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Traumatic Aortic Injury in Children

Traumatic aortic injury (TAI) in children is a rare but serious condition characterized by disruption of the aortic wall due to blunt thoracic trauma. Although relatively uncommon, TAI carries a high mortality rate if not promptly recognized and managed appropriately. Pediatric patients with TAI often present with challenging diagnostic and management considerations due to differences in anatomy, physiology, and injury patterns compared to adults. The true incidence of TAI in children is challenging to determine due to its rarity. However, it is recognized as a severe injury with significant morbidity and mortality. It occurs in 10% to 30% of fatalities from blunt thoracic trauma and is the second most common cause of death after head injury. Approximately 80% of affected patients do not survive to reach the hospital. TAI commonly occurs as a result of high-energy mechanisms such as motor vehicle accidents or falls from heights. Post-traumatic aortic rupture occurs mainly in motor vehicle frontal crashes with driver ejection. the most frequent anatomical position of ATAT (55?67%) is at the isthmus of the descending thoracic aorta, where the relatively immobile descending aorta, held by the ligamentum arteriosum, and overlying mediastinal pleura, decelerates at a different speed compared with the fairly mobile heart and aortic arch. The unique biomechanical properties of pediatric aortas, including greater elasticity and vulnerability to shear forces, contribute to the propensity for injury in this population. Children with TAI may present with a range of signs and symptoms, including chest pain, dyspnea, hypotension, and neurological deficits. However, clinical manifestations can be subtle or masked by associated injuries, making early diagnosis challenging. This lesion is an absolute surgical emergency. Diagnostic modalities such as chest X-ray, computed tomography angiography, and transesophageal echocardiography play a critical role in confirming the diagnosis and assessing the extent of injury. All children with confirmed aortic rupture in angiogram had widened mediastinum and blurred aortic arch. Associated systemic injuries are quite common in pediatric patients with traumatic aortic rupture including pulmonary contusion, long bones or pelvis fractures, head trauma and myocardial contusion. The management of TAI in children requires a multidisciplinary approach, involving pediatric surgeons, pediatric cardiologists, and trauma teams. Hemodynamic stability, associated injuries, and the extent of aortic injury guide the choice of management strategy. Delayed management approach with aggressive blood pressure control and serial radiological monitoring is a safe and recommended option for those with severe concomitant injuries or other medical comorbidities. Operative management options include open surgical repair, endovascular stent graft placement, or hybrid approaches. Non-operative management may be considered in select cases, particularly when there are associated injuries or significant comorbidities that increase the risk of surgery. Until

definitive repair, the patient should be kept relatively hypotensive to reduce the risk of complete aortic rupture, which might lead to exsanguination. The reason for permissive hypotension is to reduce the shear forces, minimizing the risk of rupture prior to repair. In the last decade there has been a transition in the therapeutic approach from open surgical repair to endovascular repair. Advantages of endovascular treatment also include avoidance of thoracotomy, single-lung ventilation, aortic cross-clamping, left heart or cardiopulmonary bypass, spinal cord ischemia, and renal insults secondary to hypoperfusion. In pediatric patients, open repair either with primary anastomosis or placement of synthetic grafts is currently still the standard of care because not all trauma centers treat children, and the implantation of such devices needs the availability of small diameter stents together with highly skilled personnel who can safely perform the procedure. The second obstacle is the small lumen in the femoral and external iliac arteries which, for proper implantation, require prior surgical exposure of the common iliac artery. The most important anatomic characteristic of a posttraumatic lesion allowing endovascular treatment is the presence of an adequate proximal neck or at least 5 mm aortic wall from the subclavian artery with absence of mural thrombus, calcifications, or hemorrhage. The endovascular technique does not require heparinization, carries a low invasiveness with attendant minimal blood loss, and can be applied in the acute phase without the risk of destabilizing pulmonary, head, or abdominal traumatic lesions. Long-term outcomes following TAI in children are influenced by several factors, including the severity of the injury, associated injuries, and the chosen management approach. Early recognition and appropriate management significantly impact patient outcomes. Children who undergo successful repair can experience favorable long-term outcomes with low rates of complications. However, long-term surveillance is crucial to detect potential late complications, such as aortic aneurysm formation, pseudoaneurysm, or aortic valve dysfunction. Prevention of TAI in children primarily focuses on improving road safety, implementing proper restraint systems, and promoting injury prevention strategies. Continued research into the optimal diagnostic modalities, management strategies, and long-term outcomes will further enhance our understanding of TAI in children and improve patient outcomes. Despite advances in surgical and resuscitation techniques in recent years, the perioperative and postoperative mortalities associated with TRTA have remained high. In most cases, a complete transection occurs, with instantaneous death. In approximately 15% of cases, the adventitial wall and mediastinal structures contain the rupture, allowing survival. In these cases, if adequate antihypertensive therapy acting to reduce wall stress is prompt, the risk of aortic rupture is limited.

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Sleeve Gastrectomy in Children

Childhood obesity has emerged as a significant public health concern, necessitating effective interventions to mitigate its long-term consequences. More than 30% of children and adolescents in the USA are overweight or obese. Morbid obesity is defined as a BMI above the 99th percentile for age and sex. Obesity increases the risk of developing type 2 diabetes, systemic and pulmonary hypertension, obstructive sleep apnea, nonalcoholic fatty liver disease, cardiovascular disease, psychosocial difficulties, and poor quality of life with premature death. Nonsurgical weight management programs achieve modest weight loss results at best. Surgical approaches, such as sleeve gastrectomy (SG), have been considered as potential options for severely obese children. During laparoscopic sleeve gastrectomy 70-80% of the greater curvature and fundus of the stomach is removed with a stapler device. Calibration as to how much to removed uses either a gastroscope or bougie dilators in children. Complications of sleeve gastrectomy include leak, bleeding, and surgical site infections. Leak is suspected in the postoperative period when the child presents with unexplained tachycardia. Other signs might include leukocytosis, fever, and intolerance to oral feedings. Leaks are typically located just below the GE junction. Should a leak be suspected a CT of abdomen with oral/IV contrast should be performed. Extraluminal bleeding is typically from the staple line, spleen, liver, or abdominal wall which might need further surgery. With intraluminal bleeding the child might present with melena or hematemesis and can be controlled endoscopically. Most common short-term complications are nutritional deficiencies. Other late complications include stricture and gastroesophageal reflux. Several studies have demonstrated the effectiveness of sleeve gastrectomy in achieving substantial weight loss in pediatric patients. Longitudinal investigations have reported significant reductions in body mass index and excess weight loss percentage following the procedure; with 25-30% of total weight lost permanently. In addition, weight loss appears to be maintained safely and growth velocity is unaffected. Successful weight loss not only improves physical health but also has a positive impact on psychological well-being and quality of life in obese children. Sleeve gastrectomy has shown promising effects on metabolic parameters in children. The procedure has been associated with significant improvements in insulin resistance, glucose metabolism, lipid profiles, and blood pressure. Remission of type 2 diabetes, hypertension and dyslipidemia occurs in 90%, 78% and 63% of patients at three to 5 years of follow-up respectively. These favorable metabolic changes contribute to the reduction of comorbidities such as type 2 diabetes, dyslipidemia, and hypertension in obese children. While short-term outcomes of sleeve gastrectomy in children appear

promising, long-term consequences and safety considerations warrant thorough evaluation. Sleeve gastrectomy in children may lead to nutrient deficiencies, specifically vitamin D, calcium, iron, and vitamin B12. This should be provided life-long. Long-term follow-up studies are necessary to assess the potential impact of these deficiencies on growth, bone health, and cognitive development in pediatric patients. Furthermore, evaluating the durability of weight loss and the potential for weight regain is essential. Long-term studies are needed to ascertain whether the benefits of sleeve gastrectomy persist into adulthood and whether patients maintain improved metabolic parameters and sustained weight loss. Addressing the psychological and behavioral aspects of obesity is critical in the management of pediatric patients. Sleeve gastrectomy has shown potential in positively influencing self-esteem, body image, and psychological well-being in children. Improved mental health outcomes contribute to long-term weight maintenance and enhanced quality of life. A multidisciplinary approach involving medical, nutritional, and psychological support is crucial in the comprehensive management of pediatric patients undergoing sleeve gastrectomy. Regular monitoring of nutritional status, including appropriate supplementation and dietary counseling, is necessary to mitigate the risk of nutrient deficiencies. Long-term follow-up is paramount to assess the sustained efficacy, safety, and potential late-onset complications of sleeve gastrectomy in children. Continued monitoring of growth, bone health, cognitive development, and psychosocial well-being is essential to ensure optimal outcomes. Sleeve gastrectomy demonstrates efficacy in achieving substantial weight loss and improving metabolic parameters in obese children. However, long-term consequences, including nutrient deficiencies, require further investigation.

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