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MANAGEMENT OF CRISES DURING ANESTHESIA AND SURGERY. PART IV: CARDIAC ARREST

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Cardiac arrest can be defined as inability of heart action to maintain adequate cerebral circulation. Arrest in association with anaesthesia accounts for millions of cases around the world[1-2]. Cardiac arrest attributable to anaesthesia occurred at the rate of between 0.5 and 1 case per 10 000 cases overall and at the rate of 1.4 per 10 000 cases for the paediatric series; 55% of these were in children less than 1 year of age. The overall rate of cardiac arrest is up to 10 times higher than this, with uncontrolled bleeding, technical surgical problems, extensive co-morbidity, and advanced age[3,4].

In-hospital mortality in the anaesthesia related group was considerably lower than the surgical rate, with 80% of these patients leaving hospital. Most of the anaesthesia related cardiac arrests were thought to be preventable and to have involved human error or inadequate human resources[5,6].

Fortunately, several changes in anesthesia practice could explain the observed decline of the incidence of anesthesia-related cardiac arrest that may include:

1. The introduction of new methods and drugs effective in decreasing anesthetic cardiac arrests. For example, enhanced respiratory monitoring accounted for most of the observed decrease in anesthetic cardiac arrest rate due to respiratory causes. They further showed that there were no respiratory cardiac arrests occurred since 1984, when the pulse oximetry was used at clinical anesthesia.
2. The availability of trained anesthesiologists. There is an inverse relationship between the incidence of cardiac arrest and the number of qualified anesthesiologists employed.
3. Human error seems one of major factors leading to anesthesia related cardiac arrest. Continued education of anesthesia practitioner and widely application of medical simulations could be useful for preventing human error in training of anesthesiology[7,8].

Some of the main risk factors are well known, such as unstable coronary artery disease, cardiac arrhythmias, heart failure, and valvular heart disease. If none of the major factors is present, perioperative morbidity and mortality risk is less than 1%, and a thorough cardiovascular diagnostic investigation would not change the perioperative management of asymptomatic patients. Given the unpredictability of sudden cardiac death in "low-risk" patients, all efforts must be made to treat those who suffer from an unanticipated cardiac arrest during anesthesia. More importantly, in patients presenting with perioperative cardiac events, further planned surgeries should only be scheduled after a complete diagnostic evaluation and definition of the causative event[9].

Precipitating factors:

*Pre-existing medical or surgical disease states such as: cardiac, respiratory, renal, sepsis and trauma.

*Consequent upon surgical technique like: reaming or cementing the femoral shaft.

*Error or fault in anaesthetic technique: inadequate ventilation, essential monitoring not in use.

*Drug problems: overdose, induction & reversal drugs, anaphylaxis, opioid overdosage.

*Regional or local anaesthesia.

*Other factors such as; Hypoxia, hypovolaemia, hyperkalaemia, hypo-kalaemia, hypocalcaemia, acidaemia, hypothermia, tension pneumothorax, tamponade, toxic substances and thromboembolism

*Unknown: arrested during routine and seemingly appropriate anaesthesia and surgery.

Diagnosis:

The diagnosis of cardiac arrest in association with anaesthesia is problematic. One can depend on the ECG rhythm changes, oxygen desaturation, capnography and other monitoring devices. Depression of conscious state in the recovery room or during regional and local anaesthesia.

Emergency management:

*Inform the surgeon

*Stop surgery and blood loss

*Place the patient in supine position and expose the chest

*Precordial thump and external cardiac compression

*Intubate and ventilate with 100% oxygen

*ECG for rhythm clues such as bradycardia, asystole, tachycardia and fibrillation

*Ensure correct dosage of adrenaline, atropine and IV fluid.

*Defibrillation

*Basic life support

*Other drugs should be available for immediate use such as: lidocaine, ephedrine, naloxone, bicarbonate, calcium, dopamine, isoprenaline, metaraminol, atenolol, hydrocortisone, aminophylline, glyceryl trinitrate, inotropes, magnesium, prochlorperazine & salbutamol.

Measures directed at specific causes:

*Head down tilt was used in a case of gas embolus.

*Break in the operating table should be removed in case of suspected caval occlusion during such as in ureterolithotomy.

*An emergency thoracotomy may be performed for the management of pulmonary embolus and to secure the airway in case of tracheal rupture.

*Autonomic stimulation may be stopped in several cases such as extraocular muscle traction and release of carbon dioxide from the peritoneal cavity.

Further care:

*Confirm and correct the cause

*Treat anaphylaxis and septicaemia

*Prevent and correct hypothermia

*Arrange admission to the ICU

*Document events accurately as soon as possible.

Post arrest care:

There is increasing recognition that systematic post cardiac arrest care after return of spontaneous circulation (ROSC) can improve the likelihood of patient survival with good quality of life. This is based in part on the publication of results of randomized controlled clinical trials as well as a description of the post cardiac arrest syndrome.

Post cardiac arrest care has significant potential to reduce early mortality caused by haemodynamic instability and later morbidity and mortality from multiorgan failure and brain injury. Understanding of the haemodynamic, neurological, and

metabolic abnormalities encountered in patients who are initially resuscitated from cardiac arrest.

Subsequent objectives of post cardiac arrest care are to[10]:

*Control body temperature to optimize survival and neurological recovery

*Identify and treat acute coronary syndromes (ACS)

*Optimize mechanical ventilation to minimize lung injury

*Reduce the risk of multiorgan injury and support organ function if required

*Objectively assess prognosis for recovery

*Assist survivors with rehabilitation services when required

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