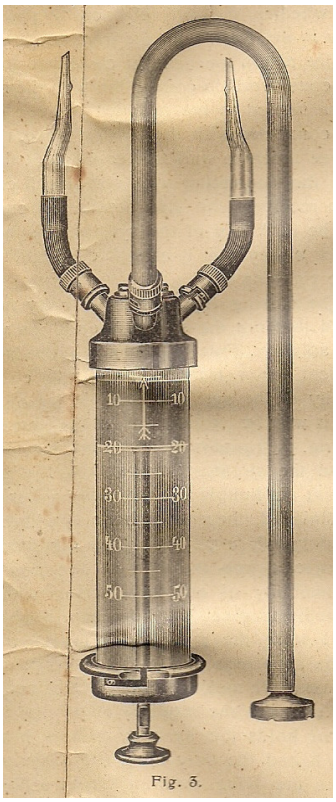

Fig. 3.

The back cap of the syringe has been fitted by a suitable snap devise in such a way that it cannot come off while the cylinder is being turned to the right or left.

The rinsing liquid will naturally turn red very quickly, but it has been proved that not the slightest clottings will form if use is made of a citric soda solution. Five to seven hundred cu cm of rinsing liquid are quite sufficient for a transfusion of 800 cu cm of blood. In comparison with the capacity of the syringe the capacity of the hose is very small so that generally it will be sufficient to rinse out the syringe twice for purposes of cleaning. A transfusion can thus be accomplished quickly, noiselessly and without the slightest interruption. It goes without saying that not even the smallest air bubble can possibly enter the apparatus. After transfusion has been finished, the rubber hose is withdrawn from the citric soda and placed in a pot with a physiological common salt solution and this solution is then injected into the vein of the transmitter. In order to guard against the possibility of any air entering while the hose is being moved, it is advisable to place the hose around while the last rinsing liquid is being ejected from the syringe. I consider it a special advantage for this

method that the apparatus makes the operator quite independent of the skill of his assistants. We make use of a Perthes compressor for purposes of stanching, which supplies the required stanching at a pressure of 5 cm mercury. The operator holds the syringe and adjusts it to suit the different directions and rinses it and the only thing the assistant has to do is to see to if that the canulas are lying well in the direction of the vein. The possibility of mistakes is thus reduced to minimum.

1. We usually precede operations by blood test according to the Moss testing method, but consider it useful to regularly apply the 0ehlecker biological method besides.