BLUTTRANSFUSION VON VENE ZU VENE MITTELS DER DREILÄUFIGEN SPRITZE “ROTANDA”

By: Prof. Dr. O. JÜNGLING

A TRANSLATION BY PHIL LEAROYD

A copy of the paper “Blood transfusion from vein to vein using the three-barrelled "Rotanda" syringe” by O. Jüngling published in 1925 in the journal *Zentralblatt für Chirurgie*, (reference Volume 52, Number 44, pages 2475-2478) can be viewed or downloaded from the following site:

https://archive.org/details/zentralblatt-fur-chirurgie-52.1925-hefte-27-52/page/2474/mode/2up

This short paper, as the title identifies, describes the ‘Rotanda’ three-way syringe that has been developed for giving a blood transfusion, by placing the syringe between the donor and the recipient. The syringe mechanism and how it is used are described in detail. Given the publication date of 1925, as would be expected, the author identifies the use of sodium citrate solution as an anticoagulant / syringe cleaning agent, to ensure that the donor blood does not clot during the transfer process. The paper also describes that by purposely mixing the donor and recipient blood in the syringe at the start of the process it provides a ‘biological method (ascribed to Oehlecker) of ensuring that the two types of blood (i.e. donor and recipient) are compatible’. The author however also notes that compatibility is also ensured by the use of ‘the Moss test method in advance.’

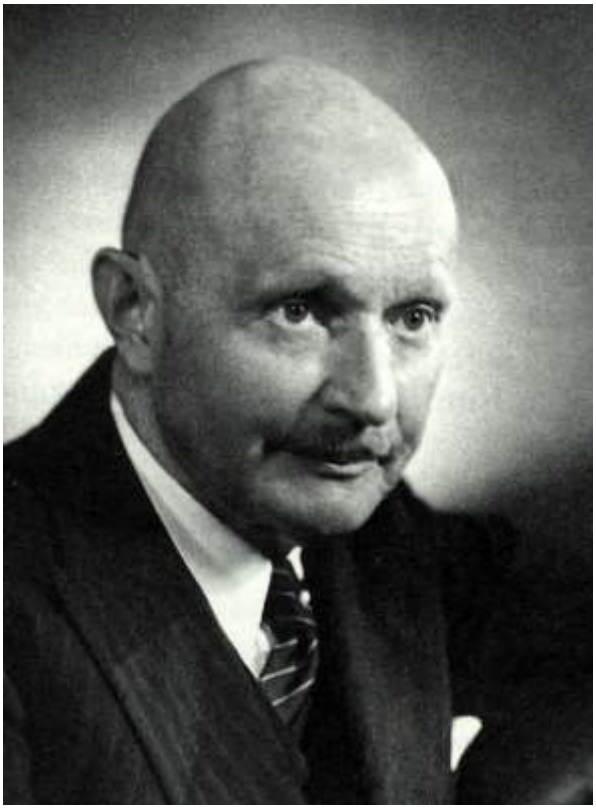
I have translated this paper from the original German into English in the hope that the content may be appreciated by a wider audience. Whilst I am obviously aware that instantaneous computer-generated translation is possible, this process struggles with specialist terminology and also produces a ‘colloquial style’ not always representative of the original text. I have purposely produced this translation to be ‘un-interpreted’, in that I wanted to maintain the author’s original meaning / wording as much as possible. As with any translation the wording may be purposely or inadvertently altered to ‘make it read better’ but in doing so there has to be an element of personal interpretation involving something on the lines of ‘I believe that this is what the author is actually trying to say’. I wanted to avoid that as much as possible and try to present what the author actually wrote and as such the reader may find that the English text does not ‘flow’ as well as it could. Although I have taken great care not to misrepresent the author’s original wording I cannot guarantee that this work does not contain ‘translational errors’ and the reader is recommended to check specific details against the original text.

NOTE: A Rotanda syringe in its original box together with a ‘product insert’ sheet (in English), forms part of the British Blood Transfusion Society’s historical artifact collection. I have included a transcript of the insert sheet together with a photograph of the actual device after the translation of the published paper – PL.

Dr. OTTO JÜNGLING – BIOGRAPHICAL INFORMATION

Otto Jüngling was born on the 19th January 1884 in Unterlenningen, Germany and studied medicine in Berlin, Tübingen and Kiel, receiving his doctorate in 1908 in Leipzig. In 1912 he became a scientific assistant in pathology and surgery at the University of Tübingen. After military service, in 1919 he qualified as a professor in Tübingen, became a private lecturer and took over the position of senior physician for surgery there in 1922; in 1923 he was appointed an extraordinary professor. From 1926 to 1934 he headed the surgical department of the Städtisches Katharinen-Hospital in Stuttgart. He was married and had three children.

As the director of one of Stuttgart's renowned hospitals he was an internationally renowned radiologist and surgeon, a pioneer in the diagnostic and therapeutic use of X-rays, but he was critical of the state's eugenic legislation. As such, under the Nazi regime, he came into conflict with the Gauleiter Wilhelm Murr, who had been Reich Governor in Württemberg since May 1933 and ensured that Jüngling was dismissed in June 1934 "for behaviour damaging to the party". After the head physician at the Evangelical Diakonie in Flensburg died unexpectedly early in 1934, Jüngling, who was unemployed, was offered the position. Although Murr tried to prevent this through his colleague there, Gauleiter Hinrich Lohse, Jüngling was in fact appointed – given the political circumstance, this was unusual. From 1940 onwards he taught part-time as an adjunct professor of surgery at the University of Kiel. He died of tuberculosis in Flensburg on 10th July 1944 at the age of just 59.



Dr. Otto Jüngling (1884-1944)
(Image credit: Erdmann Archive)

From the Department of Surgery at the University Hospital of Tübingen.
Board of Directors: Prof. Dr. Perthes.

Blood transfusion from vein-to-vein by means of the three-barrelled "Rotanda" syringe.

By
Prof. Dr. O. Jüngling,
Senior physician of the Clinic.

Undoubtedly, the method of blood transfusion from vein to vein according to Oehlecker is an excellent procedure, which has been used exclusively here in the clinic since its announcement. However, it cannot be denied that there is a certain disadvantage in the changing of syringes. Handling, removing and inserting the rinsed syringe requires some practice to avoid air entering the syringe. A technical arrangement that makes changing syringes unnecessary should therefore be worth considering from the outset. The problem has a very simple and safe solution by using the three-barreled “Rotanda” syringe.

The Stuttgart instrument maker W. Haselmeier enriched the design of the record-breaking syringe with the new principle of the rotating cylinder. This makes the two- or three-way valve superfluous. By simply turning the glass cylinder against the head piece, the syringe contents can be sprayed out in two or three ways.

The construction is very simple: the glass cylinder is closed at the front by a tapered metal cone. This is pierced by a channel running at an angle of $1^1/_2$ R diagonally to the axis of the cylinder. Accordingly, the channel opens outwards at the side wall of the metal cone (Fig.1a). On this metal spigot sits a head piece with two or three oblique holes, each of which opens outwards into an attachment piece (nozzle) (Fig.1b). The direction of the hole corresponds exactly to the direction of the channel in the metal cone. The head piece is pressed against the metal cone by a suitable spring in such a way that it is possible to rotate the cylinder against the head piece, and that a slight snap occurs when the inclined channel of the cone meets a hole in the headpiece. The path in question is now clear for the contents of the syringe; the other two paths are closed. In all intermediate positions where the cone channel and the bore in the head joint do not coincide, the syringe is closed.

Fig. 1.

After the double-barreled syringe designed according to this principle for punctures, especially for gas filling of the cerebral ventricles, had proven itself excellently, the idea of

using such a three-barreled syringe for blood transfusion according to Oehlecker was obvious. The experiments carried out in the clinic have been extremely satisfactory, so that I would like to recommend the modification of Oehlecker's method to a wider circle.

Fig.2 shows the three-barreled syringe graduated to 50 cc with the parts separated. The spring which presses the head-piece against the cone can be easily inserted and removed by placing the arrow in the cylinder between two nozzles. Once the snap spring is pulled out, the headpiece can be lifted off. For boiling, which is best done in distilled water, the syringe plunger must of course also be removed then the syringe can withstand the boiling very well. After cleaning, it is recommended to grease the snap spring with a drop of paraffin liquid. The mouth of the hole in the cone is marked by an arrow on the glass cylinder. The syringe is always open towards the outlet pipe to which the arrow points.

Fig. 2.

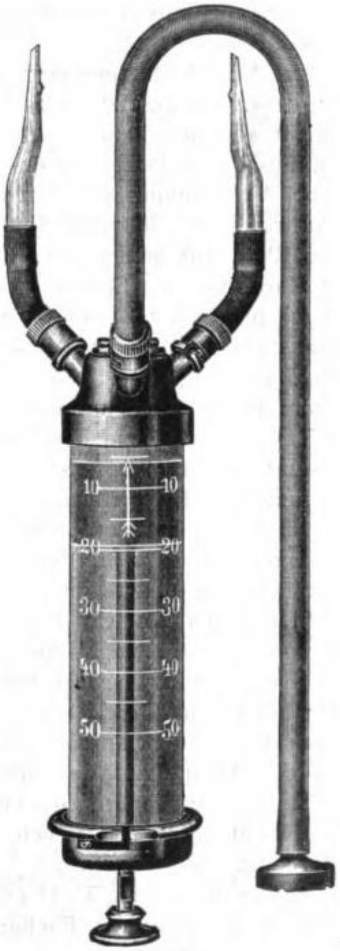


Fig. 3.

Fig. 3 shows the arrangement of the whole system as it is used for blood transfusion. The one attachment to the headpiece, which is specially marked, is connected to a tube about 60 cm long, which carries a pierced metal capsule at its free end to weigh down this end. This tube is used to flush the syringe. The other two nozzles fit attachments with bayonet locks, to which Oehlecker glass cannulas are attached by means of Gunimi tubes. These attachments are supplied in different bends so that the direction of the glass cannulas can be adapted to a large extent to the position of the veins.

To carry out the blood transfusion, the entire system is first filled with physiological saline solution or, even better, with 1-2% sodium citrate solution. When using the three-barrel syringe, we give preference to the latter solution in order to avoid any clot formation. If you keep the sodium citrate solution sterile in stock, its use does not cause any complication. It

is advisable to position the syringe so that the flushing nozzle is facing upwards. The tube then does not interfere in any way; it runs in an arc into a vessel filled with irrigation liquid next to the arm. It is best not to use a flat container, but a relatively narrow but high one, so that the flushing tube is immersed deeply and cannot get above the liquid level during the manipulations. By setting the arrow on the saline nozzle, the contents of the syringe are sprayed down to 10 cc into the rinsing pot; a slight lateral rotation of the cylinder causes the syringe to be completely closed.

The insertion of the cannulas is carried out exactly according to Oehlecker's instructions. As soon as the cannulas are integrated into the veins, 5 cc of the solution is injected into the donor's vein after setting the arrow on the donor, then 5 cc into the recipient's vein after turning the cylinder. The arrow is now turned again towards the donor, 10 cc of blood is absorbed into the syringe, which is injected into the recipient after the cylinder has been turned. The arrow is immediately switched to the flushing nozzle and the syringe is flushed by pulling up and pushing the plunger forward twice. 10 cc of sodium citrate solution is sucked into the syringe, the cylinder is rotated to the dispenser, 5 cc of the solution is injected, rotate towards the recipient and inject 5 cc of the sodium citrate solution. It has been shown whether the two types of blood are compatible (1), if this is the case, the arrow is set to the donor, the blood is sucked until the plunger stops (the dead space of the bore and the cannulas is taken into account in the measurement of the contents of the syringe), there is rotation to the recipient, injection into the vein, rotation to the irrigation nozzle, rinsing by pulling the plunger back and forth twice or three times, squeezing the irrigation liquid up to 10 cc, switching to the dispenser, injecting 5 cc of the solution, switching to the receiver, also injection of 5 cc, switching to the donor, sucking up the blood, etc.

The rear cap of the syringe is fitted by a suitable snap-on device in such a way that it cannot come off when the cylinder is turned left and right.

Of course, the rinsing liquid quickly turns red; however, it has been shown that not the slightest clot occurs when using sodium citrate solution. 500-700 cc of irrigation fluid is perfectly sufficient for a transfusion of 800 cc of blood. The capacity of the tube is small in relation to the capacity of the syringe, so that in general flushing the syringe twice is sufficient for cleaning.

In this way, the transfusion takes place silently, quickly and without any disturbance. It goes without saying that not the slightest air bubble can enter the system.

When the transfusion is complete, the rubber tube from the sodium citrate solution is placed in a pot of physiological saline solution and this saline solution is injected into the donor's vein. In order to avoid any air ingress even when the hose is folded over, it is recommended to reposition the tube while the last rinsing fluid is being sprayed out.

I see a particular advantage of this procedure in the fact that the surgeon is largely independent of the skill of his assistants. We accomplish the accumulation with the Perthes compressor, which provides the appropriate stowage at a pressure of 5 cm of mercury. The holding of the syringe, the adjustment in the different directions, the rinsing of the syringe, everything is done by the surgeon himself, the assistant only has to make sure that the cannulas lie well in the direction indicated in the veins. This reduces the possibility of error to a minimum.

The manufacturer of the syringe is W. Haselmeier, Stuttgart-Degerloch. Available from the relevant specialist shops or from P. Henger, Stuttgart, Kronprinzenstrasse 20, and Heinrich C. Ulrich, Ulm a. D., Münsterplatz 15.

(1) We usually maintain the blood test status according to the Moss test method in advance, but we think it is useful to use the Oehlecker biological method regularly.

From the Surgical Infirmary of the University of Tübingen
President: Prof. Dr. Perthes

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

By
President: Prof. Dr. O. Jüngling.
Chief Surgeon of the Infirmary

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 1½ R obliquely to the axis of the cylinder. Accordingly the port 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.

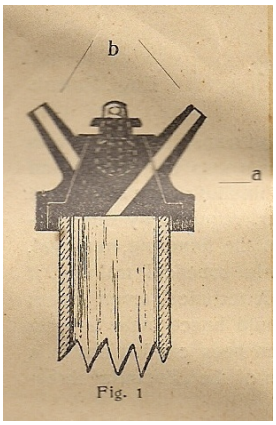


Fig. 1

After using a two-way syringe constructed on this principle for punctuations 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 paraffin liquid. 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. A connection at the head piece 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 floated through this hose. The two other connections are fitted with bayonet caps on which the Oehlecker glass cannulas are fastened by means of a rubber hose. The connections are supplied with various bends so that the direction of the glass cannulas can be adapted as closely as possible to the position of the vein.

If 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 cannulas 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 (1). 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 cannulas 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.

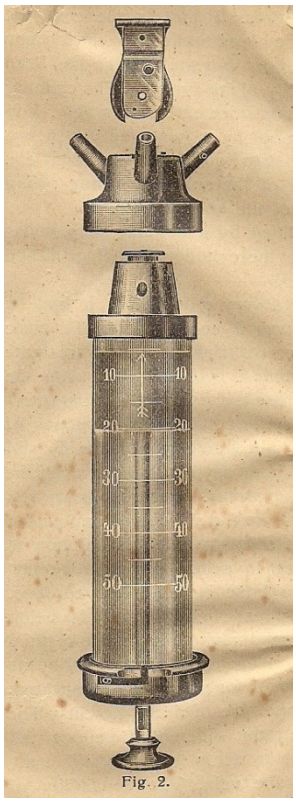


Fig. 2.

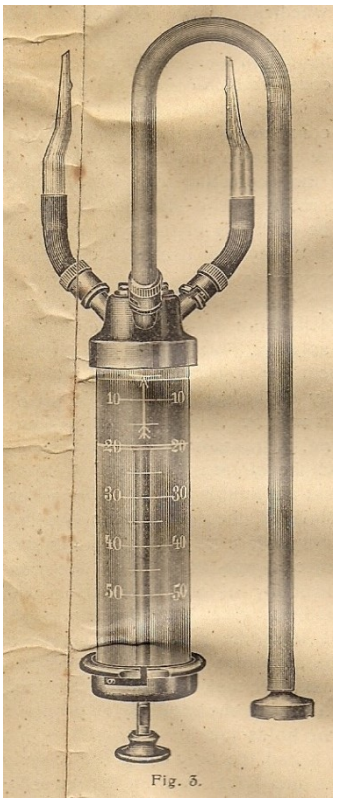


Fig. 3.

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 clots 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 cannulas 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.

Rotanda Transfusion Syringe
(Image credit – Phil Learoyd)