Heart of America Association of Blood Banks
April 22, 2015

"O - ver There"
Blood Transfusion in World War I

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WAR! What Is It Good For?

Roman Wars	**tourniquets, amputation**
Crimean War	**professional nurses**
US Civil War	**ambulances and medics**
South African War	**antiseptics, field hospitals**
World War I	**vaccinations, antitoxins mobile laboratories, orthopedics, blood transfusions**
World War II	**penicillin, plastic surgery malaria treatment**
Korean War	**MASH units**
Vietnam War	**Rapid Evacuation of Wounded**
Afghanistan War	**Prosthetics, Golden Hour transfusion**

“…the surgeons engaged in the work were practical men who apparently knew little of what had gone before, whether scientific or practical, and cared less. All they were interested in was the actual running of blood from one person to another and keeping it running. How it was to act when it got there, what it was to do, whether there would be reactions…concerned then little.”

“The radial artery of the donor is exposed and after a vein of the recipient has been dissected, both vessels are united with a Crile cannula, which made the transfer of blood from donor to recipient a safe, though technically a most difficult procedure.

... the technical preparation of the operative field (including the establishment of the anastomosis) may last over two and sometimes three hours. The slightest motion of donor or recipient stops the proper functioning of the anastomosis or a clot may form, which makes useless all the difficult work of the surgeon..”

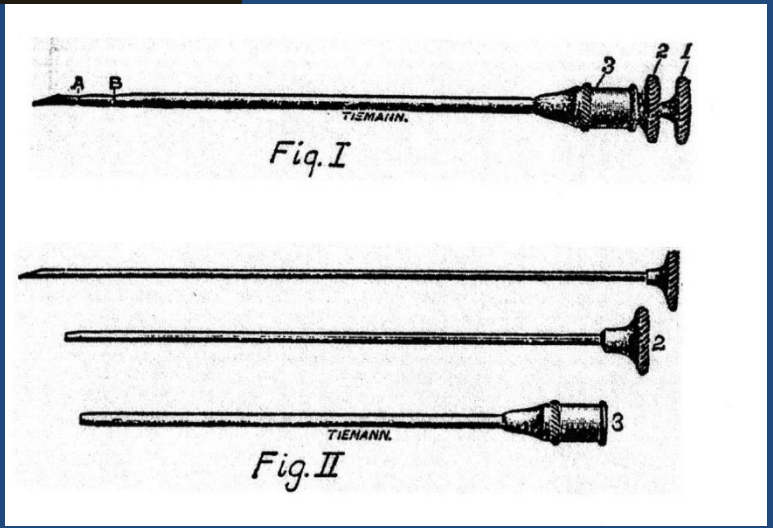
Richard Lewisohn

Syringe Transfusion Technique of Edward Lindeman (1913) Bellevue

A series of 20cc syringes passed from donor to recipient by a choreographed team of surgeons and assistants.

1st to use sharp-pointed needles with no incision

1st to allow measurement of exact quantity of blood transfused



Rosse WF. Clinical Immunohematology: Basic Concepts and Clinical Applications. Boston: Blackwell Scientific. 1990

Lawrence Bruce Robertson

1885 - 1923

1911-12 Works with Lindeman on syringe method

1913 Returns to Toronto

1914 Enlists

1915 To Canadian Casualty Clearing Station 2 at Aire in Pas de Calais,
then to British 14th General Hospital at Boulogne-sur-Mer

The transfusion of whole blood

A suggestion for its more frequent employment in war surgery

British Medical Journal 1916;2:38-40

1st to address wartime transfusion in a major medical journal

Encourages use of blood instead of saline

Further observations on the results of blood transfusion in war surgery

British Medical Journal 1917;2:679-683

Oswald Hope Robertson
1886-1966

Born In England

Moved to California (age 2)

Medical School California
Harvard

Mass. General Hospital
Assigned to Roger Lee

1915 Peyton Rous at Rockefeller Institute
Close to Mt. Sinai Hospital

Sept 1917
O.H. Robertson sent to
British 3rd Army Casualty Clearing Station
to consult on transfusion

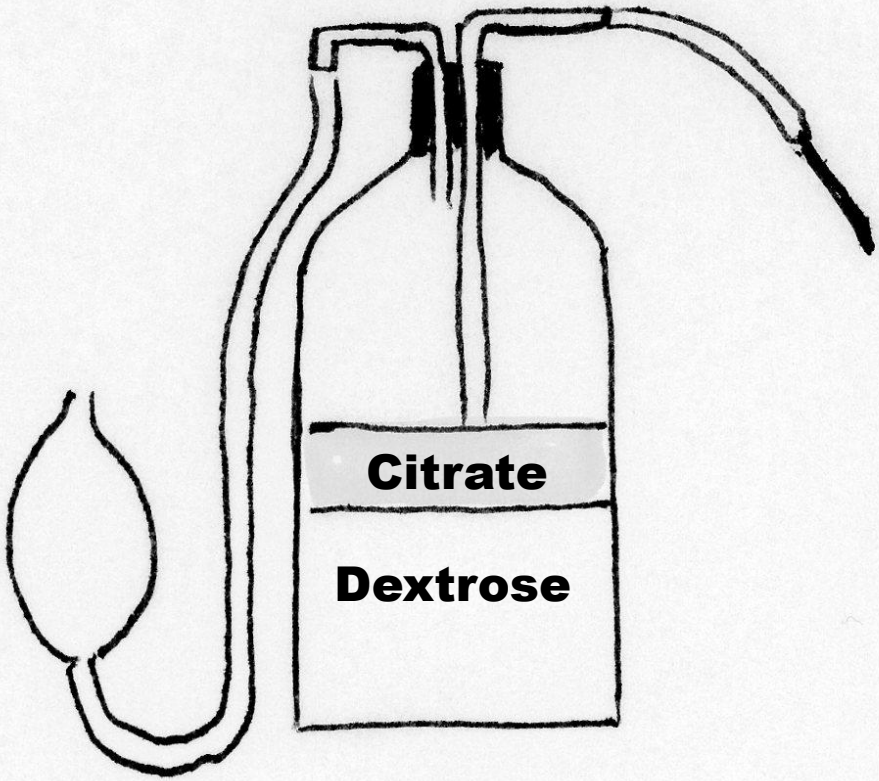
Draws up plans to transfuse using
citrated blood in glass bottles

Use all group IV blood as universal donors.

Designs a carrying case with
ice and sawdust
packed around the bottles

500 mL Blood
350 mL Citrate
850 mL Dextrose

Autoclave Citrate and Dextrose Separately



2000 mL Winchester Bottle

"short and wide rather than tall and narrow"

After Collecting Blood: Settle for 4-5 days

Draw off supernatant fluid just prior to transfusion

(Add gelatin/saline solution to 1,000 mL)

Pour through two layers sterile gauze into transfusion bottle

Place transfusion bottle in water at 105-107F (40.6-41.7C)

Original "Robertson Bottle" was 1L, with citrate only. Blood transfused immediately.

Only group O (then termed group IV) blood was used. The 500 cc. taken from each donor was collected in the Rous-Turner glucose-citrate solution ...and stored in an icebox. . .

The majority of transfusions were given within 10 to 14 days after the blood had been collected, but in some instances they were given with 26-day-old blood. The length of time the blood was kept did not seem to influence the results.

The blood arrived in good condition, with no evidence of hemolysis, after transportation by ambulance for 6 to 8 miles over rough roads...

The 22 transfusions with preserved blood reported by Robertson in June 1918 were carried out on 20 patients, of whom 9 died but all of whom, it was thought, would have died unless they had received blood.

Blood Program in World War II
Brig Gen Douglas B. Kendrick, 1964

“Robertson’s publications describe over 200 transfusions, and by the end of the war he was running a school for blood transfusion that trained six teams a week.”

Hess JR, Thomas MJG.
Blood use in war and disaster: lessons from the past century.

Transfusion 2003;43:1622-1633.

“Oswald Robertson, Arlie Bock and I tried to spread the gospel of the necessity of blood grouping to make blood transfusion safe….

In a special meeting on transfusion, a well-known American surgeon was pooh-poohing blood typing – for my particular benefit – and told of his large number of successful transfusions without the bother of blood typing.

He went on to demonstrate, and the poor devil of a patient died then and there.”

Roger Lee

Many Other World War I Transfusionists

Alexander Primrose
Stanley Ryerson
David Robertson
Edward Archibald
Norman Guiou

Émile Jeanbrau
Arnault Tzanck

Geoffrey Keynes

World War I Transfusions Conclusions

Although the war brought things together, all the pieces were in place before the war – especially before U.S. entered

War helped doctors learn how to perform transfusions

SEROLOGICAL DIFFERENCES BETWEEN THE BLOOD OF DIFFERENT RACES.

THE RESULT OF RESEARCHES ON THE MACEDONIAN FRONT.*

BY DR. LUDWIK HIRSCHFELD,
DOZENT AT THE UNIVERSITY OF ZURICH;
AND
DR. HANKA HIRSCHFELD,
OF THE CENTRAL BACTERIOLOGICAL LABORATORY, ROYAL SERBIAN ARMY.

Race Problems and Researches in Immunisation.

IT is a well-known fact that it is possible to produce anti-bodies by injecting an animal of one species with the red blood corpuscles of an animal of a different species. These

The Lancet 1919;ii:675-679

Bruce Robertson observed two cases of carbon monoxide poisoning in which almost all the patients' blood was replaced. Realized that removing "damaged blood" was as important as infusing new blood.

Returning to Toronto's Hospital for Sick Children, he used "exsanguination transfusions" to remove toxins in cases of septicemia, burn-related toxemia, drug poisoning and malignant scarlet fever.

http://theworldwar.org/

National World War I Museum at Liberty Memorial Kansas City, Missouri

Medicine in the First World War

KU MEDICAL CENTER
The University of Kansas

NATIONAL WWI MUSEUM
AT LIBERTY MEMORIAL

http://www.kumc.edu/wwi.html

World War I Medicine and Transfusion

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Lindeman E. Simple syringe transfusion with special cannulas. Am J Dis Children 1913;6:28-32.

Hedley-Whyte J, Milamed DA. Blood and war. Ulster Med J 2010;79:125-134

Pinkerton PH. Canada's transfusion medicine pioneer: Lawrence Bruce Robertson. Transfusion 2001;41:283-286.

Hanigan WC, King SC. Cold blood and clinical research during World War I. Mil Med 1996;161:392-400

Coggeshall LT. Oswald Hope Robertson, June 2, 1886-March 23, 1966. Biogr Mem Natl Acad Sci 1971;42:319-338.

Stansbury LG, Hess JR. Blood transfusion in World War I. The roles of Lawrence Bruce Robertson and Oswald Hope Robertson in the "most important medical advance of the war". Transfus Med Rev 2009;23:232-236