Scientific Works. Series C. Veterinary Medicine. Vol. LXV (2), 2019
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

CRITICALLY ILL PATIENTS- INCIDENTS IN THE POST ANESTHESIA PERIOD

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Abstract

Critically ill and emergency patients often need anesthesia and analgesia for examination, clinical procedures or surgery. Anesthesia must be performed based on advanced planning. Anesthesia for this group of patients is unpredictable and with rapid consequences. Critically ill patients are prone to have a low ability to maintain homeostasis and tissue oxygenation. Good outcomes relay on rapid identification, diagnosis and stabilisation. This study covers a general approach for anesthesia in emergency and critically ill patients and the major complications that can occur in the recovery period. Various aspects will be taken into consideration related with the anesthetized critical ill patient, anesthesia protocols and the most common complications.

Key words*: anesthesia, recovery, emergency, complications.*

INTRODUCTION

Anesthesia influences directly the additional physiological dysfunctions that may worsen patient status. Pre-anesthetic physical evaluation for the emergency or critically ill patients may be difficult and should be undertaken by a trained clinician in order to have a complete image about the patient. Critically ill patients are likely to be unstable and complex, thereby requiring intensive care and monitoring (Costea et al., 2017). Supportive care with individualized plans should be developed for every patient based on recognition of the individual needs and risks in order to make anesthesia a safe and reversible procedure for the critically ill patient. (Carter, 2015).

MATERIALS AND METHODS

This study summarises the most common complications related with the anesthetized critical ill patient, for 320 cases (canine, feline). The period analysed in this study was 2016-2018 and covers the first 72 hours after anesthesia. The data, collected from the Faculty of Veterinary Medicine of Bucharest - Clinical Department, has been statistically processed and interpreted.

Pre-anesthetic evaluation for emergency patients follows a structured **ABCD** algorithm (airway, breathing, circulation, disability-patient's consciousness level and any neurological deficits are established) that allows rapid assessment (Tudor, 2018).

History (including known medical conditions, previous anesthesia, age, breed, behavior), physical examination, type of procedure (risk of pain, hemorrhage, limited monitoring access, risk of hypothermia), type of anesthesia (sedation, general anesthesia, loco-regional anesthesia) should be evaluated (Kirby, 2017).

Time for diagnosis and planning can be very limited, which increases the patient's anesthetic risk.

Based on the preanesthetic physical evaluation patients were classified according to American Society of Anesthesiologists scoring system (ASA physical status scoring system is used to grade patient's anesthesic risk-Table 1).

Common preanesthetic dosages should always be carefully checked and administrated in combination, adjusted to the patient's clinical condition. Induction was made with propofol 2.5-4.5 mg/kg for rapid airway control-endotracheal intubation (Figure 1) and anesthesia maintained with volatile anesthetic agent (isoflurane).

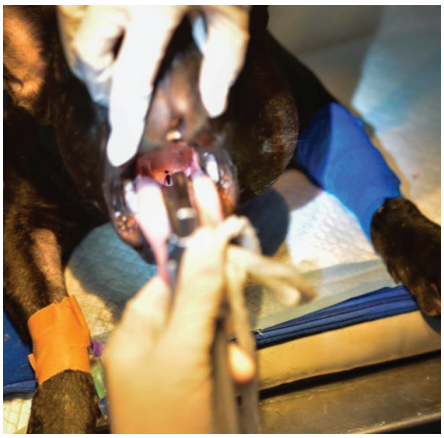

Figure 1. Endo-tracheal intubation for an emergency patient

Table 1. ASA physical status scoring system is used to grade patients their anesthesia risk

	ASA category	Description
ASA 1	Normal healthy patients	- no significant disease; general anesthesia with minimal risk
ASA 2	Patients with mild systemic disease	-localized infection, compensated disease
ASA 3	Patients with severe systemic disease	- severe systemic disease (ex. anemia, moderate hypovolemia, other morbidity influencing anesthesia)
ASA 4	Patients with severe systemic disease that is a threat to life	- ex. uremia, toxemia, severe dehydration, hypovolemia, anemia, cardiac decompensation
ASA 5	Moribund patients (life threatening disease, not expected to survive 24 hours +/- procedure)	- ex. extreme shock, terminal malignancy, infection, severe trauma
E	Emergency	–emergency

In order to decrease the amount of anesthetics required during the procedure, local analgesia protocols were used pre-emptively, before the procedures (blocks with lidocaine 1-2 mg/kg). In a multimodal approach, local anesthesia and analgesia will decrease pain and the need for use of systemic drugs, providing regional anesthesia by reversibly blocking the transmission of nociceptive signals from nerve endings to the central nervous system (CNS). Techniques were choosen according to individual risks, pain intensity and procedure's duration. The duration of the procedures for emergency patients under anesthesia, varied from 20-130 minutes, with a mean of 46 minutes.

RESULTS AND DISCUSSIONS

Recovery from anesthesia is a challenging task for critically ill patients and can be affected by medication over dosage (antagonise if possible), previous neurological injuries, ischemia, embolism, myocardic disturbance or severe hypoxia or hypothermia.

Continued monitoring of the critically ill patient during anesthesia is vital and accurate record keeping is essential.

The use of noninvasive and/or invasive monitoring techniques helped for organs and systems dysfunctions:

- heart rate, pulse (frequency, quality);
- mucous membranes' color;
- capillary refill time;
- pulse (rate & quality);
- rate and pattern of respiration;
- pulse oximetry;
- temperature;
- urinary output;
- continuous ECG;
- indirect blood pressure monitoring (oscillometry, Doppler).

Complications during the recovery time of the critically ill patient's, requires a proper anesthetic management, accurate and a continue monitoring during and after the procedures.

The most common problems encountered were hypoxemia, hypoventilation, hypotension and hypothermia.

Respiratory monitoring during recovery time from anesthesia involved the inability of the patient to maintain correct gas exchanges: transport of O_2 from air to the tissue cells (oxygenation) can be impaired or transport of CO_2 from cells to outside (ventilation) can be also impaired. Complications recorded:

- Hipoxemia -11%;
- Hypoventilation- 13%;
- Hyperventilation- 24%;
- Upper airway obstruction- laryngeal oedema, laryngospasm- 3.75%.

Cardiovascular monitoring after emergency procedures under general anesthesia, required measurements for macrovascular and microvascular parameters (Figure 2).

Macrovascular parameters-measured before the tissue beds

- mucous membrane and capillary refill time
- heart rate/rhythm/contractility
- pulse
- arterial blood pressure, central venous pressure
- urinary output

Microvascular parameters-measured after blood flows trough the tissue beds

- Lactate,Base excess, central venous oxygen saturation

Figure 2. Cardioavascular monitoring

Common complications recorded:

- bradycardia (15%);
- tahycardia (17%);
- hypotension (58%);
- hypertension (12%);
- acidosis (5.5%).

These complications can be connected to profound CNS depression due to high doses or high concentration of anesthetics, hypoxia or hypothermia in the recovery period, acid-base abnormalities, decompensate shock, high levels of K, Ca (Costea, 2017).

For tachycardic patients heart efficiency is decreasing and oxygen needs are increasing releated to pain, fever, SIRS, sepsis, hypovolemia (Blades, 2017).

Hypotension was the most commonly reported complication (58%). Hypertension (SAP>160 mmHg) in the recovery period (12%) was related to fever, pain, patients with renal disorders, endocrine pathology, CNS disorders, arterial thromboembolism.

Cardiac arrest occured in 5.2% of the critical cases (Figure 3) in the recovery period and was recorded in cases involving:

- Head trauma;
- Respiratory distress;
- Cardiac disease;
- Sepsis;
- Severe metabolic disease;
- Prolonged seizures.

Common causes of cardiovascular emergencies were represented by respiratory failure, acid-base and electrolyte imbalance, hypothermia, air embolism and cardiac disease (Kutcher, 2016).

Temperature monitoring in the recovery period of anesthesia for criticially ill patients is extremly important (Brodeur, 2017).

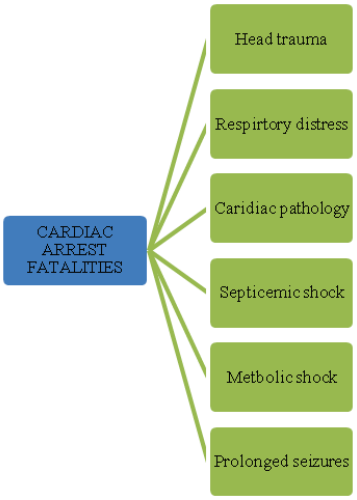

Figure 3. Most common cases of cardiac arrest fatalities in the recovery period of anesthesia

Figure 4. Monitoring for critically ill patients

Most common complication is hypothermia (79% of cases hypothermia versus 5% hyperthermia) and determines:

- peripheral vasoconstriction;
- arrhythmias;
- decreased cerebral flow;
- decreased ventilation;
- lowers the effect of analgesics.

Hyperthermia after anesthesia determines high risk to develop tachycardia, arrythmias, tachypnea or coagulopathy related with:

- ✓ thermoregulations problems;
- ✓ medication (opioids in cats);
- ✓ iatrogenic (extreme warming of the patient);
- ✓ *malignant hyperthermia* (disorder with genetic predisposition)-1 case.

CONCLUSIONS

Preanesthetic examination and an appropriate protocol selection with a multi-modal approach should assure any critically patient's analgesia and a safe recovery from anesthesia.

Regular monitoring is absolutely necessary for any emergency potential critically ill patient. Good outcome are based on knowledge preparation, rapid diagnosis and treatment of any emergency situation.

Causes of cardiovascular emergencies were represented by respiratory failure, acid-base and electrolyte imbalance, hypothermia, air embolism and cardiac disease The most common respiratory complication recorded during the recovery time of the critically ill patient's was hyperventilation.

Any critically ill patient should be considered a potential hypotensive patient.

Cardiac arrest occured in 5.2% of the critical cases in the recovery period.

Regarding temperature monitoring during the recovery time of the critically ill hypothermia was more frequent than hyperthermia and involved many other clinical complications.

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