PEDIATRIC SURGERY *Update**
Vol. 59 No. 01 JULY 2022

Trichobezoars

Bezoars are masses of solidified organic or non-biological material commonly found in the intestinal tract. Trichobezoar is a mass composed of hair that lodges in the proximal gastrointestinal tract, usually the stomach, causing symptoms of gastric outlet obstruction. Trichobezoars constitute 6% of all bezoars. Human hair is resistant to digestion as well as peristalsis due to its smooth surface accumulating between the mucosal folds of the stomach. With time continuous ingestion of hair leads to the impaction of hair with mucous and food causing the formation of a trichobezoar. Trichobezoars are almost exclusively seen in females between the ages of six and ten years, who have bizarre appetite, and emotional disturbances or mental retardation. Trichobezoars in young females with psychiatry comorbidity are usually the result of the urge to pull out hair (trichotillomania) and swallow it (trichophagia). Other psychiatry disorders such as mental disorders, abuse, pica, obsessive compulsive disorder, depression and anorexia nervosa may also be associated with trichobezoars. Many of the children also eat fabric fibers, paper napkins, plastic shopping bag pieces and cloth pieces. Trichobezoars produce multiple clinical manifestations such as: large firm movable epigastric mass, fullness, bloating, regurgitation, nausea, vomiting, epigastric pain, hematemesis, and tiredness. Originally the mass develops in the stomach and can move distally to the small bowel by fragmentation of a portion, extension, or total translocation. Children complain of early satiety and weight loss. This might reduce intake and develop failure to thrive and anemia. If left untreated the chronic obstruction might result in death from malnutrition, gastric mucosal erosion, ulceration, hemorrhage, or perforation. Due to significant size of the trichobezoar in most cases, the blood supply to the mucosa of the stomach and part of the affected bowel is reduced, which may cause ulceration and eventually perforation. In addition, intussusception, obstructive jaundice, protein-losing enteropathy, pancreatitis and even death has been reported as complications of trichobezoars. Gastric bezoars with extension into the proximal small bowel or even colon is known as Rapunzel syndrome. The diagnosis is achieved using simple abdominal films or ultrasound and confirmed with CT scan or MRI. They appear as a well-defined intraluminal mass containing mottled gas. CT is superior as it not only identifies a heterogenous bezoar but can also define its extension distally. Direct visualization of the bezoar through upper GI endoscopy is the gold standard for imaging. The management of trichobezoar in the stomach or small intestine is associated with its size, and they can attain a significant size before causing symptoms. Trichobezoars can be managed with dissolution, suction, lavage, mechanical endoscopic fragmentation, or excision. Medical treatment and enzymatic degradation although attractive due to noninvasiveness have been reported as ineffective. Endoscopic removal if

effective would be the best method. Unfortunately, due to the size, density, and hardness of most of these gastric masses achieving endoscopic retrieval is effective in less than 5% of all cases. Removal of multiple fragments requires repeated introduction of the endoscope causing pressure ulceration, esophagitis end even perforation during retrieval. Hence endoscopy is only valuable as a diagnostic modality. The same occurs with laparoscopy which have been found inferior to laparotomy due to the size of these hair concretions that assume the form of the stomach. Longer operating time with laparoscopy and the risk of spilling contaminated hair fragments into the peritoneal cavity makes laparoscopy less attractive. Laparotomy is successful in most cases with almost 12% of children suffering from complications including wound infection, pneumonia, and paralytic ileus. Laparotomy with gastrostomy for manual removal is considered the treatment of choice for most trichobezoars. In case of a tail of the bezoar into the proximal bowel caution to avoid fragmentation should be exercise, otherwise a separate incision in the bowel might be needed for removal. Whenever a surgeon encounters a small or large bowel trichobezoar, they should look for a gastric trichobezoar. Beside trichobezoar removal, management should focus in preventing recurrence. Psychiatry follow-up is necessary to reduce the frequency of recurrence. The mortality is relatively low associated to complications and septicemia.

References:

1- Santiago Sanchez CA, Garau Di-az P, Lugo Vicente HL: Trichobezoar in a 11-year old girl: a case report. Bol Asoc Med P R. 88(1-3):8-11, 1996

2- Gorter RR, Kneepkens CM, Mattens EC, Aronson DC, Heij HA: Management of trichobezoar: case report and literature review. Pediatr Surg Int. 26(5):457-63, 2010

3- Gulerman F, Guven B, Demir S, Ozmen I: How should trichobezoar be treated in children? Turk J Gastroenterol. 30(7):660-661, 2019

4- Ohnesorge S, Skari H, Zochowski K, Pekrun EM, Schistad O, Naes PA: Trichobezoar. Tidsskr Nor Laegeforen. 140(17), 2020

5- Mirza MB, Talat N, Saleem M: Gastrointestinal trichobezoar: An experience with 17 cases. J Pediatr Surg. 55(11):2504-2509, 2020

6- Haggui B, Hidouri S, Ksia A, et al: Management of trichobezoar: About 6 cases. Afr J Paediatr Surg. 19(2):102-104, 2022

Vascular Access ESRD Children

The incidence and prevalence of end-stage renal disease (ESRD) in children have been increasing with time. Transplantation is the renal replacement therapy of choice for children with ESRD. Until kidney transplant is achieved, the child will rely in several methods of vascular or peritoneal access for ultrafiltration of blood. The most used modality of management while awaiting a kidney transplant is hemodialysis. There are three forms of vascular access available to provide hemodialysis: central venous catheter (CVC), arteriovenous fistula (AVF) and arteriovenous grafts (AVG) using prosthetic or biological material. The ideal vascular access delivers a flow rate adequate for the dialysis prescription, has a long use-life, and a low rate of complications (infection, stenosis, thrombosis, aneurysm, and limb ischemia). Most pediatric patients receiving hemodialysis have a CVC as primary access. CVC use is appropriate in those patients expected to receive a renal transplant within a short period of time and in exceptionally small children

weighting less than 10 kg. The ideal vascular access is the arteriovenous fistula (AVF) due to its low complication rate and long-life span. The appropriate patient would be a child above 20 kgs in weight, in whom more than 12 months of hemodialysis is anticipated and has no cardiac dysfunction. The preferred sites for AVF placement include radial artery to cephalic vein, brachial artery to cephalic vein and brachial artery to basilic vein in the non-dominant forearm when a preferred minimum of 2.5 mm venous diameter is utilized. Potential benefits of AVF creation include a lower infection rate, lower thrombosis and stenosis rate, and greater freedom with regards to activities. Possible complications of AVF include stenosis, thrombosis, possible leg length discrepancy if placed in the lower extremity, and steal syndrome. The European Society of Pediatric Nephrology suggests that children requiring chronic hemodialysis start with a functioning AVF where appropriate, and reserve cuffed CVC for very small children or those requiring urgent unplanned hemodialysis. Place AVF in non-dominant arm at least three months before anticipated use, distally in the arm, and assessing maturation four to six weeks after AVF formation by clinical examination and duplex ultrasound. When waiting times for transplantation is significantly reduced, AVF formation rates significantly decreases. Arteriovenous grafts (AVG) are also an option for hemodialysis in children. They are placed in the forearm between the brachial artery and basilic or brachial vein. The PTFE graft is the most utilized due to fewest complication rates. Higher infection rates have been noted with thigh grafts than upper extremity grafts. Advantages of AVG include shorter time to first use, higher primary patency rate, and ease of technical creation. Access stenosis and infection rates are higher in AVGs than in AVFs, but episodes of thrombosis are similar. Disadvantages of AVG include thrombosis, stenosis, and infection. Infections are problematic as they may require graft removal. CVC are the most commonly used vascular access in children with ESRD. A CVC is first choice in children that require urgent hemodialysis or is near to receive a planned renal transplant. Two types of CVC: acute and chronic. Acute CVC are non-cuffed catheters utilized for immediate access and smaller in size. Chronic CVC are larger in size and contain a subcutaneous cuff for protection against infection. Disadvantages of using a CVC include short life span, thrombosis, infection, malfunction, and possible fibrin sheath formation. Median survival time of CVC for ESRD is between four and 10 months. In children with small vasculature and weighting less than 10 Kg, a CVC is the best temporary solution. This includes children with extremity contractures, bony deformities or other morbidity limiting condition to allow nursing personnel ready access. The order of placement of CVS should be sequential with this order of use: the right internal jugular vein, right external jugular vein, the left internal and external jugular veins, subclavian veins, femoral veins or translumbar access to the inferior vena cava. To achieve good flow the tip should be placed in the right atrium. Kinking is the most common reason for central line removal in uncuffed catheters, and second most common reason in cuffed catheters. The most common reason for cuffed CVC removal is infections with potential consequences of septic shock, subacute bacterial endocarditis, osteomyelitis, and epidural abscess. Chlorhexidine use for exit site care has the lowest rate of infection and bacterial colonization rate. Thrombus formation is another potential complication of long-term CVC use occurring in right atrial wall, vessel wall or completely occluding the vessel. Most CVC-related thromboembolism episodes remain asymptomatic and are associated with large catheters sized utilized, double lumen catheters, type of CVC, insertion site (subclavian

vein is associated with a high risk of thrombosis), insertion technique, and patient related risk factors (prothrombotic state). Formation of fibrin sheath around the catheter covers the intake and outflow holes leading to malfunction. CVC should be considered as a bridge to a more permanent, optimized, vascular access. The placement of peripheral inserted central catheters (PICC) should be avoided.

References:
1- Sheth RD, Brandt ML, Brewer ED, Nuchtern JG, Kale AS, Goldstein SL: Permanent hemodialysis vascular access survival in children and adolescents with end-stage renal disease. Kidney Int. 62(5):1864-9, 2002
2- Chand DH, Valentini RP, Kamil ES: Hemodialysis vascular access options in pediatrics: considerations for patients and practitioners. Pediatr Nephrol. 24(6):1121-8, 2009
3- Merouani A, Lallier M, Paquet J, Gagnon J, Lapeyraque AL: Vascular access for chronic hemodialysis in children: arteriovenous fistula or central venous catheter? Pediatr Nephrol. 29(12):2395-401, 2014
4- Mandel-Shorer N, Tzvi-Behr S, Harvey E, Revel-Vilk S: Central venous catheter-related venous thrombosis in children with end-stage renal disease undergoing hemodialysis. Thromb Res. 172:150-157, 2018
5- Shroff R, Calder F, Bakkaloglu S, et al: Vascular access in children requiring maintenance haemodialysis: a consensus document by the European Society for Paediatric Nephrology Dialysis Working Group. Nephrol Dial Transplant. 34(10):1746-1765, 2019
6- Raina R, Mittal A, Sethi SK, Chakraborty R: Challenges of Vascular Access in the Pediatric Population. Adv Chronic Kidney Dis. 27(3):268-275, 2020
7- Ho HL, Halim AS, Mat Saadk AZ, Sulaiman WAW, Ilias MI: Patency of permanent vascular access creation in paediatric patients with end stage renal disease. Med J Malaysia. 76(5):737-740, 2021

ROTEM

Bleeding is a serious condition related to surgery, invasive procedures, childbirth, and trauma. Impaired hemostasis is a contributing factor to postoperative bleeding. Rotational thromboelastography (ROTEM) is a rapid point of care viscoelastic test of hemostasis in whole blood which allows measurement of global clot development, stabilization, and dissolution in time. ROTEM reflects in vivo hemostasis assessing both thrombosis and fibrinolysis. Coagulopathy is a problem in pediatric surgical procedures, mostly of concern in cardiac, craniofacial oncologic operation and neonatal complex procedures. Other parameters that predict risk of coagulopathy are massive blood loss, prior coagulopathy, diffuse bleeding during surgery, sepsis, liver failure and prolonged operative time. Conventional hemostatic evaluation (platelets, PT, INR, PTT, and fibrinogen levels) has limitations directing blood component therapy. As ROTEM evaluates the whole process of coagulation from the beginning of clot formation to the need of fibrinolysis, the test promptly guides blood-component therapy in surgical patients. Patients with normal ROTEM have a low chance of having clinically significant coagulopathy. ROTEM provides information on platelets number/function and fibrinogen reserves. ROTEM provides test results within 10-15 minutes with very small samples appropriate for the neonatal surgery setting. Practical clinical uses of ROTEM include cardiac surgery (hemostatic resuscitation), trauma, obstetric (postpartum hemorrhage), liver transplantation (coagulopathy of cirrhosis, intraoperative replacement of large blood losses, changing metabolism of coagulant factors), hemophilia and burns. In adult and pediatric trauma ROTEM examines the diagnosis of coagulopathies, including hypocoagulation, hypercoagulation, platelet dysfunction and fibrinolysis. ROTEM can also be used to direct blood and blood-product

transfusion. In trauma patients ROTEM can be used to diagnose coagulopathy, predict, and guide transfusion therapy and reduce unnecessary exposure to allogeneic blood products. TEG and ROTEM have several advantages to routine coagulation tests. They are easy to use, produce rapid graphical and numerical results of the hemostatic status, can detect the anticoagulant effect of acidosis, hypo-, or hyperthermia, and are able to detect and quantify the underlying cause of coagulopathy, such as thrombocytopenia, factor deficiency, heparin effect, hypofibrinogenemia and hyperfibrinolysis. Treatment for such identified disorders may include transfusion of blood products (FFP< platelets and cryoprecipitate), or specified drugs and the effect can be evaluated in vitro. ROTEM improved mortality in elective cardiac surgery, excision of burn wounds and liver transplantation, along with reduction in the need for RBC, FFP and platelet transfusion and combined treatment. TEG and ROTEM have the potential to reduce mortality, receiving unneeded transfusions and development of dialysis-dependent renal failure. ROTEM used showed a reduction in the time to the first transfusion of blood products (RBC) and reduced total number of a hospital stay. Acquired coagulopathy for pediatric trauma patients is predominantly characterized by poor fibrinogen polymerization, poor clot firmness, followed by hyperfibrinolysis and prolonged initiation of coagulation. ROTEM-guided algorithms implement the concept of personalized or precision medicine in perioperative bleeding management. Using ROTEM-guided algorithms in bleeding patients results in improved patient safety and outcome including perioperative morbidity and mortality. The use of visual assessment of bleeding using a bleeding score does not correlate well with ROTEM measurements to diagnose coagulopathy.

References:

1- Whiting D, DiNardo JA: TEG and ROTEM: technology and clinical applications. Am J Hematol. 89(2):228-32, 2014

2- Sangkhathat S, Suwannarat D, Boonpipattanapong T, Sangthong B: Rotational thromboelastometry in the diagnosis of coagulopathy in major pediatric surgical operations. J Pediatr Surg. 50(11):2001-4, 2015

3- Veigas PV, Callum J, Rizoli S, Nascimento B, da Luz LT: A systematic review on the rotational thrombelastometry (ROTEMAr) values for the diagnosis of coagulopathy, prediction and guidance of blood transfusion and prediction of mortality in trauma patients. Scand J Trauma Resusc Emerg Med. 24(1):114, 2016

4- Wikkelso, A, Wetterslev J, Moller AM, Afshari A: Thromboelastography (TEG) or thromboelastometry (ROTEM) to monitor haemostatic treatment versus usual care in adults or children with bleeding. Cochrane Database Syst Rev. 2016(8):CD007871, 2016

5- Deng Q, Hao F, Wang Y, Guo C: Rotation thromboelastometry (ROTEM) enables improved outcomes in the pediatric trauma population. J Int Med Res. 46(12):5195-5204, 2018

6- Gorlinger K, Perez-Ferrer A, Dirkmann D, et al: The role of evidence-based algorithms for rotational thromboelastometry-guided bleeding management. Korean J Anesthesiol. 72(4):297-322, 2019

7- Restin T, Schmugge M, Cushing MM, Haas T: Comparison between intraoperative bleeding score and ROTEMAr measurements to assess coagulopathy during major pediatric surgery. Transfus Apher Sci. 60(5):103191, 2021

8- Cannata G, Mariotti Zani E, Argentiero A, et al: TEG and ROTEM Traces: Clinical Applications of Viscoelastic Coagulation Monitoring in Neonatal Intensive Care Unit. Diagnostics (Basel). 11(9):1642, 2021

***Edited by: Humberto Lugo-Vicente, MD, FACS, FAAP**

Professor of Pediatric Surgery, UPR - School of Medicine, UCC School of Medicine &

Ponce School of Medicine.
Director - Pediatric Surgery, San Jorge Children's & Woman Hospital.
Postal Address: P.O. Box 10426, San Juan, Puerto Rico USA 00922-0426.
Tel (787) 340-1868 E-mail: *pediatricsurgerypr@gmail.net*
Internet: pedsurgeryupdate.com

**** PSU 1993-2022***
ISSN 1089-7739