

## Review Article

### **Hirschsprung's Disease: A Review of Its Management Options**

#### **Abstract:**

Hirschsprung's disease (HD) is considered a functional obstruction of intestine which is caused by ganglion cells absence in the submucosal and myenteric plexuses with the subsequent result of absence of peristalsis in the affected intestinal segment. Congenital aganglionosis of colon or congenital megacolon are alternative names for this condition with an estimated incidence of 1 in 5,000-7,200 neonates. The incidence of male: female affection ratio is 4:1. The classification of Hirschsprung's disease depends on the location of transition zone and the length of involved segment of intestine. Resection of the aganglionic part of the colon and rectum, pulling down the normally innervated intestine and anastomosing it to the anorectal region is the definitive treatment of Hirschsprung's disease. This can be done completely transanal or laparoscopically assisted transanal. Three well known operations are available: the Soave, Swenson, and Duhamel operations. Transanal endorectal pull-through and laparoscopically assisted Swenson pull-through procedures for Hirschsprung's disease offer a minimally invasive alternatives to traditional open abdominal operations.

*Keywords: Hirschsprung's disease, constipation, obstruction, enterocolitis, aganglionic, Swenson, Soave, Duhamel and Laparoscopic assisted*

## **INTRODUCTION:**

Hirschsprung's disease (HD) is considered a functional obstruction of intestine which is caused by ganglion cells absence in the submucosal and myenteric plexuses with the subsequent result of absence of peristalsis in the affected intestinal segment.<sup>[1]</sup> In 1887 the Danish pediatrician Harald Hirschsprung initiated the scientific awareness on this disease.<sup>[2]</sup> Hirschsprung's disease is the most common congenital intestinal motility disorder.<sup>[3]</sup> Hirschsprung's disease incidence is nearly 1: 5000 live births, Short-segment Hirschsprung's disease, in which the aganglionosis is restricted to the rectosigmoid area is present in over 80% of cases.<sup>[4]</sup> The extent of aganglionosis in long-segment Hirschsprung's disease may involve the entire colon causing a condition named total colonic aganglionosis (TCA).<sup>[5]</sup> The incidence of male: female affection ratio is 4:1.<sup>[6]</sup> The incidence of associated congenital anomalies is approximately 18% involving the neurological, cardiovascular, urological, or gastrointestinal system.<sup>[7]</sup> In approximately 10% of affected children we can detect a positive family history, particularly in long segment disease. Children having Down syndrome and other genetic aberrations have a higher incidence of HD. Hirschsprung's disease has been associated with mutations in (RET) - rearranged during transfection- proto-oncogene, endothelin family of genes, SOX-10 gene and SIP1 gene.<sup>[8]</sup> The RET protooncogene is the main gene responsible for Hirschsprung's disease.<sup>[9]</sup>

### **Pathophysiology:**

During normal embryological development, the nervous system of the intestine is formed by neural crest cells proximal to distal migration along the

intestine. These pluripotent stem cells differentiate into the submucosal and myenteric plexuses ganglia. HD occurs when there is an interruption of this migration process with subsequent absence of normal innervation to the most distal portion of the intestine. The aganglionic segment is becomes spastic, incapable of dilatation, and causes an obstruction within the proximally dilated normal bowel. Long-segment HD is defined as aganglionosis extending proximally beyond the splenic flexure. The rectosigmoid colon is the most commonly affected area with 80% incidence, followed by transverse colon or the splenic flexure with 17% incidence and finally the entire colon with 8% incidence.<sup>[10]</sup>

### **Diagnosis:**

Diagnosis of HD depends mainly on clinical history, imaging, and rectal biopsy histopathological examination.<sup>[11]</sup>

#### **A. Clinical presentation:**

The most important symptom in neonates having HD is delayed passage of meconium beyond 48 hours of life.<sup>[12]</sup> Distal intestinal obstruction is a common presentation in neonates with HD within the first few days after birth. Vomiting, Distended abdomen, empty rectum and explosive offensive discharge of stool may be present.<sup>[13]</sup> Chronic constipation in elder children with HD may be a later presentation together with failure to thrive and gross abdominal distention.<sup>[10]</sup> Children having (HAEC) Hirschsprung's Associated Enterocolitis may present with fever, abdominal distention, and foul-smelling or explosive stool.<sup>[14]</sup>

#### **B. Radiological investigations**

**Plain X ray of the abdomen:** Erect posture view of abdomen may show air fluid levels and absence of rectal air.<sup>[15]</sup>

**Contrast enema:** A narrow rectum or rectosigmoid with a dilated proximal colon on contrast enema is an excellent finding to diagnose (rectosigmoid) short-segment aganglionosis. A transition zone with a variation in lumen size can be easily demonstrated in lateral views of the enema film.<sup>[16]</sup>

### **C-Histopathological diagnosis:**

Rectal biopsy is the gold standard for diagnosing HD.<sup>[17]</sup> The main histopathological finding in HD are: absence of ganglion cells in the myenteric and submucosal plexuses, marked hypertrophy of nerve fibers and abnormally increased acetylcholinesterase activity are.<sup>[18]</sup>

### **D- Anorectal manometry**

The absence of the rectoanal inhibitory reflex (RAIR) in HD patients had been formerly used in diagnosis, but it is of a limited value currently, except for diagnosing anal sphincter achalasia.<sup>[19]</sup>

**Variant Hirschsprung Disease:** This term is used to describe a clinical presentation suggestive of HD but with presence of ganglion cells on rectal biopsy.<sup>[20]</sup>

**Intestinal neuronal dysplasia (IND):** There are two types of IND. The less common type A has a characteristic absent or reduced sympathetic innervation of the myenteric and submucosal plexuses with hyperplasia of the myenteric plexus. The more common type B consists of dysplasia of the submucosal plexuses, nerve fibers thickening, increased acetylcholinesterase staining, giant ganglia and ectopic ganglion cells identification in the lamina propria. The later type B can occur alone or

accompanying HD. IND may be either diffuse or focal.<sup>[7]</sup>

**Hypoganglionosis:** which is characterized by small and scattered ganglia with accompanying acetylcholinesterase distribution abnormalities.<sup>[21]</sup>

**Internal sphincter achalasia:** which is characterized by presence of symptoms of HD inspite of presence of normal ganglion cells on rectal biopsy together with lack of normal (RAIR) rectoanal inhibitory reflex on anorectal manometry.<sup>[22]</sup>

### **Treatment of HD:**

surgical intervention is the definitive treatment of HD with resection of the aganglionic intestine and anastomosing the normally ganglionated intestine to the rectum with preservation of continence.<sup>[23]</sup>

**Preoperative considerations:** preoperative resuscitation, correction of any electrolytes abnormalities and rectal irrigation with warm saline every six hours to relieve any obstruction.<sup>[24]</sup> Colostomy may be needed to decompress severely dilated colon.<sup>[25]</sup> Triple intravenous antibiotic coverage should be given one hour before surgery and repeated postoperatively three times daily.<sup>[26]</sup>

### **Surgical procedures:**

**Swenson procedure:** The aim of this operation is to resect the aganglionic bowel with an end-to-end anastomosis above the anal sphincter. It is extremely important to maintain the dissection very near to the rectal wall to avoid injury to the deep pelvic vessels, nerves, vas deferens, seminal vesicles, prostate and vagina.<sup>[27]</sup>

**Soave procedure:** It had been described by Franco Soave in 1964 and its principle depends on removal of the mucosa and submucosa of the rectum and pulling normally ganglionated bowel through aganglionic muscular cuff.<sup>[28]</sup> The main

advantage of this procedure is minimizing the risks of pelvic structures injury.<sup>[29]</sup>

**Duhamel procedure:** It involves bringing the normally ganglionated colon between the rectum and sacrum and anastomosing the two walls with a stapler to produce a new lumen that is aganglionated anteriorly and normally ganglionated posteriorly. It is felt to be safer, easier than the Soave or Swenson operations and create a large anastomosis with reduction of stricture incidence. In spite of these advantages, It leaves a large area of aganglionic intestine with the risk of enterocolitis, obstructive symptoms and constipation.<sup>[30-32]</sup>

**Transanal endo-rectal pull through (TERPT):** Transanal mucosectomy for HD is a modification of the Soave's procedure. It had been first described in 1998 by De La Torre-Mondragon and Ortega.<sup>[33, 34]</sup> Pelvic nerves damage can be obviated if the dissection is done directly on the rectal wall. A short muscular cuff is left, so cuff abscesses occurrence is minimized and rectal compliance is increased.<sup>[35]</sup> No abdominal opening is needed; so, adhesion risks are reduced with excellent cosmetic results.<sup>[33]</sup>

**Laparoscopic assisted pull through for HD:** This operation had been first described by Georgeson et al., in 1995 in 12 patients with excellent results.<sup>[36]</sup> The benefits of this technique are preservation of the pelvic nerves, simplicity and skipping the obstructing muscle cuff that could happen following the Soave procedure.<sup>[37]</sup>

**Laparoscopic assisted Swenson pull through:** In the laparoscopic part of this technique full thickness rectal and colonic mobilization is being done using unipolar diathermy in a plane directly on the bowel wall to avoid injury of any pelvic organ.<sup>[38]</sup> In the perineal part, a full thickness rectal incision is being done above the pectinate

line and a full thickness Swenson plane is being created circumferentially, the dissection is being continued until reaching the peritoneal reflection, then coloanal anastomosis is being done.<sup>[39]</sup>

**Laparoscopic Duhamel procedure:** In addition to the advantages mentioned in the open Duhamel technique, the laparoscopic version of the procedure adds a lower risk of injuring pelvic nerves, good visualization, minimizing postoperative pain and quicker recovery.<sup>[40]</sup>

**Laparoscopic Soave procedure (laparoscopic assisted transanal endorectal Pull through):** this procedure avoids dissection in the pelvic cavity and theoretically lower the incidence of pelvic organs and nerves injuries.<sup>[41]</sup>

### **Complications Following Repair of Hirschsprung's Disease:**

The main postoperative complications include enterocolitis, incontinence and obstructive symptoms, regardless of which operation is performed.<sup>[42]</sup>

### **Specific Complications of Laparoscopic Pull through Surgeries:**

**Trocar Associated Complications:** Abdominal hematoma, incision site bleeding, abdominal organs injuries or large blood vessels injuries can cause extensive bleeding, fistula formation and even death.<sup>[43]</sup>

**Electric and Ultrasonic Associated Complications:** Improper use of ultrasonic or electric instruments as shear, electric hook or ultrasonic scalpel, can cause severe thermal injuries to the tissues nearby.<sup>[44]</sup>

**Pneumoperitoneum Associated Complications:** subcutaneous emphysema is the most common complication.<sup>[45]</sup>

### **Other Complications of pull through procedures:**

**Early complications:** Early and late complications may be related to each other for example: (leaks may lead to scarring or stricture, anal canal destruction results in permanent incontinence).<sup>[46]</sup>

**Wound infection:** This can be lowered by perioperative antibiotics, preoperative bowel preparation, good hemostasis and sterile surgical technique.<sup>[46]</sup>

**Bleeding:** Hematoma formation may increase anastomotic complications and the risk of infection.<sup>[46]</sup>

**Anastomotic leak:** Factors aggravating the risk of anastomotic leak are: tension, bad technique, ischemia, inadequate nutrition, drugs (steroids, etc.), distal obstruction and residual aganglionosis, postoperative rectal manipulation in the early postoperative period.<sup>[46]</sup>

**Pelvic abscess:** Same factors which cause leak may also cause pelvic abscess. If not adequately diagnosed and treated pelvic abscess may cause systemic septicaemia and pull-through segment necrosis.<sup>[47]</sup>

**Perianal excoriation:** The use of barrier creams may reduce the severity of this complication.<sup>[46]</sup> This usually resolves in six to eight weeks.<sup>[6]</sup>

**Anastomotic dehiscence of the pull through:** This can occur due to compromised blood supply or inadequate mobilization.<sup>[48, 49]</sup>

**Retraction of the pull-through segment:** This problem can occur due to inadequate mobilization or tension of the pull-through segment. Minimal disruptions may be corrected by transanal repair. Severe retraction may need proximal diverting colostomy with a planned delayed revision after several months.<sup>[46, 50]</sup>

**Fistula:** This complication may follow leak or perforation. It may be enterocutaneous, rectovaginal or

rectourethral. Fistulas can resolve spontaneously or may need a planned redo pull-through procedure.<sup>[48]</sup>

**Late complications:** Incontinence, soiling, enterocolitis or obstructive symptoms can occur.<sup>[6, 46]</sup>

**Bowel obstruction:** The five main causes of bowel obstruction are mechanical as (stricture formation, twisted pull through, fecaloma, long rectal cuff, adhesions), pathologic (pull-through of aganglionic bowel or secondary aganglionosis), achalasia of the internal sphincter, motility disorders as (intestinal neuronal dysplasia (IND) and functional enlargement of colon).<sup>[51]</sup>

**Constipation:** It may result from sphincter achalasia, incomplete resection, stricture formation, neuropathic ganglionic bowel, fecaloma, acquired proximal aganglionosis or functional (stool withholding behaviours).<sup>[46]</sup>

**Fecal soiling:** Contrast enema, manometry, rectal biopsy and MRI of the pelvis may be needed for diagnosing its cause.<sup>[52]</sup> Bulking agents and dietary modifications should be the first line therapy before considering surgical intervention.<sup>[53]</sup>

**Stricture formation:** This can be caused by technical complications, a narrow muscular cuff, compromised blood supply, not doing the postoperative dilatation program adequately or following an anastomotic leak. Digital rectal examination can detect it. Conservative measures should be tried first followed by stricturoplasty or a redo pull-through.<sup>[54]</sup>

**Enterocolitis:** Residual aganglionic segment, stricture, dysmotility, internal anal sphincter achalasia, twist in the pull-through or tight Soave muscular cuff can predispose the patient to enterocolitis.<sup>[55, 56]</sup> Irrigations, dilations, botulinum toxin injections and antibiotic prophylaxis can be used as

preventative measures.<sup>[57, 58]</sup> Administration of broad-spectrum intravenous antibiotics, metronidazole, early resuscitation and bowel decompression or even colostomy may be needed for adequate management.<sup>[59, 60]</sup>

**Voiding and Sexual Dysfunction:** This may be caused by damage to the pelvic nerves. Denervation of the parasympathetic fibers to the pelvic splanchnic nerves will cause a flaccid bladder, on the other hand, denervation of the sympathetic fibers to the hypogastric nerves may cause loss of bladder compliance and bladder neck incompetence.<sup>[61]</sup>

### **Conclusion:**

Hirschsprung's disease (HD) is considered a form of functional intestinal obstruction caused by absence of ganglion cells in the myenteric and submucosal plexuses of the intestine, which results in absent peristalsis in the affected bowel. It is also referred to as congenital megacolon or congenital colonic aganglionosis that occurs in 1 in 5,000-7,200 newborns. Hirschsprung's disease is being classified based on the length of involved bowel and location of transition zone. HD is one of the important pediatric diseases, which causes a significant morbidity. Open or laparoscopic Soave, Swenson and Duhamel procedures are available for the surgical treatment of HD. The outcomes of laparoscopic assisted trans-anal or complete transanal are superior to other older procedures. There several postoperative complications of the mentioned procedures that can be avoided by adequate technique and early detection of occurrence of complication.

### **CONSENT**

**It is not applicable.**

### **ETHICAL APPROVAL**

**It is not applicable.**

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