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A SIMPLE AND SAFE METHOD FOR THE PREVENTION OF AIR EMBOLUS DURING TRANSFUSION

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The necessity for rapidly replacing blood loss occurs often in the busy hospital. One common way this is accomplished is by forcing air above the blood. Inherent with this method is the very real danger of air embolization with its consequent fatal results.

In the past year at the Henry Ford Hospital there have been two cases of air embolus secondary to the forced transfusion of blood, both terminated fatally. Several near accidents of this type have stimulated interst in a method of forced blood replacement which is safe. The general policy in our hospital has been that when air has been used to force transfuse, one member of the team has been delegated to observe the intravenous set-up at all times to prevent air from gaining entrance to the circulatory system. The two fatalities previously mentioned are mute testimony to the ineffectiveness of this method.

Another effective way of forcing blood without danger of air embolus is available when plastic containers are used. Manual pressure can be exerted on the outside of the bag without air entering the system. Commercially available are also special types of valve pump mechanism which will not transmit air into the circulatory system. Neither of these are commonly used in our hospital at the moment.

It was, therefore, thought that the description of a safe effective method of forced transfusion using compressed air would be of general interest. A combination of several existing methods now in use is employed. Especially important are the facts that no special type of equipment is necessary, nor does the set-up have to be under constant observation.

The transfusion set-up consists of a blood donor set which is connected to a liter bottle of saline of which 800 cc's. has been discarded (Figure 1). In place of the usual ball valve needle in the blood inlet (N) an ordinary 15 gauge needle is used. To this a hand bulb is attached by a length of rubber tubing. Air is now forced into the blood bottle, (Figure 1b) this in turn rapidly forces the blood into the saline bottle. *No air* is pumped from the blood bottle into the saline bottle. When an adequate amount of blood has been forced into the saline bottle or just before the blood bottle becomes empty the rubber tube is detached (Figure 2a). This allows the compressed air in the blood bottle to exhaust out the 15 gauge needle. The blood saline mixture is prevented from entering the blood bottle by a ball valve previously indicated at (V). This valve is an intergal part of several commercially available intravenous sets. The compressed air in the saline bottle now serves as a safe source to force blood into the patient. When the air has expanded to its original volume the blood drips only from the force of gravity and air embolus is impossible.

To re-emphasize the important steps: If an ordinary 15 gauge needle is used as an air intake, if no air is forced from the blood bottle into the saline bottle, and

if the hand bulb is removed allowing the compressed air to exhaust, air embolus cannot occur if the bottles are hung with the vents down.

In summary a simple, fool-proof method for the prevention of air embolus requiring no extra equipment has been presented.

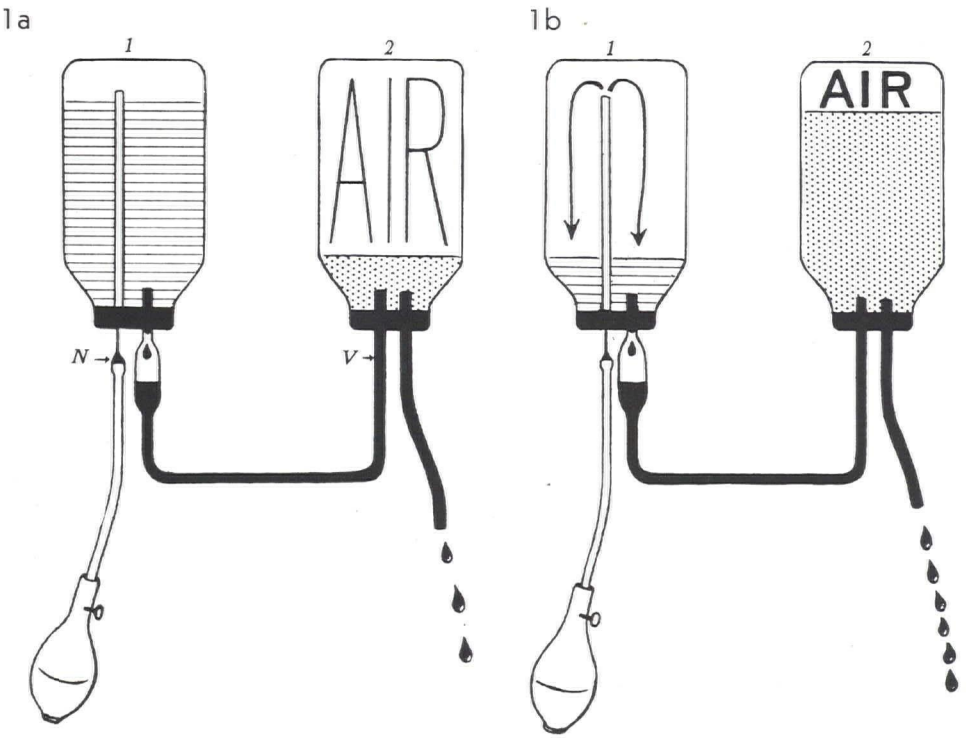

Figure 1a

The intravenous set-up consists of a blood donor set connected to a liter of saline of which 800 cubic centimeters has been discarded. An ordinary fifteen guage needle is placed in the air inlet (N). To this a hand bulb is attached. "V" represents a ball valve which allows blood to flow only into saline bottle.

Figure 1b

Compressed air is pumped above the blood rapidly by means of the bulb. Blood is then forced into saline bottle faster than it can escape into the patient thereby compressing the air above the mixture.

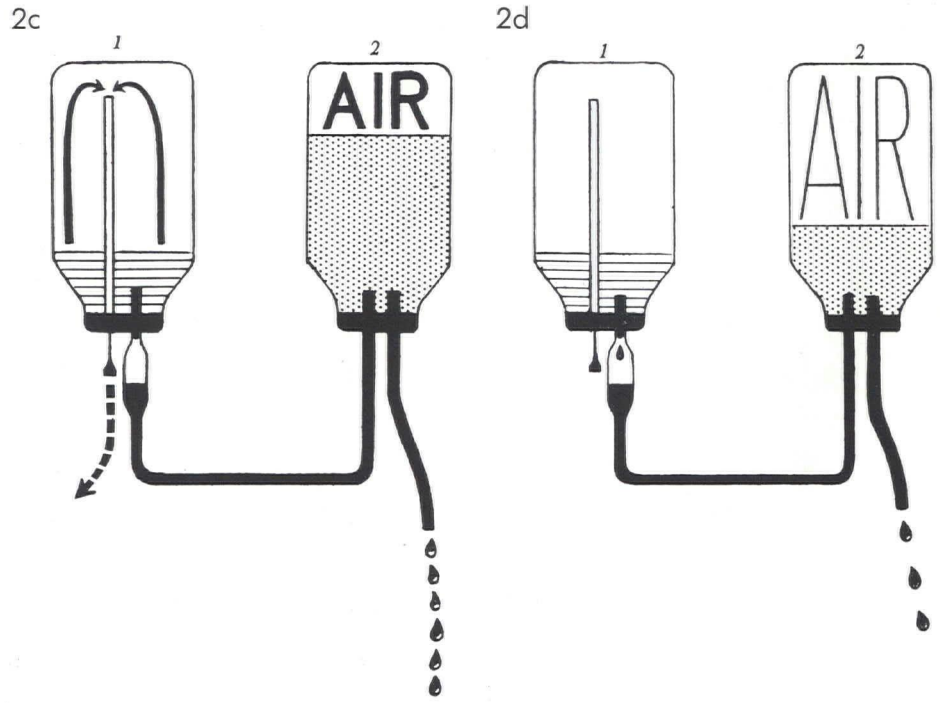

Figure 2c

When the blood flow is rapid enough or just before the blood bottle becomes empty the hand bulb is removed. (*No air* is pumped from the blood bottle into the saline bottle.) Now the compressed air in the blood bottle exhausts out the fifteen guage needle until the pressure becomes atmospheric. The compressed air above the blood saline mixture now safely forces the mixture rapidly into the patient.

Figure 2d

When enough blood has been forced into the patient the air expands to the original volume of 800 cubic centimeters. The air is now at atmospheric pressure and air embolus can't occur.