



## Original Article

## Comparison of Duhamel's Pull-Through Procedure Versus Soave's Pull Through Procedure for The Management of Hirschsprung's Disease

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## ABSTRACT

The Hirschsprung's disease is managed via surgical procedures. Mostly two different procedures are common called Soave's and Duhamel's. we compared the procedure safety and output benefits and complications rate of these two studies. **Objectives:** To find the efficacy of Soave's and Duhamel's pull-through procedure that which method is more safe and efficient for the children with Hirschsprung's disease. **Methods:** Randomized clinical trials were conducted. The sample included was consists of 60 children of less than 1 year of age up to 3 years. Sample size was calculated by world health sample size calculator for randomized control trials. With the confidence interval of 95%. Purposive sampling technique was used to collect the data. The study used paired t-test to compare the outcomes of two surgical procedures. 30 patients got Soave's procedure and 30 underwent Duhamel's procedure. Overall 54 boys and 6 girls were under study. Paired t-test were used to analyze the data. **Results:** In Soave's pull-through the 26 patients recovered without any serious complications. If we compared this to the Duhamel's procedure output the complications rate was a little high 23 patients recovered uneventfully while complications reported in 7 patients. The results of this study prove the significant findings in terms of efficiency and associated complications. **Conclusion:** In the light of above mentioned clinical trials the Soave's procedure covers less frequency of complications and cost-efficient in comparison to Duhamel's pull-through procedure in which the complications rate was significantly higher and a costly procedure.

## INTRODUCTION

Many colonic congenital abnormalities had been reported in infants and children. Anorectal malformations and Hirschsprung's disease in the most frequently diagnosed and occur with a high incidence rate. In Hirschsprung's disease there is a migration failure of neural crest cells and that result in a ganglionic colon resulting in a functional abnormality and functional obstruction of the colon. The children and infants present with hyper dilated colon and inability to contract the colon and pass the feces. The obstruction creates discomfort and pressure in colonic

walls [1]. The Hirschsprung's disease is further categorized by the length of ganglionic part of the colon. There are three possibilities. Short segments long segments and a ganglionic colon [2] This also confers the severity of illness of the disease and time of diagnosis. Although the disease is more prevalent in males than females [3]. We have found the prevalence of male to female 4: 1 in under developed countries where nutritional deficiencies in children and mothers are frequent [4]. The pull through surgical procedure is performed to treat the disease and the

procedure includes to resection of complete ganglionic part of the colon right above the dentate line and adjoining the functional part of colon so that it can perform normal functions [5]. The study and the literature focuses on the procedure of pull-through surgeries. There are comparisons of different pull through procedures. The most common techniques are called Soave's pull-through and Duhamel's pull-through procedure [6]. These two surgical procedure are commonly performed for the treatment of Hirschsprung's disease after the colostomy formation. The outcomes of these procedures are categorized on the basis of rate of constipation. [7]. The constipations rate is high in patients underwent Soave's procedure. By literature we found out that the constipation and soiling remain the most important indicator of the functional outcomes after the surgery [8]. In some studies the outcome and complications frequencies were also studied. The study we performed compare not only the functional outcomes but the frequency of the complications occur in follow-up of these patients. Also and economical comparison was also done to indicate which procedure is cost-efficient and most effective. Although the literature provides the evidences of functional outcomes defective in Soave's procedure. But there are some studies that proves no such differences [9]. The reasons for the defective outcome and high constipation rate might be due to the muscular cuff created by the rectal muscles in the Soave's procedure. The systemic analysis proves the frequency of 8 folds high of constipation in such patients [10]. The sample size is highly recommended for the comparisons of complications rate. The retrospective study forbids such large sample size. Although the frequency of HD cases are high in Pakistan and other countries [11]. But the choice of procedure sometimes depends on the availability of state which are used in Duhamel's procedure and costly. For the management of Hirschsprung's disease three traditional surgical procedures are known and have been used to lessen the extent of intraabdominal wound and injuries to the colon. Swenson, [12]. Soave and Duhamel. New surgical techniques with the aid of laparoscopy are also common these days. Pediatric surgery always intend to evaluate the age of patients. The infants tends to heal quick and better functional response after these surgical procedures there is no big difference and contraindications have been found or recorded. Some studies compare the nutritional status among patients. The nutritional status helps in improvement and healing of wound [13]. Krickbeck classifications is used by many researchers to evaluate the outcome of these surgical procedure and in study we followed the same trend. Krickbeck classification was initially used for the patients of anorectal malformation and

having colostomy formation surgeries. But later it was also modified to evaluate the functional outcome of the HD the patients who are suffering from HD do not possess any anomaly of rectal muscles [14]. And also have a normal sphincter. Vertebrae and spinal cords are also normal in these patients. Therefore the classification have different functional outcomes and rates [15]. The overall response of soiling and constipation improve after the pull-through surgery done by any way. Pediatric surgeon focuses on many symptoms of the patients starting with algorithm of soiling and eating habit. Later the rectal biopsy is done to confirm the a ganglionic part of the colon and accordingly first and second stage pull-through surgeries are done. Latest era also focuses of laparoscopic guided pull-through surgeries. The patients must be follow up for 3 to 6 months to monitor the efficacy and general output after the surgery. If any anomaly happen the patients must be evaluated accordingly.

## METHODS

A sample of 60 by world health sample size calculator for randomized control trials was calculated. With the confidence interval of 95%. Purposive sampling technique was used to collect the sample. The study used paired t-test to compare the outcomes of two surgical procedures. Soave's and Duhamel's pull-through surgeries done for the management of the Hirschsprung's disease. Randomized clinical trials were conducted to evaluate the efficacy of these procedures. The sample included was consists of 60 children up to three years of age and infants. The functional outcomes, efficacy and recovery time, post-operative issues and complications were calculated a analysis of cost effective comparison was also done. By the institutional ethical approval and consent of the parents and guardian the data from the patients was taken. A follow-up of up to 3 months was done to compare the later life and soiling issues. All the patients have confirmed the diagnosis of HD and the part of ganglionic colon was measured. The length of segment and outcome of surgery was an important indicator. Rectal biopsy was done to confirm the aganglionosis and during surgery the length was measured. Data collected included; height, weight, age clinical presentations, type of surgery or pull-through performed. Clinical findings of follow-ups and record of other surgical procedure which were done during the follow-ups. Symptoms of enterocolitis were also noted represented but the fever and abdominal cramps or episodes of pain. Total record of antibiotics were also noted which evaluated the infection rate of the surgeries. Paired t-test were used to analyze the data. Cost-analysis was also done for both procedures. Statistical evaluations were performed by running the SPSS/PC software package version 24.0 (SPSS, Inc., Chicago, IL, USA). P

values of less than 0.05 will be regarded as statistically significant. Wilcoxon paired non-parametric tests were used to compare the p values for the interventions of two groups

## RESULTS

A 30 patients got Soave's procedure and 30 underwent Duhamel's procedure discussed in table 1. Overall 54 boys and 6 girls were under study. The disease is more commonly found in males than females. With a frequency comparison of 4: 1.

Parameter	Soave pull-through n	Duhamel pull-through n	p-value
<b>Gender</b>			
Male	28	26	0.86
Female	2	4	0.14
<b>Aganglionosis type</b>			
Short-segment	21	25	0.62
Long-segment	6	4	0.34
Total aganglionosis	2	1	0.04

**Table 1:** Clinical presentations of patients of HD

Demographics of patients were also studied discussed in table 2. In HD diagnosis 36 patients were of less than 1 years of age.

Demographics	Frequency n=average
	<b>Age of HD diagnosis</b>
Less than 1 year	36
Above one year	24
<b>Age of pull-through</b>	
Soave's	0.2 to 200 months
Duhamel's	1 to 200 months

**Table 2:** Demographics of patients

In Soave's pull-through the 26 patients recovered without any serious complications. If we compared this to the Duhamel's procedure output the complications rate was a little high 23 patients recovered uneventfully while complications reported in 7 patients discussed in table 3.

Functional outcomes	Soave (n, %)	Duhamel (n, %)	p-value
Voluntary bowel movements	28/30(98)	26/30(94)	0.66
SoilingConstipation	3/30	6/30	0.12

**Table 3:** Functional outcomes of patients of HD in follow up

The Soave's pull through procedure followed mentioned complications. Cuff abscess in 1 patient managed conservatively with antibiotics. 2 patients developed strictures. Enterocolitis in 2 patients. Anastomotic leakage was not observed in any case and no additional surgery was required. Duhamel's procedure complications were as follows; Stricture is not presented in any patient. And enterocolitis in six patients. Leakage of stump 1 patient, which required diversion colostomy at transverse colon discussed in table 4.

Parameter	Soave's (n)=30	p-value	Duhamel (n)=30	p-value
Complications	4/30	0.18	7/30	0.24
Strictures	2		0	
Enterocolitis	2		6	
Anastomotic leakage	0		1	
Cuff abscess	1		0	

**Table 4:** Comparisons of complications HD patients underwent Soave and Duhamel pull-through

The rate of complications was same in both procedures. The results of this study prove the significant findings in terms of efficiency and associated complications. Another comparison was done of the surgical technique and post operative findings. Duhamel's pull through surgical time was 90 to 120 minutes on average. Soave's pull through surgical time was 100 to 150 min on average. Post-operative hospital stay was also recorded. Duhamel's pull through procedure included 5 to 6 days on average. Soave's pull through procedure included 4 to 5 days on average. Another comparison of cost, the Duhamel's procedure needed extra cost for linear staplers used while in soave's procedure the cost of surgery was less discussed in table 5.

Surgical procedure efficacy	Soave's	Duhamel's
Operative time	100-150 minutes	90-120 minutes
Hospital stay of patients	4 to 5 days	5 to 6 days
Recovery rate	high	low
Total cost	Cost efficient	costly

**Table 5:** Comparisons of surgical procedures efficacy

## DISCUSSION

We conducted the study for the comparison of two pull-through surgeries. In our study the efficacy and outcome were found more than the Duhamel's procedure but many study support the Duhamel's procedure more than laparoscopic surgeries. Kiely and colleagues evaluated the efficacy of Duhamel's procedure over laparoscopic techniques. The results come out in support of laparoscopic procedure [12]. Soave's and Duhamel's pull-through are mostly preferred for the infant surgeries for children of older age and adults Swenson's technique is more commonly used and have better results. This study evaluated the pull-through procedures for children less than 3 years of age [14]. Hirschsprung's disease early sign and symptoms help in diagnosis and treatment of this disease is done in early ages. There are some cases in which the segment of a ganglionic part of colon is smaller and the symptoms are not developed at an early age. But in later age the patients present with developing sign of dilated and obstructed colon [15]. A comparative review done to study the functional outcomes of HD by Aworanti and colleagues. The scoring grades of constipation and soiling levels were done to compare efficacy or the

surgery. The surgical techniques used under study were both Soave's and Duhamel's. but the study found no definite comparisons and difference among these two procedure [16]. Another study supports the outcome of the pull-through surgeries for the treatment of HD [17]. The main pitfall of any surgery is the introduction of infections in the body. And that is the most frequent type of complication reported and studied. The rate of infection was not dependent on the type of procedure, soave's and Duhamel. But the surgical environment and post-operative care. Our study reported no such infectious wound cases and sepsis [18]. Langley focused for the management of post-operative care for the children suffering from HD. The study aimed to find the management ways of post-operative obstruction and the solutions [19]. Trans anal and transabdominal surgeries both are common and used for the patients suffering from Hirschsprung's disease. Standard and emblem compared the functional outcomes of trans anal and transabdominal surgeries. Literature confers the pull-through surgeries are better than abdominal surgeries [20]. Some systemic review conducted in recent era impacts on the science and surgery for the management of Hirschsprung's disease. The patients have better response toward pull-through surgeries [21]. Less number of patients and lack of funds were the limitation of our study.

## CONCLUSIONS

The Soave's procedure covers less frequency of complications and cost-efficient in comparison to Duhamel's pull-through procedure in which the complications rate was significantly higher and a costly procedure. our study support the results and outcome of Soave's pull-through procedure and found it more feasible for patients and surgeons both.

## Conflicts of Interest

The authors declare no conflict of interest

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