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Operating Room Fires

Though very rare, fires do occur in the operating room during a surgical procedure. They occur around 600 times per year in the US operating rooms. Two-third of the time surgical fires involve electrosurgical equipment. The most common site of fires is the head, face, neck and upper chest of the patient or personnel. Oxygen use is also documented in most cases. Cuff endotracheal tubes (without leaks) are preferred to serve as barrier of oxygen leak out from the trachea or accumulating around operative sites. For fire combustion to develop it needs three components: oxidizer (oxygen and carbon dioxide), an ignition source (cautery, lasers, light sources, drills, endoscopes, etc.) and fuel sources (degreaser, prep agents, drapes, gowns, hood masks, ointments, aerosols, alcohol, hair, GI gases, etc.). Alcohol-based skin preparations (chlorhexidine, thimerosal, iodophor) are a common source of fuel and they should be allowed to dry completely avoiding pockets of the solution within the drapes. Electrocautery is the most common ignition source. OR fires occur either in the patient or in the room environment. Should the fire start in the patient the first priority is extinguishing the flames or removing the burning material as soon as possible along with discontinuation of all gases such as oxygen and carbon dioxide. Smoke should be dissipated and notification to the fire department should occur. The fire area must be irrigated with normal saline and moist towels. The fire can also occur on the patient airway during a procedure. In such a case all gases must be discontinued, the endotracheal tube removed and saline or water can be pour into the airway. If needed, reintubate and ventilate the patient with plain air until the fire is extinguished and oxygen can be use safely. The OR should be equipped with sterile saline, CO2 fire extinguisher, tracheal tubes, face masks, laryngoscopes, replacement airway breathing circuit, drapes and sponges to replace in case of a fire. All operating rooms should have fire alarms with fire, smoke and heat sensors. All surgical fires can be prevented. Every year the fire protocol of the hospital must be revised. High volume intraoral suction can inhibit or suppress the onset of combustion in surgical procedures in the oral cavity.

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Neck Hematoma after Thyroidectomy

The most common complications after thyroidectomy include hypocalcemia, damage to the recurrent laryngeal nerve and a neck hematoma. Postoperative neck bleeding can be life threatening due to acute airway obstruction and occur in 1.5 to 4% of all thyroidectomies. The cause of bleeding after thyroidectomy includes slippage of a ligature on major vessels, reopening of cauterized veins, retching and bucking during recovery, Valsalva maneuver, increase blood pressure or oozing from the cut surface of the thyroid gland. Total airway obstruction progress once the critical compression pressure occurs in the compartment below the strap muscles. This leads to compression of the trachea, impairment of venous and lymphatic drainage causing laryngopharyngeal edema and airway obstruction. Incomplete closure of the strap muscles or no reapproximation inferiorly during closure is recommended to allow decompression of the deep space of the neck into the superficial area. Time intervals for most hematomas to develop is less than 24 hrs., though 20% can occur three days after surgery. Patients with a postoperative neck hematoma present with respiratory distress, pain, pressure sensation in the neck, dysphagia and salivation. Signs include progressive neck swelling, suture line bleeding, dyspnea, stridor or ecchymosis in the neck skin. Early recognition with immediate surgical evacuation of the hematoma including intubation due to airway obstruction or bedside decompression of the wound is essential. Once laryngopharyngeal edema occurs there might be inability to intubate the patient with need of immediate tracheotomy. The source of hematoma is almost always found (92%) and most are caused by arterial bleeding (upper pole). The incidence of hematoma or seroma do not change with the use of a postoperative neck drain. The risk of postoperative hemorrhage is a limiting factor for outpatient thyroid surgery or early discharge from the hospital. Age (old), sex (male), race (African-American), obesity, geographic region, comorbidity, alcohol abuse, underlying diagnosis (Grave's disease), bleeding disorders, previous neck surgery, and type of surgical procedure (total thyroidectomy, substernal thyroidectomy, neck dissection) are independent risk factor for neck hematoma. Hospital bed size, location, teaching status or volume is not associated with increased risk of this complication. The incidence of hematoma after parathyroidectomy is lower than after thyroidectomy. Early severe neck hematoma with rapid mucosal edema and airway swelling needs intubation or tracheotomy. With late swelling of the neck a seroma or chyloma should be sought to be the cause.

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Variceal Bleeding

Variceal bleeding from the esophagus or stomach is a symptom of portal hypertension. Portal hypertension (PH) can be classified as presinusoidal, sinusoidal or post-sinusoidal. Presinusoidal portal hypertension in children is most commonly associated with thrombosis of the portal vein. Sinusoidal PH is usually associated with liver fibrosis (cirrhosis) of which the most common etiology is progressive biliary atresia. Post-sinusoidal PH is found in Budd-Chiari syndrome, veno-occlusive and cardiac disease. The primary symptom of variceal bleeding is hematemesis. Bleeding can be massive. Gastric varices have an increased risk of bleeding compared with esophageal varices. Portal vein thrombosis is the most common cause of portal hypertension in children and is associated with exchange transfusions, hypercoagulability states, cirrhosis, congenital portal vein malformation, umbilical vein catheterization, omphalitis, sepsis and trauma. Portal vein thrombosis creates a greater portal vein to hepatic vein gradient having a higher risk of bleeding from varices. With acute upper GI bleeding the child must receive aggressive IV and blood replacement, transfer to an intensive care unit and manage with gastric lavage using saline at room temperature. Vasoactive drugs such as vasopressin, somatostatin, octreotide is indicated. The source of variceal bleeding is diagnosed with upper gastrointestinal endoscopy. In children the preferred management of variceal bleeding is banding since is more safe, effective and leads to resolution of the bleeding in more than 90% of the patients. If the child is small (less than three years of age) banding is more difficult and sclerotherapy is often used. If endoscopic manipulations fail and persistent bleeding occurs the child can be managed with esophago-gastric tamponade using a Linton or Sengstaken-Blakemore tube. These tubes can be left in place for up to 24 hours due to the risk of aspiration, rupture, ulceration, airway obstruction or necrosis of the esophagus. Tamponade is successful in more than 80% of the cases. Should bleeding persist then emergency shunting with transjugular intrahepatic portosystemic shunt (TIPS) is indicated. Rebleeding occurs in 50% of children in the next six weeks and the mortality in such situations can be very high.

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