

Clotting in the venous reservoir

【Clotting in the venous reservoir】

Even if heparin is administered during extracorporeal circulation, blood in the venous reservoir may coagulate due to suction blood or aggregation caused by blood degeneration. If each filter in the venous reservoir becomes clogged with clotted blood, problems such as backflow of gravity vent and poor venous return will occur, so it is necessary to constantly monitor the venous reservoir, connected circuits, and various lines. Please refer to the following information for points to note and suggestions on how to deal with problems and countermeasures when they occur.



【Points to note】

Blood coagulation in extracorporeal circulation includes intrinsic blood coagulation activated by stagnation of blood and xenobiotic response, and extrinsic blood coagulation activated by tissue factor released from damaged tissue. In addition to these blood coagulation causes, coagulation in the venous reservoir may be caused by surgical adhesives or blood coagulation due to drugs, etc. For this reason, please note the following points:

- ① Do not allow blood to remain in the cannula or cardiopulmonary bypass circuit for long periods of time.
- ② Blood exposed to the pericardium and mediastinal surface contains a large amount of tissue factor, so monitor the blood status in the venous reservoir as well as ACT, and use an autologous blood transfusion device as much as possible.
- ③ Avoid rapid infusion of drugs such as alkalizing agents.
- ④ Be alerted and monitor not to aspirate surgical adhesives, etc.



Handling

1. In case where abnormality is found on the surface or fluid level of the venous reservoir filter, and venous return cannot be obtained at the initiation of extracorporeal circulation:
 - There is a possibility that clotted blood has been drawn into the venous reservoir or that there is clotting.
→Stop the arterial pump and suction immediately and change-out the venous reservoir.
 2. In case where suction and vent stop functioning, or if the infusion line on the venous reservoir is backed up:
 - The filter on the suction (cardiotomy) side of the venous reservoir may be clogged.
→Discontinue suction, vent, and add a cardiotomy reservoir to the venous reservoir.
- ※ Please consider the needs for action and the specific measures to be taken at each facility. Upon handling, explain the situation to the surgeon and proceed with the work. Conduct simulation training on troubleshooting as well, to respond quickly to problems.



Countermeasures

1. Clotting in venous reservoir due to blood retention
 - Start cannulation with a high ACT (480 seconds or more recommended).
 - Select a surgical procedure that minimizes the time from cannulation to the initiation of extracorporeal circulation within the medical team.
 - Carry out recirculation where possible, and measure ACT periodically.
2. Clotting in venous reservoir by aspiration of tissue fragments, coagulated blood, glue, etc. from suction
 - Monitor the surgical field and suction blood inlet area (positive pressure, blood clots) when using suction
3. Increased pressure in venous reservoir due to clotting
 - Use one-way valves for circuits such as gravity vent, which are greatly affected by internal pressure increase

References

- Nakahira A, et al. Closed cardiopulmonary bypass circuits suppress thrombin generation during coronary artery bypass grafting. *Interact Cardiovasc Thorac Surg* 2010;10:555-60.
- Nakahira A, et al. Cardiotomy suction, but not open venous reservoirs, activates coagulo-fibrinolysis in coronary artery surgery. *J Thorac Cardiovasc Surg* 2011;141:1289-97.