

Clinical Extracorporeal Bypass Transfer from Bubble to Membrane Oxygenator

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INTRODUCTION

Bubble oxygenators are used in most centers as the circuit of choice for elective open-heart procedures. However, when emergencies requiring long term perfusion occur, one turns to membrane oxygenators. This necessitates a change of circuit during clinical perfusion. At our hospital we were faced with an emergency and the circuit was changed utilizing the following described technique with circulatory arrest time of less than 30 seconds.

CASE REPORT

A 68 year old male with a diagnosis of arteriosclerotic heart disease, hypertension and diabetes underwent routine triple aorto-coronary artery bypass surgery. He was perfused for 1 hour and 22 minutes on a 6LF Travenol bubble oxygenator using moderate hypothermia. The chest was being closed and the blood was being returned via an intravenous line when cardiac arrest occurred.

Routine resuscitation was instituted and perfused for an additional 50 minutes while an intra-aortic balloon was inserted. Despite the action of the balloon, repeated attempts to discontinue cardiopulmonary bypass were unsuccessful. After 3 hours and 12 minutes of perfusion it was decided to transfer to the Teflo® membrane oxygenator, and after the circuit change, a fourth aorto-coronary vein graft was added.

PROCEDURE

Perfusion with the 6LF bubble oxygenator was continued while the Teflo membrane oxygenator and pump were assembled in the routine manner. The arterial and venous pump lines were omitted and, as shown in Figure 1, the suction and sump pumps of the first system were turned off and their tubings transferred to the membrane pump and connected to the cardiotomy reservoir (Figure 1a and 1b). The blood suctioned was used as prime with the addition of 500 ml. of 5 percent dextrose in Ringers Lactate. A recirculation shunt was established between the arterial and venous reservoirs using a reducer, 1/2" x 3/8", and a 1/2" extension tubing (Figure 1c). The priming volume was circulated and all air removed via the reservoirs (Figure 1d). The shunt was then clamped off and cut out (Figure 2). At this time the 6LF pump was stopped, venous and arterial lines were double-clamped (Figure 3a) and transferred to the membrane pump (Figure 3b). The pump was turned on, air was removed by venting the reservoirs and the patient was put back on bypass. Finally, a new 3LF pump tubing was attached to the arterial outlet of the bubble oxygenator,

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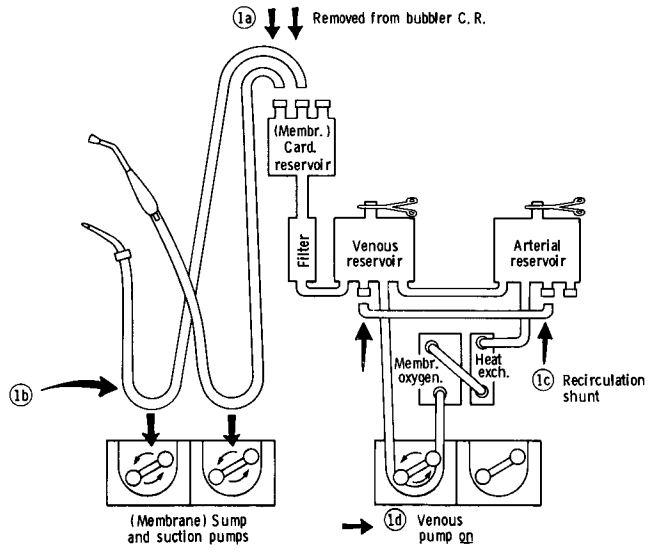


Figure 1

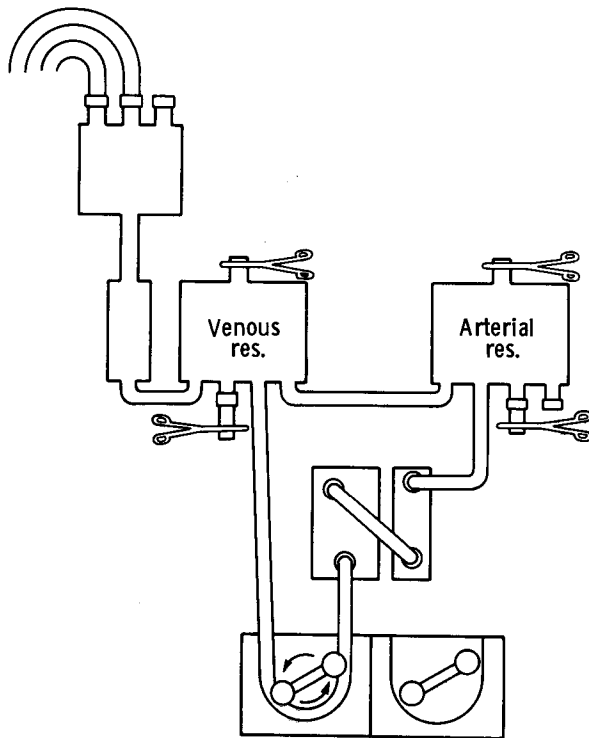


Figure 2

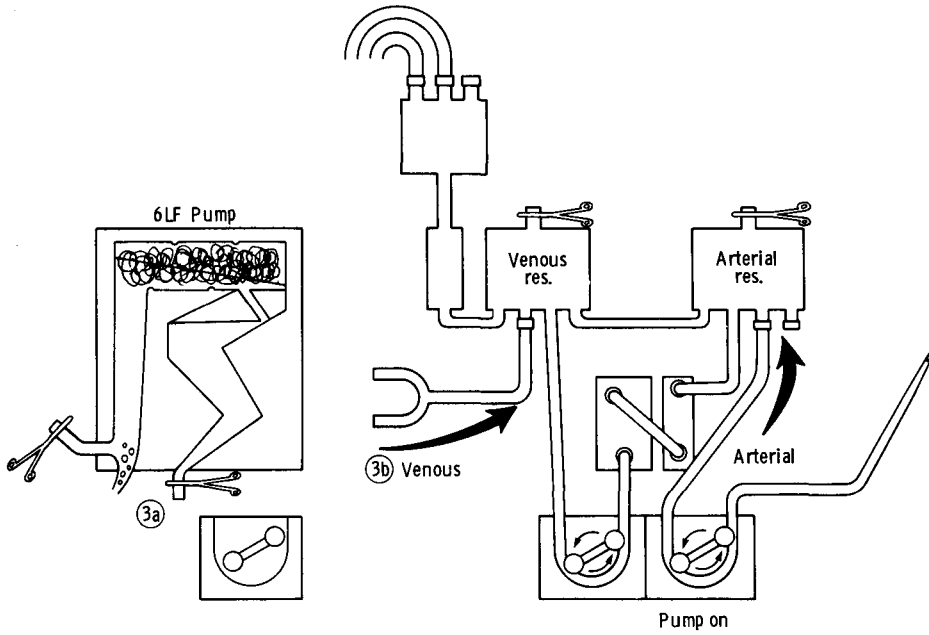


Figure 3

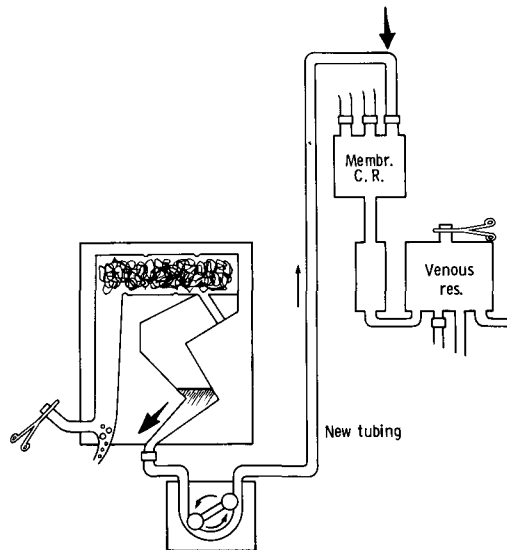


Figure 4

and all remaining blood was transferred to the membrane reservoir and returned to the circulation (Figure 4).

EXTRA EQUIPMENT REQUIRED

1. 3/8 x 1/2 reducer
2. 1/2" tubing 6" long
3. 3/8 tubing 2" long
4. 1 3LF pump tubing
5. 6 pump clamps

DISCUSSION

This clinical circuit transfer was carried out without incident because several experienced perfusionists were available to assist. Probably this could not have been done by a single perfusionist. This is an example of expeditious team work and of successfully carried out pre-established routine.

SUMMARY

It is impossible to predict all cases in which long term perfusion may be required. This satisfactory procedure for transfer from a 6LF bubble oxygenator to a Teflo® membrane oxygenator proved to be effective and was done without incident in a reasonable amount of time.