

# Measurement of Activated Clotting Time (ACT)

Monitoring of arterial line pressure at the inlet of the oxygenator has become a common practice, and reports of abnormal coagulation and other symptoms reminiscent of obstruction of the oxygenator have been increasing recently. Although there are cases in which the abnormal aggregation cannot be resolved, it is important to ensure good anticoagulation management as a countermeasure.

For this purpose, it is necessary to measure the activated clotting time (ACT), but in practice, the optimal ACT during cardiopulmonary bypass has not been established. The commonly used minimum ACT of 400 seconds is based on empirical rule that clotting rarely occurs above that time, and the dire side effects that may result from lowering it have led to the acceptance of a target value of 400 seconds or more. Understanding ACT measurements is important because many factors can affect them.

## 【Causes】

ACT during cardiopulmonary bypass may not reach the target value or may show excessive prolongation in the following respects:

- 1) Target value not reached
  - Reduced effect of heparin due to decreased antithrombin III, etc.
  - Mixing with inadequate activator
  - Misadministration of protamine
- 2) Excessive prolongation
  - Hemodilution with priming solution
  - Inactivation of coagulation factors by hypothermic extracorporeal circulation
  - Low platelet count (below 50,000)
  - Patients taking warfarin
  - Antiphospholipid antibody syndrome, contact factor deficiency (e.g., factor XII)



## 【Points to note】

- There can be significant differences in the value obtained depending on the device used.
- Adjusting heparin dosage based solely on the ACT values may lead to thrombosis, especially if excessive prolongation occurs.
- Even after weaning from cardiopulmonary bypass and protamine is administered, there may still be excessive prolongation above normal due to decreased platelets and overdose of protamine.



## Countermeasures

The following measures can be taken to counteract shortening or excessive prolongation of measurements. When reconsidering the dosage or changing the measurement device, it is necessary to consult with the physician and use a method suitable for each institution to avoid errors.

- Additional dose of heparin in anticipation of its half-life, review of protocol
- Review of protamine administration protocol
- Administration of antithrombin III preparation
- Reconfirmation of mixing with activators
- Confirmation of equipment installation environment, operation check prior to use, and accuracy control
- In the case of antiphospholipid antibody syndrome, contact factor deficiency (e.g., factor XII), a method such as measuring Xa activity directly is needed.

## References

- Bull BS et al.: Heparin therapy during extracorporeal circulation. J Thorac Cardiovasc Surg 68 ; p674-689,1975 .

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