Journal of the Medical Sciences
(Berkala Ilmu Kedokteran)

Volume 53, Number 2, 2021; 127-134
http://dx.doi.org/10.19106/JMedSci005302202103

Hirschsprung's disease: epidemiology, diagnosis, and treatment in a retrospective hospital-based study

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Submited: 2020-06-26
Accepted : 2020-11-02

ABSTRACT

Hirschsprung's disease (HD), or congenital megacolon, is a disease characterized by the absence of ganglion cells in the myenteric (Auerbach's) and submucosal (Meissner's) plexuses of the intestine, causing maximum obstruction in neonates. The purpose of this study was to investigate patient characteristics, clinical presentation, investigations, surgical treatment, and outcome. This study is a retrospective study of HD cases. Data obtained from medical records at the institution. Of the 109 with a positive rectal biopsy diagnosis, 91 were patients with this disease. There were more cases in boys than girls with a ratio of 1.37: 1. The patients were grouped into 4 age groups: neonates 29 cases (26.61%); infants/toddlers/young children 55 cases (50.46%); children over 5 years16 cases (14.69%); and teenagers 9 cases (8.24%). The neonates generally presented with abdominal distension, green vomiting, and a history of delayed meconium release, while the toddler, child, and adolescent groups experienced constipation and abdominal distension. Furthermore, from 37 patients (33.94%) that got barium enema examination, the most common transition zone was observed in the rectosigmoid (17 patients, or 45.9%). In addition, The Duhamel procedure was the most frequent pull-through procedure found in our cohort which was performed in 40 patients (36.70%). In conclusion, HD is mostly found in male infants/toddlers/young children with abdominal distention and chronic constipation as common symptoms. The barium enema shows the rectosigmoid as the most common transition zone, while the Duhamel pull-through procedure is the primary definitive operative action performed.

ABSTRAK

Penyakit Hirschsprung atau megakolon kongenital adalah penyakit dengan ciri berupa tidak adanya sel ganglion pada plexus Myentericus (Auerbach) dan plexus Submucosa (Meissner) dari usus sehingga menjadi penyebab obstruksi terbanyak pada neonatus. Tujuan penelitian ini untuk mengetahui karakteristik pasien, presentasi klinis, pemeriksaan penunjang, manajemen, dan keluaran. Penelitian ini merupakan penelitian retrospektif pada penyakit Hirschsprung dengan mengambil data rekam medis di Institusi kami. Pada penelitian ini didapatkan 91 pasien hirschprung disease dari 109 pasien yang dilakukan biopsi rectum. Jenis kelamin laki-laki lebih banyak dibanding perempuan, dengan rasio 1,37 : 1. Data terbagi dalam 4 kelompok, yaitu bayi baru lahir 29 kasus (26,61%); bayi/balita 55 kasus (50,46%); anak usia lebih 5-13 tahun 16 kasus (14,69%), dan anak usia remaja 9 kasus (8,24%). Kelompok bayi baru lahir umumnya datang dengan keluhan distensi abdomen dan muntah hijau dengan riwayat keterlambatan pengeluaran mekonium sedangkan pada kelompok bayi/balita, anak dan remaja datang dengan keluhan konstipasi kronik dan distensi abdomen. Ada 37 (33,94%) yang dilakukan pemeriksaan Barium enema dengan gambaran zona transisi terbanyak di rectosigmoid sekitar 17kasus (45,9%). Tindakan bedah definitive berupa Pull-through dengan prosedur Duhamel pada 40 pasien (36,70%). Dapat disimpulkan bahwa penyakit Hirschsprung lebih sering terjadi pada laki-laki pada usia bayi/balita dengan keluhan terbanyak berupa distensi abdomen dan konstipasi kronik. Pemeriksaan barium enema menunjukkan rectosigmoid merupakan loaksi transisional terbanyak dan tindakan operatif definitif yang dilakukan tersering berupa Duhamel Pull-Through.

Keywords:
chronic constipation;
pull;
through;
Hirschsprung's disease;
epidemiology;
hospital based;

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INTRODUCTION

Hirschsprung's disease (HD), also known as congenital megacolon, is the leading cause of intestinal obstruction in neonates.[1] The Hirschsprung's disease worldwide incidence ranges are from 1 per 2,000 to 1 per 12,000 live births, but the most commonly reported incidence rate is 1 per 4,000 live births, with boys out numbering girls at 3.4:1.[2–4] The transition zone can cover 75% of the rectosigmoid, although the disease is capable of affecting the entire colon up to the terminal ileum, which is seen in 8% of cases. Moreover, a total of 80-90% of cases are diagnosed during the neonatal period, and a small number display symptoms as infants, toddlers, and children (through adulthood), according to clinical symptoms based on age.[2,5,6]

The breakthrough treatment approach is the pull-through procedure, a curative surgery that involves cutting an intestinal ganglionosis such as trans anal endorectal pull-through (TEPT), trans-abdominal endorectal pull-through (open soave), Duhamel, trans-anal Swenson-like, and posterior neurectomy procedures.[1,7,8] However, pre-surgical, and post-surgical complications can occur both immediately and later, including anastomosis leakage, stenosis, impaired anal sphincter function, and enterocolitis. Moreover, it is estimated that up to 20-38% of patients develop enterocolitis, even if surgery is unsuccessful.[9]

Addressing the lack of data, this retrospective study aimed to provide information on the characteristics of HD patients as a basis for further study, since no real data were available in Makassar, especially in Department of Surgery, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia .

MATERIALS DAN METHODS

Subjects and design

Data were obtained retrospectively from medical records at Department of Surgery, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia from the period January 2013 to December 2017. The patients were identified using the code given in the international classification of diseases-10 (ICD-10) for Hirschsprung's disease (Q43.1).

Protocol of study

The data were collected in the form of patient characteristics (i.e., gender, age), clinical presentation, radiological results, surgical treatment, and outcome.

Statistical analysis

The data were processed using the SPSS program version 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). The data were analyzed descriptively and presented in tabular or narrative form.

RESULTS

Patient characteristics

TABLE 1 highlights the 109 cases of rectal and rectum biopsy for HD during the review period. The 91 cases were confirmed histologically as HD. The other 18 showed no abnormalities in the transition zone during the barium enema; thus, no histopathology examination was performed. The patients' age at presentation was noted: neonates (0–28 days) were 29 cases (26.61%); infants,

toddlers, and young children (1 month–5 years) were 55 cases (50.46%); children (5–13 yeasr) were 16 cases (14.69%); and teenagers (>13 years) were 9 cases (8.24%). In terms of gender, 63 cases (57.80%) were male and 46 (42.20%) cases were female, for a ratio of 1.37:1.

TABLE 1. Patient characteristics

Variable	N (%)
Gender	
• Male	63 (57.80)
• Female	46 (42.20)
Age	
• 0–28 days	29 (26.61)
• 1–12 months	27 (24.77)
• 1–5 years	28 (25.69)
• 5–13 years	16 (14.69)
• >13 years	9 (8.24)
Transition Zone (based on barium enema)	
• Recto-sigmoid	17 (45.9)
• Sigmoid colon	10 (27)
• Descending colon	6 (16.2)
• Ascending colon	4 (10.8)
• Normal	18 (16.51)
Histopathology	
• Aganglionosis	91 (100)
Management	
• Pull-through + colostomy	89 (97.80)
• Pull-through only	2 (2.20)
Pull-through Procedure	
• Soave procedure	31 (28.44)
• Duhamel procedure	40 (36.70)
• Swenson procedure	14 (12.84)
• Rectal washout and colostomy	24 (22.01)

Clinical presentation

TABLE 2 provides a clinical overview of Hirschprung's disease, where patients in the neonatal age group (0–28 ds) generally presented the most common symptoms: the delayed passage of meconium >24 hrs (41.28%) and abdominal distension (31.03%). Meanwhile, infants, toddlers, and young children (1 months–5 years) presented with chronic constipation (47.27%), abdominal distension (40%). Chronic constipation was the primary symptom in children older than 5 years (56.25%). Teenagers primarily had chronic constipation (55.55%). However, it should be noted that patients in this study could have more than one symptom simultaneously.

TABLE 2. Patient characteristics based on clinical presentation

Clinical presentation	Neonatal	Infants/Toddlers/ Young children	Children	Teenagers
	n (%)	n (%)	n (%)	n (%)
History of delayed passage of meconium > 24 hrs	12 (41.38)	7 (12.72)	-	-
Abdominal distention	9 (31.03)	22 (40.00)	-	-
Chronic constipation	0	26 (47.27)	9 (56.25)	5 (55.55)
Complication				
• Vomiting	8 (27.58)	0	7 (43.75)	4 (44.44)
• Lethargy	10 (34.48)	20 (74.07)	8 (32.0)	3 (33.3)

Histological and radiological investigations

A histopathological test (full-thickness rectal biopsy) was performed on all samples to confirm an exact diagnosis of Hirschsprung's Disease (TABLE 1). We found that all cases of biopsy barium enema abnormality showed aganglionosis in the area examined. Of the 109 cases, 33.94% of patients were photographed with barium enema to obtain a description of the transition zone. We found 17 cases of rectosigmoid (45.9%), 10 cases of sigmoid (27%), 6 cases of descending colon (16.2%), and 4 cases of ascending colon (10.8%). Barium examination was not performed for the rest of the patients because it was not a mandatory procedure.

Surgical treatment & outcome

As seen in TABLE 1, colostomy was conducted in 89 patients (97.80%) followed by the pull-through procedure, while 2 patients (2.20%) were directly treated with a definitive one-stage therapy and histopathology examination in the form of a frozen section procedure. Regarding the level of ganglion cells, 70 patients (76.92%) had a short segment localized to the rectosigmoid region, while 18 patients (19.78%) had a long segment, and 3 patients (3.30%) had a complete absence of ganglion cells in the colon.

Three types of pull-through procedures were performed in 85 patients (93.41%). The Soave was performed in 31 patients (28.44%). The Duhamel was performed on 40 patients (36.70%). While the Swenson was performed in 14 patients (12.84%). The remaining 24 patients (22.01%) only experienced colostomy and thus no definitive therapy.

The duration of hospitalization after colostomy formation ranged from 5 to 15 days, with an average duration of 7 days. However, two patients have died after the pull-through procedure and two other patients have died after colostomies procedure.

DISCUSSION

Known as congenital megacolon, HD is characterized by the absence of ganglion cells in the myenteric/Auerbach's and submucosal/Meissner's plexuses. It is also a major cause of functional intestinal obstruction in children.[2,9–13] In addition, experienced abnormalities are associated with spasms of the distal colon and internal anal sphincter, resulting in obstructions.[5] The abnormal region experiences contractions in the distal segment, while the normal portion experiences dilation in the proximal area. Furthermore, the absence is always in the distal colon area.[7,11]

The results of this study found that the majority of patients are infants, toddlers,

and young children (50.46%), while 26.61% are neonates. However, in this study, we found that the number of patients with HD in the infant/toddler/young child age group is high, in contrast to other epidemiological studies in Indonesia. It is similar to a study conducted by Mabula *et al.*[5] where most of the patients were one year or older, with 5.5% of a neonatal age. In contrast, a study in Yogyakarta and Aceh, Indonesia, found that neonates were the largest number of HD patients.[1,14]

This study shows a higher occurrence of HD in boys compared to girls at a ratio of 1.37:1. This is also in line with the study conducted by Mabula *et al.*[5] who found a ratio of 3.6:1; another study found 3.4:1. However, further studies are required to explain the fact that mostly HD patients were found in the boys.

The clinical presentation of HD in this study was no different from other previous studies. Neonates generally present three symptoms—delayed meconium removal, green vomiting, and abdominal distension—where the delayed passage of meconium after 24 hrs is off concern.[15] Alehossein *et al.* reported that 72% showed a delay in passing meconium within 48 hours after birth. The manifestations of green vomiting and abdominal distension usually decrease when meconium is released immediately.[4,12] However, common symptoms observed in older children are chronic constipation and abdomen distension.[6,16,17] In our study, no patients had been associated with congenital anomalies such as Waardenburg syndrome, down syndrome, neurofibromatosis, multiple endocrine neoplasia type II, and neuroblastoma.

The rectal biopsy is the gold standard for HD diagnosis, which is determined by the absence of ganglion cells in the distal intestine, not found in the submucosal/Meissner's plexus and the intermuscular/Auerbach's plexus.[6,12] Another important discovery is an increase in nerve fibers extending to the end (observed after hematoxylin-eosin staining, although it is easier to observe with acetylcholine esterase).[5,17,18] The examination is carried out by suction or full-thickness rectal biopsy, in which anesthesia is not required. This clinical procedure tends to show a low false-positive rate. However, the suction biopsy was not available at the institution of this study, prompting the need to explore full-thickness rectal biopsy as an option with the help of general anesthesia.[5,12] An enema contrast examination helps confirm the diagnosis or rule out a differential diagnosis of Hirschsprung's disease, and a positive outcome determines the transition zone. However, the result is not clear in the first three months.[5,19] We found that all cases subjected to histopathological tests showed the presence of aganglionosis, which is characteristic of HD. We found that barium enema was performed in 37 patients (33.94%), many of whom arrived late to the hospital with complications requiring emergency surgical intervention. Our institution was not equipped to conduct anorectal manometry (ARM), despite it being a minimally-invasive procedure and allowing for evaluation in preemies, neonates, infants, and uncooperative patients. With the high level of sensitivity (89%) and specificity (83%), ARM should be conducted first, particularly in emergency cases. However, further confirmation from histopathology examination is still needed.

A total of 85 patients had definitive therapy, of which 31 patients (28.44%) got the Soave pull-through procedure, 40 patients (36.7%) got the Duhamel procedure, and 14 patients (12.84%) got the Swenson procedure, while 24 patients (22.01%) only got colostomy and a full-thickness rectal biopsy and were waiting for the pull-through procedure at the end of the study. Neonates diagnosed with HD got colostomy and waited for a pull-through procedure at 6–12 mos of age. However, this approach has changed considerably in the last decade: the transanal endorectal pull-through (TEPT) approach has become popular among pediatric surgeons around the world and is the most commonly performed procedure,[1] but most surgeons

seem to stick to their preferred surgical techniques.

The treatment of HD is surgically achieved by removing the intestine segment with an absence of ganglia.[7,13] This is a temporary and definitive therapy involving decompression and the performance of a colostomy in the most distal part of the colon with normal ganglion cells to eliminate the intestinal obstruction and to prevent enterocolitis.[7,9,20] The most common procedures are the Swenson, Duhamel, and Soave procedures (FIGURE 1),[7] although several other procedures (including Rebhein and State) have been described and are presently used in several treatment centers.[20,21]

The removal of the intestine lacking ganglion and the proximal ganglionated intestine by pull-through was first described by Swenson and Bill in 1948. This was followed by the depiction of retro-rectal and endorectal approaches by Duhamel and Soave. These three procedures have been widely used in surgical management and show good results and prognosis.[5,21] However, the selection is influenced by the surgeon's experience and their preferred surgical techniques.

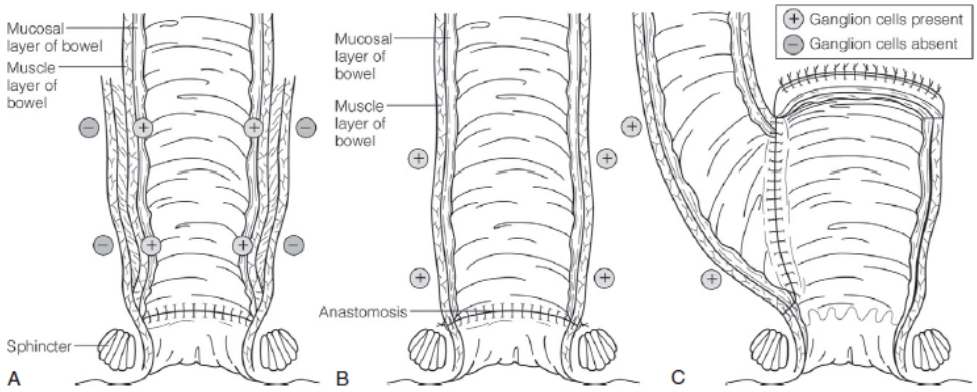

FIGURE 1. Three types of surgical techniques for Hirschsprung's disease: A. Soave. B. Swenson. C. Duhamel

CONCLUSION

HD incidence is most prevalent in male neonates, infants, toddlers, and young children. And abdominal distension and chronic constipation are recognized as the most common symptoms. All histopathology examination results showed a ganglionosis at the biopsy site, and the barium enema test showed the rectosigmoid as the most common transition zone. The definitive operative procedure performed is the pull-through procedure, particularly the Duhamel method.

ACKNOWLEDGEMENTS

The authors would like to thank to all staff from the Dr Wahidin Sudiro Husodo Hospital and Hasanuddin University Hospital, Makassar, Indonesia for the permission of using the database as the source of this study.

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