SUMMARY

In the past, anesthetic and analgesic agents have been with-held from neonates undergoing surgical procedures. However, neonates, including preterm infants, demonstrate physiological responses to surgical procedures that are similar to those in adults and have shown to be more vulnerable to the negative effects of pain and stress.

Physiology of neonates differs from adults in many ways. Control of breathing in the newborn is less mature and adapation of lung mechanics takes several weeks after birth to complete. This leads to different responses to hypoxemia and hypercapnia in this age group, in addition to presence of irregular breathing (periodic breathing- and central apnea, more in preterms), which makes them more vulnerable to respiratory complications. Lung volumes in neonates are less, in relation to their body weight, making them more susceptible to atelactasis. Blood oxygen affinity in the new born is extremely high thus oxygen delivery at the tissue level is lower despite high red blood cell mass and hemoglobin level.

Maturation of the cardiovascular system is not complete at birth. After birth. Intra-and extra- cardiac shunts close to increases systemic vascular resistance and decrease pulmonary vascular resistance. Pre-term or critically ill neonates are at high risk for persistant fetal shunting with increased pulmonary vascular resistance. Due to the immaturity of myocardium, cardiac output in neonates depends mainly on their heart rate and to a limited degree on the force of contraction.

Renal blood flow correlates with gestational age. Glomerular filtration rate is low in neonates. They are able to conserve sodium. However they are unable to handle an acute sodium overload. The urine concentrating ability of the kidney is low at birth, especially in prematures. Fluid needs varies markedly in low birth weight infants and full-term neonates. Infants have greater fluid needs because of their higher rates of metabolism and growth and increased insensible fluid loss.

The major method of heat production in neonates is non-shivering thermogenesis through the metabolism of brown fat. The neonates thermoregulatory range is significantly limited and easily overwhelmed by environmental influences.

Pre-anesthetic assessment of the neonate includes perinatal history taking, examination of the body systems and investigations. These include hematology, blood chemistry and body functions, taking into consideration the variability of results between neonates and older children and adults.

Surgical procedures may be done under general or regional anesthesia. General anesthesia includes pre-operative, intra-operative and post-operative management. Pre-operative fasting is necessary for elective surgeries. Stabilization of vital systems is essential before anesthesia. Securing a patent airway is the main goal during induction of anesthesia. A face mask or a laryngeal mask airway may be considered in short elective procedures. However, an endotracheal tube in usually required. Laryngoscopy and endotracheal intubation in neonates are performed either a wake or under general anesthesia. Induction of anesthesia is usually done using a rapidly acting intravenous anesthetic

and a muscle relaxant (e.g., succinylcholine) which gives optimum conditions for endotracheal intubation.

Maintenance of anesthesia includes thermal protection of the neonate and proper fluid management, which includes covering the metabolic needs and replacing fluid losses. The pharmacology of anesthetics differs in neonates than in adults. Hypnosis may be induced using inhalational anesthetics or intravenous agents. Halothane and isoflurane are the most widely used agents. Sevoflurane has recently been introduced for better induction. The wash-in and wash-out rates of these agents is more rapid in infants. Among the intravenous agents available, ketamine has the advantage of no cardiovascular depression. Sodium thiopental is commonly used. Analgesics are used to decrease the requirements of hypnotics for better hemodynamic stability. Fentanyl is the most popular synthetic narcotic used. During maintenance of anesthesia, non-depolarizing muscle relaxants are used. Pancuronium is a long acting agent commonly used in pediatrics. Intra-operative monitoring is essential and basically includes electrocardiography, systemic arterial blood pressure monitoring, central venous pressure monitoring, pulse oximetry, capnography, temperature and urine output monitoring.

Post-operative apnea is the most concerning complication after general anesthesia. Other post-anesthetic problems include hypoxemia, hypothermia, post intubation croup and cardiovascular instability. Post-operative pain management may include non-pharmacological and pharmacological methods. The use of systemic analgesics should be practiced with caution for fear of respiratory depression. Local infiltration and extradural anaglesia are safer.

Regional anesthesia in neonates provides the advantage of reduced requirements for anesthetics and good post-operative analgesia. Neuroaxial blocks include spinal and epidural anesthesia using various local anesthetic agents and other drugs such as narcotics. Caudal epidural anesthesia is more commonly employed in pediatrics. Peripheral nerve blocks may also be used.

Most neonatal surgical lesions require urgent intervention. Common lesions include cardiovascular problems such as patent ductus arteriosus, tetralogy of Fallot and transposition of great arteries. Considerations of these lesions include careful fluid therapy and management of hypoxia and cardiac failure. Respiratory problems include tracheo-esophageal fistula and diaphragmatic hernia. Hypoxia due to various causes is the main complication. Gastrointestinal lesions include gastroschisis, omphalocele, necrotizing enterocolitis, intestinal obstruction and pyloric stenosis. Caution from regurgitation and aspiration should be taken with proper correction of fluid and electrolyte imbalances.