TRANSFUSION - HANDBUCH DER KRIEGSCHIRURGISCHEN TECHNIK

By: FRIEDRICH VON ESMARCH

A TRANSLATION BY PHIL LEAROYD

A copy of the 'Transfusion' section of the 'Handbook of Military Surgical Technology' by Friedrich von Esmarch, published in Hanover (by C. Rumpler) in 1877 is available to read or download from the following site:

https://archive.org/details/b2190733x/page/n231/mode/2up

The 'Transfusion' section (sub-headed: 'transfer of blood from one person to another') of this handbook is as would possibly be expected of a handbook of military surgery, a step-by-step numbered procedural guide of performing a blood transfusion. This section is very well illustrated, providing a valuable historical insight into the actual procedural details of performing an indirect transfusion using defibrinated-filtered human blood. It provides practical details of the defibrination process as well as the actual transfusion process using a hydrostatic gravity method, a syringe or Collin's transfusion device. Finally, it also somewhat surprisingly, includes short notes on the use of arterial blood for transfusion.


Handbuch

der

Kriegschirurgischen Technik.

Eine gekrönte Preisschrift

von

Dr. Friedrich Esmarch,

Professor der Chirurgie und Director der chirurgischen Klinik an der Universität Kiel, Geheimer Medicinal-Rath, Generalarzt der Landwehr, Ritter des K. Preussischen Kronenordens 2. Klasse, des K. K. Oesterreichischen Ordens der eisernen Krone 3. Klasse, Commandeur 2. Klasse des K. Schwedischen Nordsternordens, Comthur des K. K. Oesterreichischen Franz-Joseph-Ordens, Inhaber des Schleswig-Holsteinischen Erinnerungskreuzes für 1848–49, der Kriegsdenkmünze für 1864, der Kriegsdenkmünze für 1870–71, des Sächsischen Erinnerungskreuzes für 1870–71, des Französischen Bronzekreuzes für Hülfe im Kriege, Ehrenmitglied des Oesterreichischen patriotischen Hilfsvereins für verwundete Krieger, correspondirendes Mitglied der Société de Chirurgie in Paris, des ärztlichen Vereins in München, der K. Gesellschaft der Aerzte in Buda-Pest und des Vereins zur Beförderung der medicinischen Wissenschaften in Niederländisch Indien.

Motto: Kurz und bündig.

Mit 536 Holzschnitten und 30 Tafeln in Farbendruck.

Hannover.

Carl Rümpler.

1877.

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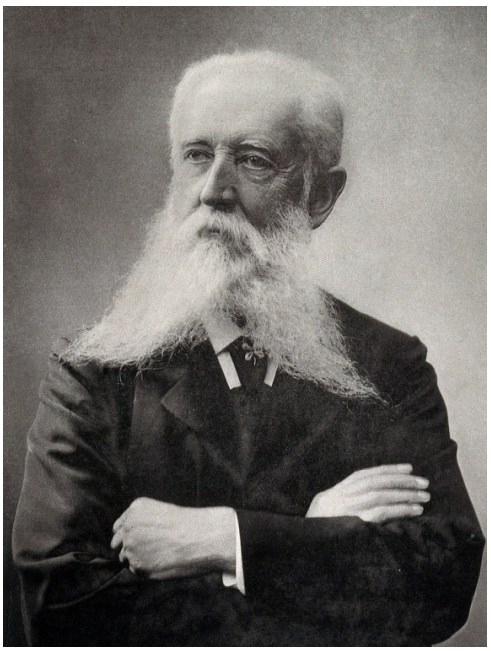
Title-page: Handbuch der kriegschirurgischen Technik
(Image credit: Internet Archive)

I have produced a translation into English to enable its content to be appreciated by a wider audience. Whilst I am aware that instantaneous computer generated translation is available, this process struggles with accurately reading the original text and interpreting specialist terminology, as well as producing a 'colloquial style' not always representative of the original text. In addition, an 'automatic translation' may either purposely or inadvertently alter the wording to 'make it read better' but in doing so there has to be an element of interpretation involving something on the lines of 'I believe that this is what the author is actually trying to say'. I want to avoid that as much as possible and try to present what the author actually wrote and as a result the reader may find that the English text does not 'flow' as well as it could.

Although I have taken great care in accurately identifying the original text and producing a true representative translation of 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. I have maintained the format of the numbered sections though the positions of the various illustrations in relation to the actual text may vary from the original.

FRIEDRICH ESMARCH – BIOGRAPHICAL INFORMATION

Friedrich Esmarch – full name 'Johannes Friedrich August von Esmarch' (9 January 1823 – 23 February 1908) was born in Tönning, Schleswig-Holstein and studied in Kiel and Gottingen universities. He became assistant surgeon at Kiel Hospital in 1846 and was appointed as a field surgeon in the Schleswig-Holstein war in 1848, where his interest in military surgery and first aid began. He became director of the surgical clinic at Kiel in 1854 and head of the general hospital and professor at the University of Kiel in 1857. He was appointed to the Berlin Hospital Commission in 1866 when he also became superintendence of the surgical work in the hospitals there. In 1870 when the Franco-Prussian war broke out he was appointed surgeon-general to the army and afterwards became consulting surgeon at the military hospital near Berlin, becoming an authority on hospital management and military surgery. His *Handbuch der kriegschirurgischen Technik* was a landmark publication in providing surgical and first aid information for battlefield injured.



Friedrich von Esmarch (1823-1908)
(Image credit: Wikipedia)

THE TRANSFUSION

(Transfer of blood from one person to another.)

1. Blood is removed from a healthy, strong person through bloodletting.

2. The blood is collected in a clean glass and immediately defibrinated by beating or stirring it for about five minutes using a clean stick or spatula made of glass, wood or hard rubber (Fig. 288).

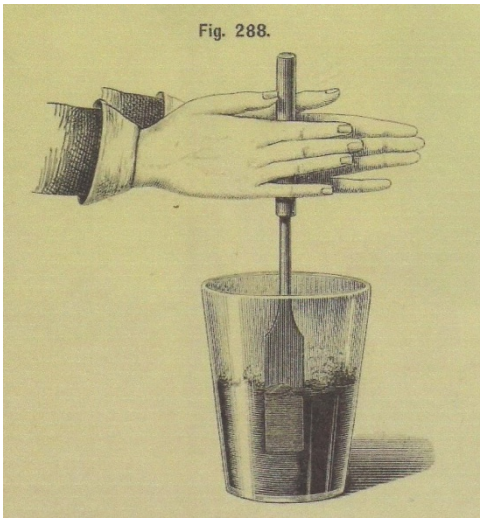


Fig. 288: *Defibrination of the blood by stirring*.

3. The whisked blood is filtered through a clean, thick linen cloth, then whisked again and filtered again through pure white satin, the finish of which has previously been removed by washing in distilled water. The filters can either be placed in a pure glass funnel or stretched over a wooden frame with small points (Fig. 289 and 290).

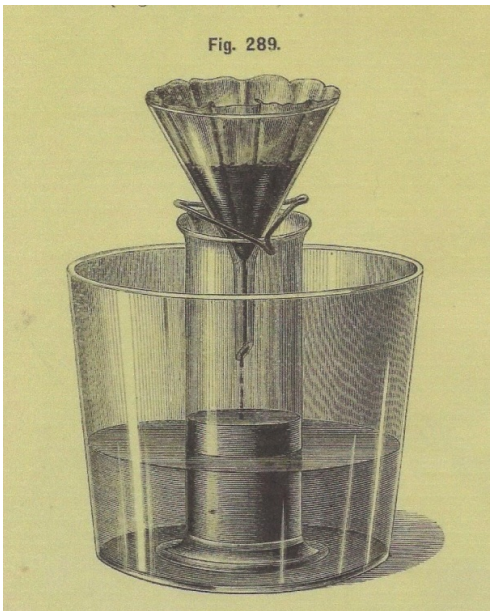


Fig. 289: *Filtering the defibrinated blood through linen into a glass jar,*

4. The filtered blood flows into a clean, dry glass vessel which is placed in warm water at 40° Celsius and remains there until it is to be used.

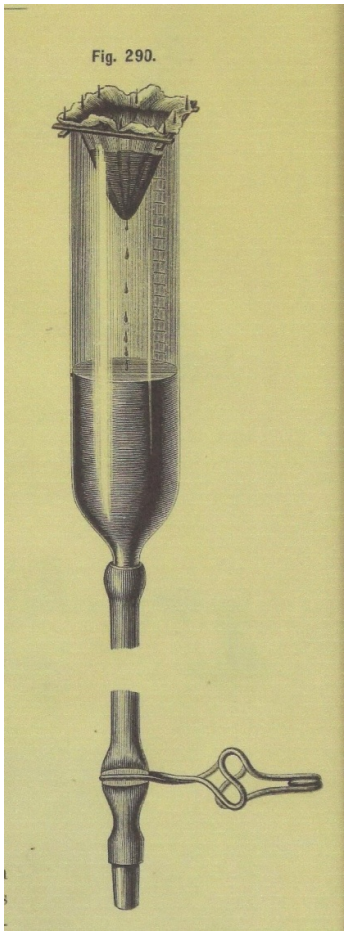


Fig. 290: *Filtration of the defibrinated blood through satin into the glass cylinder.*

Annotation. Whisked blood can be stored in a well-covered vessel surrounded with ice for up to 24 hours, but before transfusion it must be warmed to 36° Celsius by placing it in hot water and saturated with oxygen by repeatedly sucking it in and spraying it out again (Panum).

5. Meanwhile, in the patient, a subcutaneous vein (e.g. the median basilic vein in the crook of the elbow, or the great saphenous vein in front of the internal malleolus) is exposed by incising a fold of skin and isolated to such an extent that two catgut threads can be passed underneath.

6. The peripheral end of the vein piece is tied with one thread; the other thread is pushed under the central end.

7. The exposed vein is opened by lifting the upper wall with fine hooked forceps and making an oblique incision underneath it with scissors so that a small flap wound is created.

8. By making it gape by raising the flap, a cannula with a rounded tip (made of glass, hard rubber or silver) is inserted into the central end of the vein and tied with the second catgut thread (Fig. 291).

9. The cannula and a rubber tube attached to it with a hard rubber attachment are previously completely filled with defibrinated blood (or with a weak solution of Natrum carbonicum [0.3%] or table salt [0.5%]) and closed using a pinch valve.

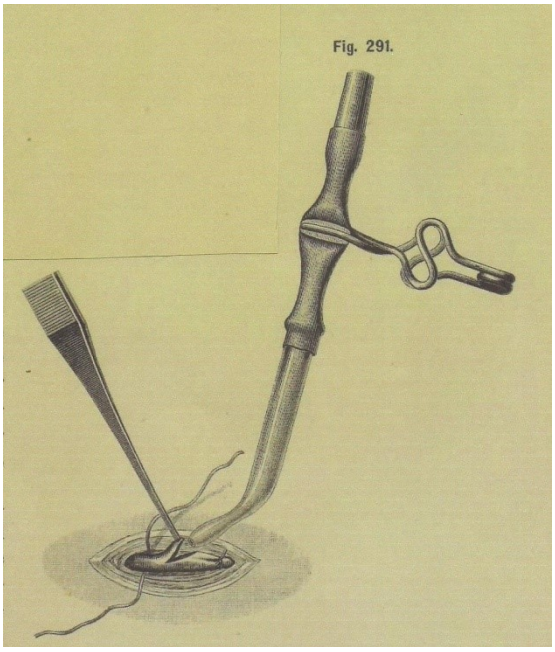


Fig. 291: *Insertion of the cannula*.

10. To transfer the defibrinated blood it is best to use hydrostatic pressure in the manner of a wound douche, e.g. in the following way:

11. A calibrated glass cylinder, which holds 3 - 400 grams of liquid, ends at the bottom with a button-shaped pierced tip to which a foot-long rubber tube is attached. In the lower end of the latter there is a small pierced attachment of hard rubber that fits exactly into the attachment of the cannula. The lumens of these parts must all be of the same diameter, so that there is no shoulder inside the entire tube (Fig. 290).

12. The defibrinated blood is poured into this cylinder; as soon as it flows out of the hanging hose, it is closed by a pinch valve just above the end piece. By pressing and stroking upwards, all air is removed from the hose.

13. To prevent the blood from cooling, the hand holding the cylinder can press an ice pack filled with hot water onto the outer wall of the cylinder (Fig. 292).

14. Then the end piece of the hose (Fig. 290) is inserted into the extension piece of the cannula (Fig. 291). You raise the glass cylinder with one hand and the patient's arm with the other, have the two pinch valves removed and now see the column of blood slowly sinking down into the glass cylinder (Fig. 292).

15. As soon as the cylinder is almost empty, the hose is closed with a finger pressure. The cannula is pulled out of the vein, the central end of the latter is cut off, the wound is cleaned with carbolic water and bandaged with an antiseptic.

16. Using a syringe for transfusion is less practical, 1) because too much pressure can easily be applied, 2) because the plunger of the syringe can easily contaminate the blood (through rancid oil, dried liquids from previous use, etc.) and 3) because the risk of air entering the vein is greater.

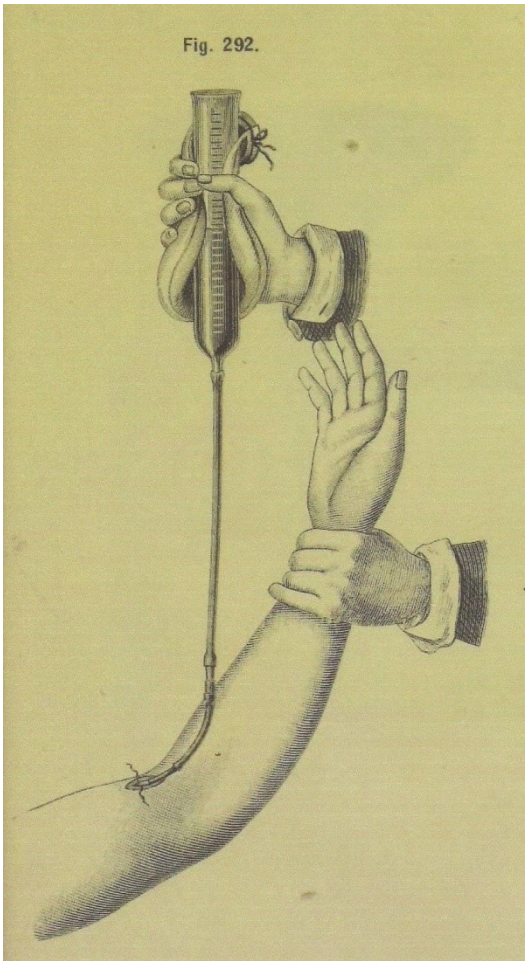


Fig. 292: *Transfusion by hydrostatic pressure*.

17. To avoid the latter, you can use the glass syringe from Uterhart (Fig. 293), in which the outflow tube is placed eccentrically, so that any air that may still be present above it remains in the syringe tube (air catcher), as long as you don’t push the plunger to the very end.

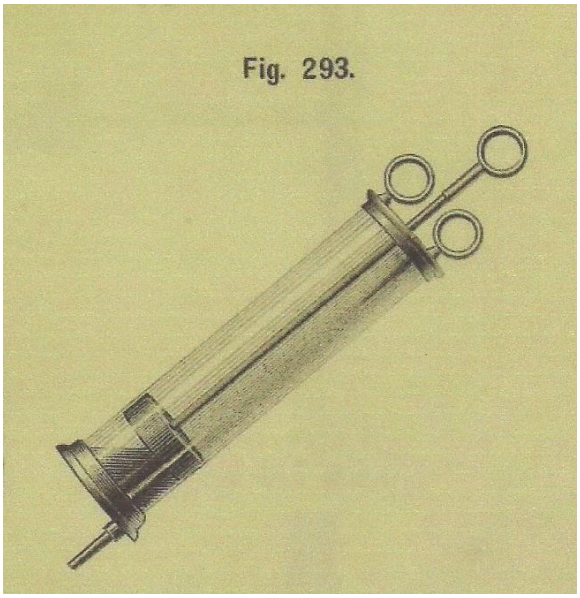


Fig. 293: *Uterhart's transfusion syringe*.

18. Also the transfusion apparatus by Collin (Fig. 294), introduced into the French army, in which a light, hollow aluminium ball serves as a valve, which does not allow the blood, but rather the air bubbles, to escape upwards into the funnel the syringe plunger is advanced, making it impossible to inject air.

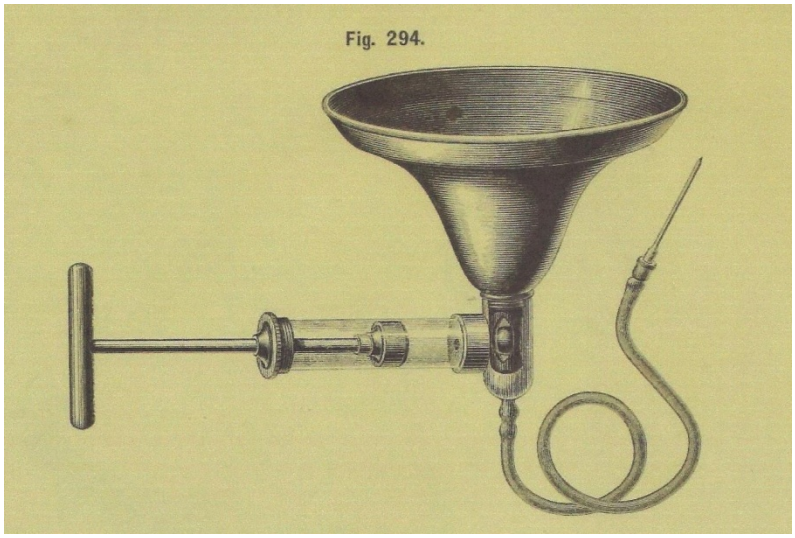


Fig. 294: *Collin's transfusion apparatus*.

19. Incidentally, the glass cylinder (Fig. 292), as long as it has the same calibre everywhere, can be very easily converted into a good and absolutely pure syringe by screwing an embolus made of hard rubber onto the whisk (Fig. 295), whose diameter is a few millimetres smaller than the lumen of the cylinder, and whose side surfaces are somewhat hollowed out. You wrap it with cotton wool, jute, gauze or cotton wick, tie a piece of protective silk over it and get a syringe stamp that is absolutely pure and exactly fills the lumen of the cylinder. If this tip is always held vertically and the advancement of the stamp [plunger] is interrupted before the blood column has been pressed down to the lower tip of the cylinder, there is no fear of air being injected into the vein.

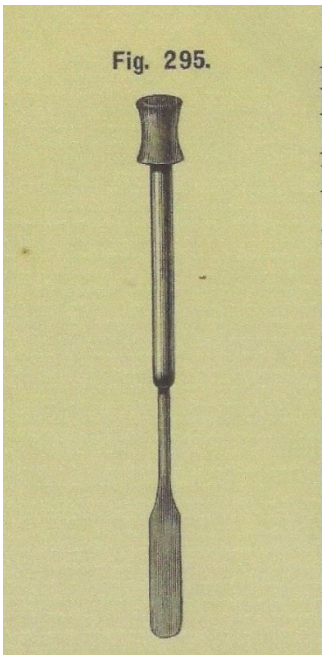


Fig. 295: *Whisk with syringe stamp*.

20. When using the syringe it is particularly important to let the plunger act very slowly and evenly so that the right heart is not overfilled. More than 25 grams of blood should never be transferred in one minute. On the Hasse transfusion syringe (Fig. 296), the plunger is moved by a screw nut, the rotation of which enables very slow and even advancement.

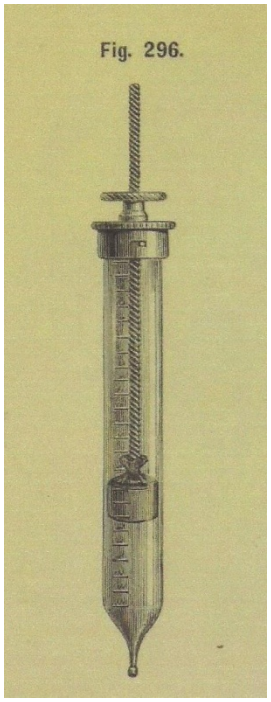


Fig. 296: *Hasse's transfusion syringe*.

21. The safest way to avoid the above-mentioned dangers is, according to Hüter, to use an artery for transfer (arterial transfusion). For this purpose, in adults, the radial artery is chosen above the wrist or the tibialis postica artery behind the internal malleolus; in children, the brachial artery is chosen on the inner edge of the biceps muscle.

22. Expose the artery as described above and pass two catgut sutures under it. One is used to tie off the artery at the central end of the incision, open it with a small flap incision, insert the tip of the cannula into the opening towards the periphery and tie it with the second suture.

23. Since in arterial transfusion strong pressure must be applied to force the blood through the capillary vessels, a good syringe or Collin's apparatus must be used for this purpose.

24. As soon as the transfusion is completed, the cannula is pulled out of the artery, the peripheral end is also tied off, the middle section is cut and the wound is bandaged with antiseptic.

25. In some cases, the transfusion can be avoided by temporarily forcing the blood out of the extremities by wrapping them tightly from below with elastic bandages (Auto-transfusion. Müller). In others, at least this means can be used to stop the escaping life until the transfusion can be carried out.