Anesthesia for Pediatric Urologic Surgery

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Circumcision
Hypospadias Repair
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Urologic surgery is extremely common in children. Most procedures are simple surgical repairs in healthy children and are performed on an outpatient basis. This chapter reviews anesthetic management for these simple procedures, as well as some complex procedures too, with emphasis on those performed mainly in children.

CIRCUMCISION

Circumcision in the newborn period without general anesthesia remains one of the most common procedures performed in children. Older children may present for circumcision under general anesthesia as an elective procedure for cosmetic reasons, or as a treatment for recurrent phimosis. The vast majority of children are healthy without coexisting diseases.

Preoperative assessment is unremarkable. Premedication may include an anxiolytic, as well as an analgesic agent such as acetaminophen 15 mg/kg or ibuprofen 10 mg/kg. Induction and maintenance of general anesthesia are routine. Airway management is provided by facemask or laryngeal mask airway (LMA). Pain relief is provided by a penile block (see Chapter 20). Postoperative fevers are very common after circumcision, especially in children with preexisting phimosis.

HYPOSPADIAS REPAIR

Hypospadias is a congenital defect that consists of an abnormal positioning of the penile meatus. It occurs in approximately one out of every 350 male births. It ranges from a very mild defect, in which the penile opening is located slightly more anterior than normal, to a severe defect where the opening is located on the underside of the scrotum. The severity of the lesion will determine the type of surgical procedure. Hypospadias is often associated with a chordee, which is a downward curve of the penis. There are usually no other congenital defects present in affected boys. Surgery is necessary to allow normal urination, to correct the deformation for cosmetic reasons, and to ensure normal sexual functioning in the case of a severe chordee. Repair is often performed during the first year of life.

There are several types of surgical procedures, depending on the severity of the lesion. In general, the more severe the lesion, the longer and more extensive is the surgery. Preoperative assessment is routine and includes screening for other congenital anomalies, and optimizing coexisting medical conditions. Laboratory studies are not indicated. Anxiolytic premedication should be ordered if the child is older than 10 or 11 months. Induction and maintenance of general anesthesia is routine. Airway management consists of LMA placement or endotracheal intubation, and will depend on the length of the procedure. A penile block will provide analgesia to the distal two-thirds of the penis; if the repair involves the base of the penis, systemic analgesics should be administered.

TESTICULAR TORSION REPAIR

Testicular torsion is manifested by acute scrotal pain and results from a twisting of the spermatic cord with
vascular compromise of the testicle. If the problem is not surgically corrected in a relatively short time (6-8 hours), testicular ischemia can result. This is generally considered a surgical emergency. Temporizing treatment involves manual detorsion; this may alleviate ischemia but orchidopexy is still required.

Preoperatively, the patient should be prepared for emergency surgery. This consists of a focused history and physical and optional administration of a prokinetic such as metoclopramide 0.1 mg/kg to facilitate gastric emptying. An intravenous catheter should be inserted to prevent dehydration and to prepare for a rapid sequence induction of general anesthesia. Adolescents may be offered spinal anesthesia with sedation. Intraoperative analgesia is provided by local infiltration at the surgical site and small doses of opioids. Postoperative concerns include pain and nausea/vomiting, which are treated by standard therapies.

**ORCHIDOPEXY**

Orchidopexy (also known as orchiopexy) is performed to repair cryptorchidism (also known as undescended testicles). During fetal development, the testicles develop in the abdomen and descend into the scrotum during the last trimester. In a small percentage of newborns (3%), one or both testicles fail to descend. Approximately half then descend within the first year of life. The remaining must undergo surgical intervention because of the increased risk of infertility and malignancy in testicles that remain undescended within the abdominal cavity.

Children with undescended testicles are usually healthy, although there is a higher incidence of prematurity. Prune-belly syndrome consists of undescended testicles, absent anterior abdominal musculature, and dilatation of parts of the urinary tract. This rare syndrome may be accompanied by impaired renal function. A number of congenital syndromes are associated with undescended testicles and include Noonan’s and Prader-Willi syndromes, among many others.

Preoperative assessment is routine and will depend on any coexisting medical conditions. Induction and maintenance of general anesthesia are routine. Airway management consists of LMA placement or endotracheal intubation. Regional analgesia is provided by a hernia block (see Chapter 20).

The procedure consists of two incisions – one in the lower groin to retrieve the testicle, and the other at the bottom of the scrotum to anchor the testicle. Infiltration of local anesthesia at the surgical site should be administered by the surgeon. Blood and insensible fluid losses are minimal. Postoperative concerns include pain and nausea/vomiting.

**URETERAL REIMPLANTATION**

Ureteral reimplantation is the surgical correction of vesicoureteral reflux (VUR), which is a congenital incompetence at the site where the distal ureter implants into the bladder. This results in the retrograde flow of urine from the bladder up into the ureter and kidneys during micturition. If undiagnosed or untreated, VUR may cause dilatation of the ureter and hydroureteronephrosis. Long-term effects include pyelonephritis, hypertension, and progressive renal failure. Many children with severe VUR...
are diagnosed in utero by a fetal ultrasound that demonstrates hydronephrosis. More mild forms may manifest during childhood as recurrent urinary tract infections.

Preoperative assessment includes evaluation of renal function. Premedication and fasting guidelines are age-appropriate.

The procedure is performed in the supine position, with a low transverse incision. It involves reimplantation of the distal ureter into the bladder wall. Several surgical methods have been described to prevent VUR and are beyond the scope of this discussion. Less invasive injection of an antireflux material (Deflux) into the bladder wall is employed in selected cases. Intraoperative anesthetic considerations include maintenance of normothermia and administration of sufficient fluid to avoid stasis of blood within the bladder with subsequent formation of clots that may obstruct bladder outflow.

Induction and maintenance of general anesthesia are routine, with awakening occurring in the OR. Intraoperative and postoperative pain control can be accomplished using epidural analgesia. Typically, a “one-shot” caudal is performed using 0.25% bupivacaine (1 mL/kg) combined with epidural clonidine 2 µg/kg. Postoperative pain from bladder spasms can be troublesome. Treatment includes ongoing epidural analgesia, ketorolac, and anticholinergic agents.

**PYELOPLASTY**

A pyeloplasty is a procedure to repair ureteropelvic junction (UPJ) obstruction, the most common cause of congenital hydronephrosis. In most cases it is diagnosed by fetal ultrasonography. Older children may present with urosepsis, nausea/vomiting, failure to thrive, flank pain, abdominal mass, or hematuria. The most common surgical therapy is an open pyeloplasty, which involves excision of the narrowed segment of the UPJ and a reanastomosis of the ureter to the renal pelvis. It is usually performed through an extraperitoneal flank incision.

Preoperative assessment includes confirmation of normal renal function. Induction and maintenance of general anesthesia are standard with endotracheal intubation performed for the procedure. The infant may be placed in the semilateral position with flexion of the OR table. Blood loss should be minimal. Insensible fluid losses will average approximately 5–7 mL/kg/h due to a large flank incision. Routine monitors will suffice.

Intraoperative and postoperative analgesia can be accomplished with epidural analgesia or intercostal nerve blocks into the open incision. Systemic analgesia can include opioids and ketorolac. There are no unique postoperative anesthetic issues for these children.

**WILM’S TUMOR**

Wilm’s tumor is the most common renal tumor in children. Most cases are sporadic but some are inherited. It is most commonly diagnosed in preschool children. Presenting signs and symptoms include a painless abdominal mass, abdominal pain, hypertension, fever, hematuria, and anemia. An associated, acquired Von Willebrand’s disease has been reported in these children. In advanced disease, the tumor most commonly spreads to the liver and lungs, and may spread contiguously to the inferior vena cava and aorta. Treatment consists of a radical nephrectomy of the involved kidney; chemotherapy, and possibly radiation if there are pulmonary metastases. Anesthetic implications of chemotherapeutic agents are discussed in Chapter 8. The prognosis depends on the extent of spread and histology of the tumor.

Preoperative assessment should include a complete blood count, electrolytes, liver and renal function studies, coagulation studies, and a type-and-crossmatch. Radiological studies should assess the extent of spread of the tumor and presence of metastases. Cardiac function should be assessed in children who have received chemotherapy with anthracyclines (e.g., doxorubicin). Children with a large intraabdominal mass that impedes gastric emptying should have preoperative placement of an intravenous catheter for rehydration and to prepare for a rapid sequence induction of general anesthesia. Anxiolytics should be administered as appropriate. If delayed gastric emptying is suspected, administration of preoperative H₂-antagonists may be considered.

The procedure is performed with the child supine. Standard monitors are sufficient unless there is significant tumor involvement of the aorta or inferior vena cava (IVC). If this is the case, a central venous catheter may be inserted for monitoring central venous pressure and ease of large-volume infusions. In addition, an arterial catheter may be indicated for direct blood pressure measurement and facilitation of intraoperative blood tests. Two large-bore intravenous catheters should be placed in the upper extremities and red blood cells should be immediately available for transfusion if necessary. Intraoperative risks include sudden or massive blood loss, tumor embolism, or hypotension from IVC compression and loss of preload. Insensible fluid losses may exceed 10 mL/kg/h, depending on the extent of the surgical procedure. Hypothermia is common and should be prevented by warming the OR, use of a forced-air warming blanket, and warming of intravenous fluids and blood products.

Unless the tumor is small, and gastric emptying presumed normal, a rapid sequence induction of general anesthesia is indicated. Maintenance of general anesthesia should consist of a balanced technique using...
neuromuscular blockade to enhance surgical exposure. If coagulation studies are normal, an epidural catheter may be placed after induction to provide intraoperative and postoperative analgesia. Unless the surgical procedure involves large fluid shifts or clinically significant hemodynamic changes, these children are awakened in the OR. Postoperative ICU admission is dependent on the medical condition of the patient and the extent of the surgery. Postoperative problems concerns include oliguria that may be caused by impaired renal function or hypovolemia if bleeding is continuing. Poor pain control may result in splinting, and cause atelectasis and hypoxemia.