HIRSCHSPRUNG'S DISEASE- 12 YEARS STUDY

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ABSTRACT

BACKGROUND

Hirschsprung's disease is the commonest cause of functional intestinal obstruction in children. Majority of children with Hirschsprung's disease will have delayed passage of meconium in newborn period with abdominal distension and older children present with chronic constipation.

This study describes the clinical characteristics and outcome of management of this disease in our setting where frozen section facilities are difficult.

MATERIALS AND METHODS

A total of three hundred and nineteen patients were analysed over twelve years' duration; stage I 147 patients and stage II 172 patients. The presentation, diagnostic investigations, operative management and complications were described.

Study Design- This is a retrospective study with record based analysis.

RESULTS

Patients of Hirschsprung's disease both in stage I (Colostomy) and stage II (Pull-through) developed significant number of complications with severity ranging from minor to major.

CONCLUSION

Although complications are common, majority of the complications are manageable and attain a socially satisfactory bowel habit.

KEYWORDS

Hirschsprung's Disease, Aganglionosis, Congenital Megacolon, Pull-through Procedure, Chronic Constipation, Colostomy, Rectal Biopsy.

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BACKGROUND

Hirschsprung's disease is the commonest cause of functional intestinal obstruction in children and poses challenges to paediatricians and paediatric surgeons practicing in resource-limited places. This study describes the clinical characteristics and outcome of management of this disease in our setting and highlights challenges associated with the care of these patients.

The diagnosis is mostly by radiographic studies, especially barium contrast enema. Water soluble contrast can be used whenever there is doubt of necrotising enterocolitis in newborn. Anorectal manometry and histological examination of rectal wall biopsies were used less commonly at initial diagnosis.⁽¹⁾

Definitive treatment of Hirschsprung's disease involves 'pull-through' surgery following formation of a preliminary

colostomy. Regular follow-up is essential post-operatively as children often have problems with stool frequency, perianal excoriation, constipation or even recurrent episodes of enterocolitis. In the long-term significant number of children will suffer from constipation and/or soiling, and approximately 5% will have such severe problems that they may require re-formation of a stoma. Hirschsprung's disease cripples and deaths due to Hirschsprung's disease are also noted occasionally.

It is essential that parents be given a realistic expectation of outcome. They should be informed from the beginning that a significant number of children require laxatives and enemas in the long term, while many experience continence problems extending into adolescence. Nonetheless, the majority of children with Hirschsprung's disease will attain a socially satisfactory bowel habit.

In 1886, Harold Hirschsprung first described Hirschsprung's disease as a cause of constipation in early infancy. Early recognition and surgical correction of Hirschsprung's disease protects the affected infants from enterocolitis and debilitating constipation.

Hirschsprung's disease results from the absence of enteric neurons within the myenteric and submucosal plexus of the rectum and colon. Enteric neurons are derived from the neural crest and migrate caudally with the vagal nerve fibres along the intestine. These ganglion cells arrive in the

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proximal colon by 8 weeks gestation and in the rectum by 12 weeks gestation. Arrest in migration leads to an aganglionic segment. This results in clinical Hirschsprung disease. There is no clear explanation for the occurrence of spastic or tonically contracted aganglionic segment of bowel. Also known as congenital megacolon or congenital colonic aganglionosis, is a developmental disease characterised by absence of ganglion cells in submucosal (Meissner's) and myenteric (Auerbach's) plexuses in distal bowel extending proximally for variable distances that result in functional intestinal obstruction caused by dysmotility of the diseased segment. Short segment disease is most common and is confined to the rectosigmoid region of the colon. Long segment disease extends past this region up to left transverse colon and can affect the entire (total colonic) colon. Rarely, the small and large intestines are involved. Hirschsprung's disease is approximately 3 to 4 times more common in males than females. Incidence is 1 in 3000 to 5000 live births.

Most of the children with Hirschsprung's disease are diagnosed during the first 2 years of life. Approximately, one-half of children affected with this disease are diagnosed before they are aged 1 year. A small number of children with Hirschsprung's disease are not recognised until much later in childhood or adulthood. Presentation is during the newborn period. Newborns affected with Hirschsprung's disease may present with abdominal distension, failure of passage of meconium within the first 48 hours of life and repeated vomiting. A family history of a similar condition is present in about 20% of cases. Nearly, 50% of all infants with Hirschsprung's disease have a history of delayed first passage of meconium and 50% of infants with delayed first passage of meconium have Hirschsprung's disease. Older children present with chronic constipation. Soiling and overflow incontinence are rare, may be malnourished. Poor nutrition results from early satiety, abdominal discomfort and distention associated with chronic constipation. This constipation often is refractory to usual treatment protocols and may require daily enema therapy. May present with neonatal meconium plug syndrome. May also present with acute enterocolitis.

Hirschsprung's enterocolitis can be a fatal complication of Hirschsprung's disease. Enterocolitis typically presents with abdominal pain, fever, foul-smelling and/or bloody diarrhoea as well as vomiting. If not recognised early enterocolitis may progress to generalised sepsis, transmural intestinal necrosis and perforation. On examination, tympanic abdominal distension and symptoms of intestinal obstruction may demonstrate marked abdominal distension with palpable dilated loops of colon. Rectal examination commonly reveals an empty rectal vault and may result in the forceful expulsion of faecal material upon completion of examination.

Aetiology Genetic⁽²⁾ causes, generally sporadic, although incidence of familial disease has been increasing. Multiple loci appear to be involved like chromosomes 13q22, 21q22 and 10q; may be associated with multiple endocrine neoplasia 2A or MEN 2B and familial Hirschsprung's disease. Other genes associated with Hirschsprung's disease include the glial cell-derived neurotrophic factor gene, the endothelin-B receptor gene and the endothelin-3 gene etc.

Associated conditions- Hirschsprung's disease is strongly associated with Down's syndrome (trisomy 21); Down syndrome is the most common chromosomal abnormality

associated with aganglionosis and had been reported to occur in 4.5% - 16% of all cases of Hirschsprung's disease.

Other associations include Waardenburg syndrome, congenital deafness, malrotation, gastric diverticulum and intestinal atresia. Plain abdominal radiography may show signs or symptoms of abdominal distension or obstruction. Unprepared single-contrast barium enema: If perforation and enterocolitis are not suspected, an unprepared single-contrast barium enema may help establish the diagnosis by identifying a transition zone between a narrowed aganglionic segment and a dilated and normally innervated segment. The study may also reveal a non-distensible rectum, which is a classic sign of Hirschsprung's disease. A transition zone may not be apparent in neonates, because of insufficient time to develop colonic dilatation or in infants who have undergone rectal washouts, examinations or enemas. Rectal manometry⁽³⁾: In older children who present with chronic constipation and an atypical history for either Hirschsprung's disease or functional constipation, anorectal manometry can be helpful in making or excluding the diagnosis. Children with Hirschsprung's disease fail to demonstrate reflex relaxation of the internal anal sphincter in response to inflation of a rectal balloon. Blood count may show elevation of WBC count or a band forms should raise concern for enterocolitis. T3, T4 and TSH estimation in atypical and suspected of hypothyroidism to be done.

The aganglionosis is confined to rectosigmoid in 75% of patients, sigmoid and splenic flexure or transverse colon in 17% and total colon along with a short segment of terminal ileum in 8%. The incidence of Hirschsprung's disease is estimated to be 1 in 3000 to 5,000 live births. The disease is more common in boys with a male-to-female ratio of 3:1. The male preponderance is less evident in long-segment Hirschsprung's disease, where the male-to-female ratio is 1.5-2: 1.

Radiological Diagnosis

Plain abdominal films in a neonate with Hirschsprung's disease will show dilated loops of bowel with fluid levels and airless pelvis or absent rectal gas shadow. Occasionally, one may be able to see a small amount of air in the undistended rectum and dilated colon above it raising the suspicion of Hirschsprung's disease. Plain abdominal radiographs obtained from patients with total colonic aganglionosis (TCA) may show characteristic signs of ileal obstruction with air fluid levels or simple gaseous distension of small intestinal loops. In patients with enterocolitis complicating Hirschsprung's disease, plain abdominal radiography may show thickening of the bowel wall with mucosal irregularity or a grossly dilated colon loop indicating toxic megacolon. Pneumoperitoneum may be found in those with perforation. Spontaneous perforation of the intestinal tract has been reported in 3% of patients with Hirschsprung's disease.

Barium enema performed by an experienced radiologist using careful technique should achieve a high degree of reliability in diagnosing Hirschsprung's disease in the newborn. It is important that the infant should not have rectal washouts or even digital examinations prior to barium enema, as such interference may distort the transitional zone appearance and give a false-negative diagnosis. A soft rubber catheter is inserted into the lower rectum and held in position with firm strapping across the buttocks.

A balloon catheter should not be used due to the risk of perforation and the possibility of distorting a transitional zone by distension. The barium should be injected slowly in small amounts under fluoroscopic control with the baby in the lateral position. A typical case of Hirschsprung's disease will demonstrate flow of barium from the undilated rectum through a cone-shaped transitional zone into dilated colon. Some cases may show an abrupt transition between the dilated proximal colon and the distal aganglionic segment, leaving the diagnosis in little doubt. In some cases, the findings on the barium enema are uncertain and a delayed film at 24 h may confirm the diagnosis by demonstrating the retained barium and often accentuating the appearance of the transitional zone.

Tissue diagnosis either by suction rectal biopsy or transanal rectal biopsy. If a suction biopsy is performed, take the biopsy 2 - 2.5 cm above the dentate line on the posterior wall to minimise the risk of perforation. Carefully examine biopsy specimens for the presence or absence of ganglion cells in the submucous plexus (suction rectal biopsy) or myenteric plexuses (transanal rectal biopsy).

Histologic Findings

Histologically, HD is characterised by the absence of ganglionic cells in the myenteric and submucous plexuses and the presence of hypertrophied non-myelinated nerve trunks in the space normally occupied by the ganglionic cells. The aganglionic segment of bowel is followed proximally by a hypoganglionic segment of varying length. This hypoganglionic zone is characterised by a reduced number of ganglion cells and nerve fibres in myenteric and submucous plexuses.

Histochemical Staining

Acetylcholinesterase staining identifies the hypertrophy of extrinsic nerves trunks. In short-segment Hirschsprung's disease, the diagnosis can be made with a properly placed rectal suction biopsy alone or in combination with anorectal manometry.

Acetylcholinesterase staining and calretinin immunostaining may be helpful in making the diagnosis. Calretinin is helpful in ruling out Hirschsprung's disease by staining the ganglion cells and intrinsic nerve tissue. Acetylcholinesterase, on the other hand, is helpful in confirming the diagnosis by demonstrating increased activity in the hypertrophied nerve trunks.

Management⁽⁴⁾ include intravenous hydration, withholding of enteral intake, and intestinal and gastric decompression. Decompression can be accomplished through placement of a nasogastric tube and either digital rectal examination or normal saline rectal irrigations 2 - 3 times daily. Need broad-spectrum antibiotics to patients with enterocolitis such as cefotaxime, Amikacin and metronidazole. Surgical intervention may be planned either by single-stage pull-through or two-staged procedure⁽⁵⁾ after correction of anaemia and malnutrition.

Differential Diagnoses

Differential Diagnoses includes the following-

1. Acquired megacolon (generally at > 1 year of age), resulting from anal fissure, anal or rectal stricture,

anorectal malformations, tumour or psychogenic reasons.

2. Small left colon syndrome, particularly in diabetic mothers.
3. Meconium plug syndrome in neonates.
4. Chronic idiopathic intestinal pseudo-obstruction (CIIP, or CHIPS).

The surgical procedure depends on the patient's age, mental status, ability to perform activities of daily living, length of the aganglionic segment, degree of colonic dilation and presence of enterocolitis.⁽⁶⁾ Surgical procedure are levelling colostomy, which is a colostomy at the level of transitional zone of bowel; a staged procedure with placement of a levelled colostomy followed by a pull-through procedure or a single-stage pull-through procedure. The single-stage pull-through procedure may be performed with laparoscopic, open or transanal techniques. This procedure can be performed at the time of diagnosis or after the newborn has had rectal irrigations at home and has passed the physiologic nadir. Colostomy followed by pull-through procedure is generally done for those patients who present with sepsis due to enterocolitis, massive distention of ganglionic bowel prohibiting pull-through procedure or are otherwise not medically suitable for the pull-through procedure. Single-stage pull-through procedure option largely depends on the availability, experience and capabilities of the pathologist because aganglionic intestine must not be in the pull-through segment.

Definitive Surgical Procedures

Swenson Procedure⁽⁷⁾

This was the original operation described by Swenson in 1948. It involves resection of the aganglionic segment deep into the pelvis and direct end-to-end anastomosis of the proximal colon to the anorectal canal.

Duhamel Procedure

In the Duhamel procedure (retrorectal pull-through), the lower but aganglionic rectum is retained and the ganglionic bowel brought posteriorly and anastomosed to the aganglionic remnant in a side-to-side anastomosis.

Soave Procedure

The Soave procedure (extramucosal endorectal pull-through) along with its variations is the most frequently performed procedure in the world for short-segment Hirschsprung's disease. It has more recently been popularised as a laparoscopic-assisted or anal approach. The procedure involves an extramucosal resection of a retained aganglionic rectal segment. The rectal mucosa is removed and a muscular cuff retained. The ganglionated colon is brought through this cuff and anastomosed to the dentate line in the rectum, thus forming an endorectal pull-through.

Transanal Pull-Through

The transanal pull-through approach is through the anus, thus avoiding abdominal scars. It is done in selected cases, being mostly suited to a short aganglionic segment. It is similar to the Soave procedure, but is performed in reverse through the anus.

The technique involves the patient being placed in lithotomy and the rectum irrigated until clean. Retraction sutures are placed to expose the rectal mucosa and open the anus. Submucosal dissection is commenced 3 - 5 mm from the dentate line and the cut-line controlled by multiple fine traction sutures. Following the completion of the submucosal dissection, the rectum is transected. The dissection is continued proximally until the peritoneal reflection where the sigmoid colon is mobilised and delivered. Following histological confirmation of ganglion cells in the proximal bowel, the aganglionic segment is resected and a sutured anastomosis is performed. Many recommend a laparoscopic first stage to mobilise the bowel and perform biopsies to facilitate the resection margins.

Post-Operative Complications⁽⁸⁾

Recurrent postoperative enterocolitis may require treatment. Current therapeutic options include rectal dilations, application of topical nitric oxide, posterior myotomy/myectomy, injection of botulinum toxin or repeat operation in the event of refractory obstructive symptoms or repeated other complications include intermittent faecal soiling and incontinence, anastomotic leak, stricture formation, intestinal obstruction and enterocolitis, bleeding or death.

MATERIALS AND METHODS

Study period from June 2005 to June 2017 over 12 years. Total number of patients are 319 Males and 211 (66%) Females 108 (34%).

Age of Presentation- Stage I

Less than 10 days- 103 (70%), less than 30 days- 26 (17.5%), more than one month- 18 (12.5%). Our plan of management is in two stages. Stage I is colostomy at presentation.

Stage II

Planned at 10 kg weight. Average age 12 - 18 months.

	Total	Male	Female
	319	211	108
Stage I	147(46%)	97	50
Stage II	172(54%)	114	58

Stage I, 147 (46%); stage II, 172 (54%).

Stage I 147 female - 50 (3 long segment, 47 rectosigmoid), males - 97 (7 total colonic, 16 long segment, 74 rectosigmoid).

Stage II, 172 female - 58 (2 long segment, 47 rectosigmoid), males - 114 (6 total colonic, 19 long segment, 89 rectosigmoid).

Procedures done for Stage I are total colonic- ileostomy, long segment- left transverse colostomy, rectosigmoid-transitional zone colostomy (pelvic).

Procedures done for Stage II 172 are-

1. Modified Duhamel pull-through with Kocher's crushing clamps- 97 (before 2013).
2. Modified Duhamel pull-through with 55 mm stapler assisted- 67 (after 2013).

3. Soave endorectal pull-through- 5.
4. Swenson pull-through- 3.

Stage II Procedures

Modified Duhamel with Kocher's clamp	97 patients
Modified Duhamel with 55 mm stapler	67 patients
Soave endorectal pull-through	5 patients
Swenson pull-through	3 patients

Stage I Complications

Peristomal excoriation, prolapse of distal loop 5, stomal stenosis 5, revision of stoma due to wrong selection of site of stoma 3, neonatal sepsis 7, deaths 9 (Male 7, Female 2).

Stage II

Total 4 deaths, 2 from bleeding from anastomosis, both are stapler assisted, two deaths from post-operative severe sepsis complications-

1. Adhesive intestinal obstruction 5 - two needed laparotomy and adhesiolysis, three resolved conservatively.
2. Colocutaneous fistula 5 - three through abdominal wound (two subsided spontaneously, one needed diverting colostomy), one through sacral bone midline, needed diverting colostomy, one through perineum.
3. Severe stenosis of anastomosis- three needed diverting colostomy.
4. One patient has excess spur treated by 55 mm stapler application.
5. One patient has huge growth of blind rectal stump 30 cms long- treated by resection and closer of stump through laparotomy.
6. Faecalomas in 7 patients treated by manual evacuation.
7. Prolapse of neorectal mucosa, 9 patients treated by trimming of mucosa.
8. Constipation on and off in 19 patients treated by laxatives, enemas and dietary management.
9. Recurrent UTIs in 3 patients treated by antibiotics.
10. Enterocolitis in 6 patients treated by IV antibiotics, IV fluids.
11. Incontinence in 7 patients, treated by dietary management.

Barium Film showing Aganglionic Narrow Segment and Ganglionic Dilated Colon

HD in Newborn

Prolapse of Stoma

Stapler

Total Colonic HD

Transitional Zone 2

Transitional Zone 1

X-Ray Abdomen showing Dilated Colon and Absent Rectal Gas Shadow

DISCUSSION

Hirschsprung's disease is one of the commonest surgical problems in paediatric surgery and is due to developmental disease characterised by absence of ganglion cells in submucosal (Meissner's) and myenteric (Auerbach's) plexuses. Majority of the patients present in the infancy with abdominal distension and constipation. Although majority of paediatric surgical centres treat them with staged procedures, some centres prefer in single stage. Barium enema and rectal biopsy are commonly used for diagnosis as well as to know the transitional zone. We follow sequence of investigations and management in the order of clinical

features, x-ray abdomen, barium enema and then transitional zone colostomy with full thickness biopsy from transitional zone as well as distal aganglionic segment. We prefer full thickness biopsy, because the pathologists are well familiar with full thickness biopsy. We do not have histochemical staining or calretinin immunostaining facilities. We do double barrel loop colostomy to prevent prolapse.

Definitive procedures commonly done are Swenson, Duhamel procedure, Soave procedure and Transanal pull-through. In our institute, we practice Stapler assisted Duhamel pull-through with reasonably less complications. We have more patients in 2nd stage than 1st stage, because of referral from outside to the institute. Our results and complications are on par with most of the centres.

CONCLUSION

Hirschsprung's disease is common paediatric surgical problem. Regular follow-up is essential postoperatively as children often have problems with stool frequency, perianal excoriation, constipation or even recurrent episodes of enterocolitis. In the long term,⁽⁹⁾ 25% of children will suffer from significant constipation and/or soiling and approximately 5% will have such severe problems that some of them may require re-formation of a stoma. Postoperative complications⁽¹⁰⁾ are common, and majority of complications are manageable. Majority of children with Hirschsprung's disease will attain a socially satisfactory bowel habit.

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