

Cardiac Anesthesia in Korea

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The first cardiac operation in Korea was performed in 1956 and was a closed mitral commissurotomy. The first open heart surgery which was ASD repair was performed in 1959. There is 46 hospitals where cardiac operations are undergone in 1993. Total number of cardiovascular surgery in 1992 was 6,939 and 66.5 % of them was congenital cardiovascular operation. More than 200 cardiovascular surgeries were performed at each of 7 hospitals in 1992. Twenty-two out of 46 hospitals have fixed cardiac anesthesiologists and 17 hospitals have one cardiac anesthesiologist each. Ninety-seven anesthesiologists involve in Cardiovascular anesthesia in Korea.

All cardiac anesthesiologists monitor Lead II (30/46) or II & V₅ (16/46) and radial arterial pressure. Pulmonary arterial and left atrial pressures are monitored at 22 and 19 hospitals respectively. Anesthetic induction agents are fentanyl, thiopental and benzodiazepine, in the adult cardiac cases and include fentanyl, ketamine, thiopental and benzodiazepine for the pediatric cases in the frequency order. Anesthesia is maintained with fentanyl, isoflurane and enflurane for both adult and pediatric cardiac operations. The cardiopulmonary bypass is managed by the cardiac surgeon at 78% of hospitals in Korea. Fentanyl, benzodiazepine and morphine are administered during cardiopulmonary bypass period. The cardiac surgical department manages the postoperative care

for the cardiac patients at 56% of hospitals although an anesthesiologist is the director of the intensive care unit.

Cardiovascular anesthesia could be improved if financial support, monitoring system, man power and specialty training would be provided.

Since the first cardiac surgery which was a closed mitral commissurotomy was performed in 1956, a great deal of clinical experience have been accumulated in the cardiovascular surgery.

The improved surgical techniques, and advance diagnosis and development of new cardiac drugs have made the operative mortality low. An advance in anesthesiology seems to contribute to low surgical mortality. The development of new muscle relaxants and the routine perioperative use of beta-blockers, nitrates and other vasodilators, highlight the advances in pharmacology. In monitoring, intra-arterial pressure monitoring, pulmonary artery catheterization and themodilution cardiac output determination have become routine.

The intraoperative transesophageal echocardiography became a practical diagnostic tool for anesthesiologists. An intraoperative transesophageal echocardiography is particularly useful in cardiac anesthesia, where rapid and accurate decision making is essential in critical situations. In spite of recent progress in anesthesia, many problems remain to be solved.

Therefore the clinical data in cardiovascular anesthesia were collected from 46 cardiovascular surgical hospitals in Korea by nation-wide inquiry and were reviewed to improve our cardiovascular anesthesia.

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The first open heart surgery was an ASD repair performed in 1959 when cardiac surgeries were undergone in two hospitals. Until the early of 1980, cardiac operations were preformed in a few hospitals. Numbers of hospital with cardiac surgical program rose rapidly in late of 1980. There is 46 hospitals performing cardiovascular surgeries in 1993. These hospitals include 7 national college, 19 private college, 7 private college affiliated, 9 private and 4 public hospitals.

Total number of cardiovascular surgery in 1992 was 6,939 and 66.5% of them was congenital cardiovascular operation.

More than 200 cardiovascular surgeries were performed as each of 7 hospitals. At each of 26 hospitals, less than 100 cases were undergone in 1992. Congenital open heart surgeries were performed in 3,399 cases. Numbers of hospital where congenital open heart surgeries were performed in more than 200 cases was three. Acquired cardiovascular operations include valvular heart surgery, coronary artery bypass graft, aortic surgery, ventricular aneurysm, cardiac tumor and cardiac trauma. One thousand-six hundred-forty-four patients underwent valvular heart surgeries. More than 100 valvular surgeries were performed at each of 3 hospitals. Coronary artery bypass graft (CABG) surgeries were performed in 473 cases, at 32 hospitals. More than 50 CABGs were undergone at each of 3 hospitals. coronary artery bypass graft surgeries were performed in less than once a month at each of 21 hospitals. One hundred-fifty-six patients underwent aortic surgery at 32 hospitals. At 30 hospitals out of 32, less than one aortic surgery per month was performed.

The first cardiac surgery was performed at Yonsei Medical College Hospital in 1956. We performed 5,145 congenital (63%) and 2,985 acquired (37%) cardiovascular surgeries at Yonsei Medical College Hospital between 1956 and december 1992. Yonsei Cardiovascular Center was opened in May 1991.

Since the opening of Yonsei Cardiovascular

Center, number of surgery has risen rapidly. Coronary artery bypass graft surgery was increased in number rapidly after the opening of the center. The mortality rate for valvular surgery was same as before the opening of the center. The mortality rate for coronary artery bypass graft surgery declined to 3%. An accumulated surgical experience and advance in anesthesia seem to contribute to low surgical mortality.

Twenty-two out of 46 hospitals have fixed cardiac anesthesiologists and twenty four have a rotation system with all or a few anesthesiologists in their own anesthesia department. Anesthesiologists in rotation system have not enough opportunities to practice cardiac anesthesia.

Seventeen hospitals have one fixed anesthesiologist each and four hospitals have two anesthesiologists each and there is one hospital with three cardiac anesthesiologists. Eleven hospitals have rotation system with two anesthesiologists and one anesthesiologist performs cardiac anesthesia every other case at his or her hospital. Eight hospitals have three anesthesiologist-rotation system. There in one hospital with 7 anesthesiologist-rotation system. Ninety seven anesthesiologists involve in cardiovascular anesthesia in Korea.

Each of thirty-nine hospitals owns one cardiac surgical suit and one hospital has 5 cardiac surgical rooms. There are 3 hospitals without a designated cardiac surgical suit.

Most anesthesiologists monitor ECG, rectal and esophageal temperatures, arterial and central pressure. Electrocardiography is monitored with Lead II at 30 hospitals and with Lead II and V₅ at 16 hospitals. Anesthesiologists at 16 hospitals monitor only central venous pressure. Pulmonary arterial pressure and left atrial pressure are monitored at 22 and 19 hospitals, respectively. Thermodilution cardiac output is determined whenever pulmonary artery is cannulated. Anesthesiologists at 11 hospitals monitor pulmonary arterial pressure and left atrial pressure together. Intraoperative echocardiography is monitored at 5 hospitals. Cardiologists are asked to monitor intraoperative

echocardiography with transesophageal or epicardial probe by the cardiac surgeons at 4 hospitals. Transesophageal echocardiography has been monitored intraoperatively by the anesthesiologist at one hospital.

Anesthesia is induced with fentanyl, thiopental, benzodiazepine and morphine in frequency order for the adult cardiac surgery and is maintained with fentanyl, isoflurane and enflurane. Anesthesiologists at 40 hospitals use fentanyl as an induction agents. Anesthesia for the pediatric cardiac surgery is induced with fentanyl, ketamine, thiopental and benzodiazepine and is maintained with fentanyl, isoflurane and enflurane.

Muscle paralysis during anesthesia is obtained with vecuronium or pancuronium in both pediatric and adult cardiac surgeries.

Each of thirty-three hospitals own one cardiopulmonary bypass (CPB) machine and one hospital has 4 CPB machines. Twenty-three hospitals have one perfusionist each and 15 hospitals have two perfusionists and one hospital has 6 perfusionists. Most perfusionists are nurses and a few of them are technicians. Fentanyl, benzodiazepines, morphine and muscle relaxants are administered during CPB by the anesthesiologist's instructions. Cardiopulmonary bypass is managed by cardiac surgeon at 36 hospitals and by anesthesiologist at 10 hospitals.

Most anesthesiologists and cardiac surgeons em-

ployed several techniques to reduce homologous transfusion. They include intraoperative hemodilution, use of cell savor, preoperative donation and administration of aprotinin. With these techniques, a reduction of homologous transfusion would be achieved with some draw-back. Intraoperative hemodilution technique needs help from other person and causes a low osmolality. Aprotinin is expensive but definitely reduces amount of transfusion and reduces postoperative bleeding.

The cardiac surgical department manages the postoperative care for the cardiac patients at 26 hospitals, and the surgery and anesthesiology departments manage together at 15 hospitals although an anesthesiologist is the director of the intensive care unit in the most hospitals.

Most cardiac anesthesiologists pointed out that their problems in cardiac anesthesia included 1) shortage of man power for designated cardiac anesthesia 2) insufficient equipments 3) lack of financial support: insufficient reimbursement from national health insurance 4) lack of sociality training. They think that cardiovascular anesthesia could be improved if financial support, monitoring system and man power would be provided.

In conclusion, since the first cardiac operation in Korea was performed in 1956, number of cardiovascular surgery increased.

(Circ Cont 15 : 350~352, 1994)