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AN APPRAISAL TO THE FUNCTIONAL PATTERNS AND THE ROLE OF ANORECTAL MYECTOMY IN REFRACTORY IDIOPATHIC CONSTIPATION.

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Aim: *Assessment of: 1. Functional patterns in patients with refractory idiopathic constipation and its impact on treatment strategies. 2. Role of anorectal myectomy in outlet obstruction.*
Methods: *Forty patients with refractory constipation were subjected to full clinical assessment, perineometry, standard proctography, measurement of the anorectal angle, assessment of colon motility, colon transit time, and anal manometry, assessment of rectal sensation, recto anal inhibitory reflex, electromyography, and rectal biopsy. Anorectal myectomy was performed as a therapeutic and diagnostic procedure.*
Results: *Patients with normal CTT included 56.25% of children and 43.75% of adults. A significant difference was present in perineal descent between patients with delayed CTT and the control group. After anorectal myectomy, there was an overall significant fall in maximum resting anal pressure. The RAIR was present in 66.67% after anorectal myectomy. Rectal biopsy and histopathological examination revealed aganglionosis and diagnosis of ultrashort-segment Hirschsprung's disease in 31.25% with normal CTT and 16.7% with delayed CTT. 75% of patients with delayed CTT and without aganglionosis were initially improved by anorectal myectomy. Patients with ultrashort-segment were cured after anorectal myectomy.*
Conclusions: *Anorectal myectomy is successful in outlet obstruction constipation and is perfect in detection and cure of ultrashort-segment Hirschsprung's disease presenting as refractory constipation.*

Keywords: *Myectomy, Constipation.*

Abbreviations: **CTT:** *Colon Transit Time.* **RAIR:** *Recto Anal Inhibitory Reflex.*

INTRODUCTION

Constipation not responding to ordinary medical treatment or lasting for more than one month under care with no response is referred to as refractory constipation. It can have a destructive effect on self-esteem. To achieve predictable success in managing constipation, it is important that underling pathophysiologies be identified.[1,2] Outlet obstruction constipation is characterized by a failure to defecate because the pelvic floor does not relax during attempted defecation. It can be identified by electromyographic evidence of increased activity of the puborectalis or by proctogram evidence of failure to expel rectal contents, during defecation. Two, more common, reasons for outlet obstruction are ultrashort-segment Hirschsprung's disease and internal sphincter achalasia. Colonic inertia constipation is due to slow transit in the colon and can be assessed by radio-opaque transit markers and colonic motility studies. Outlet obstruction and colonic inertia may sometimes present in the same patients with constipation. Anorectal myectomy is probably therapeutically appropriate only for patients with outlet obstruction and encouraging results have been reported. Moreover, diagnostic value of this procedure was emphasized.[1,3,4]

This study was designed to: 1. Assess the pattern of colorectal motility, anorectal manometry, rectal sensitivity and rectoanal inhibitory reflex in patients with refractory idiopathic constipation and its impact on the treatment strategies. 2. Assess the diagnostic and the therapeutic role of anorectal myectomy in outlet obstruction.

PATIENTS AND METHODS

Forty patients with refractory idiopathic constipation

admitted to the Units of Pediatric Surgery and colorectal surgery, Alexandria Main University Hospital. All patients had a frequency of two or less than two stools per week, and/or with sense of incomplete evacuation, straining more than 25 % of the duration of defecation or assisted defecation either mechanical evacuation or by laxatives for at least six months.[1] All patients had been previously treated by their primary physicians or pediatricians with unsuccessful results. Patients with constipation-predominant irritable bowel syndrome were excluded from the study. Control group: Ten children and ten adult normal volunteers with completely normal bowel habits.

All patients were subjected to:

1. Thorough history taking: with special emphasis on defecation.

2. Thorough examination and colonoscopy: with a focus on perineometry; perineal descent measurement were quantified using a perineometer. On straining, the anal verge descends at least 1 to 1.5 cm in healthy people. A perineal descent of greater than 3 cm is considered abnormal (Henry et al., 1982).[5]

3. Standard proctography: to determine the anorectal angle, degree of perineal descent, anal canal length with the aid of the beaded metal chain. Anorectal angles were assessed at rest, during maximal pelvic floor contraction and during attempted defecation.

4. Assessment of colon motility, classification of the patients according to CTT: For at least two weeks prior to and during the investigation, patients were instructed to eat a high-residue diet, to use no laxatives or enemas, and to record their stool output on a calendar. Twenty-four radiopaque markers (Sitzmarks) were given on the first day. A plain abdominal film was done directly after intake to ensure swallowing of the markers. Plain abdominal x-ray supine were done after 12, 24, 48, 72, 96 and 120 hours to determine the location and extent of elimination of radiopaque markers. Markers were expected at the cecum after 12 hours, at mid-transverse colon after 24 hours, at recto-sigmoid after 36 hours and in the rectum after 48 hours. Colonic inertia can be distinguished from anorectal outlet obstruction in which the markers proceed quickly along the colon but accumulate in the rectum.[4]

5. Anal manometry: A manometry Smartlab (Sandhill Scientific Inc, USA) with pressure amplifiers was used to acquire manometry data.[3] (Fig. 1)

6. Rectal Sensation: The standard three elements of rectal sensation were measured using the rectal balloon of Schuster probe.[3]

7. Recto-anal Inhibitory Reflex: Schuster probe was used with its three inflatable balloon apparatus. The rectal balloon was inflated at 10, 20, 30, 40 & 50 cm air. Smart graph computer program (Sandhill Scientific, inc, USA) was used for measurement of latency of excitation, latency of inhibition, duration of relaxation, duration of recovery, total duration, & amplitude.[3]

8. Electromyography: of the pelvic floor was recorded using a concentric needle electrode. Single fiber electromyography was not used in this study. Electrical activity was recorded at rest, during maximal pelvic floor contraction and after attempted defecation. Electrical activity in normal subjects was always reduced during attempted defecation. If there was more electrical activity during defecation than at rest, this phenomenon was considered abnormal.

9. Anorectal myectomy:[6] it was performed in patients with outlet obstruction as a therapeutic measure. However, it has been used as a diagnostic procedure in the others. A 1 cm width of smooth muscles was excised over a length of 10 cm after marking the distal margin with a suture (2 cm above the dentate line) and was subsequently examined histologically.

10. Biopsy and histopathological examination: Noblett's suction or full thickness rectal biopsy was taken 2 cm above the dentate line .

11. Follow up: Range of follow up was 6-28 months. Manometric examination and proctograms were performed 6 months after operation. Patients were classified into two groups: a 'good results' group in which patients were able to defecate spontaneously more than 3 times a week after operation and the remainder with 'poor results' who were unable to defecate spontaneously more than 3 times a week.

Statistical Analysis:

The Statistical Package for Social Sciences (SPSS) was utilized for statistical analysis and tabulation. The level of significance selected for this study was P less than or equal to 0.05.

RESULTS

The children patients included sixteen males (80%) and four females (20%) with a mean age of 4.60 ± 2.09 years. The children control group consisted of seven males (70 %) and three females (30 %) with a mean age of 4.24 ± 1.21 years. The adult patients included three males (15%) and seventeen females (75%) with a mean age of 42.62 ± 11.33 years. The adult control group consisted of two males (20 %) and eight females (80 %) with a mean age of 29.1 ± 13.42 years.

Colon Transit Time (CTT): The patients were classified

according to the CTT into; 1. Normal CTT group (40%): in which CTT was normal but markers accumulated and retained in the rectum (outlet obstruction). It included nine children (56.25%) and seven adults (43.75%). 2. Delayed CTT group (60%): Colon inertia included eleven children (45.83%) and thirteen adults (54.17%). Arrest of markers was at descending colon in 20.83%, at mid-transverse colon in 4.17%, at splenic flexure in 4.17%, and at recto-sigmoid colon in 70.83%. Table 1,2 & (Fig. 2)

Perineometry: The mean descent of perineum in normal CTT group was 1.55 ± 0.34 cm while in delayed CTT group was 1.21 ± 0.39 cm. The mean descent of perineum in the control group was 1.36 ± 0.29 cm. A significant difference was present between delayed CTT group and the control group.

Standard proctography: The mean anorectal angles during rest, maximum pelvic floor contraction and during attempted defecation were 86.9 ± 16.8, 82.3 ±14.3 and 114.1 ±13.0 before anorectal myectomy. After anorectal myectomy, the mean anorectal angles were 90.7 ± 20.2, 89.4 ±15.9 and 121.6 ±9.3. The difference was statistically significant.

Anal manometric study: Anal manometric patterns of both groups are shown in Table 3. After anorectal myectomy, there was an overall significant fall in maximum resting anal pressure from 77.6 ±10.2 to 58.6 ± 20.5 cmH20 (P<0-05). Maximum squeeze pressure did not change significantly after operation or in either of the groups.

Rectal sensation: Rectal sensation patterns of both groups are shown in Table 1. The sensation threshold, urge pressure and maximum tolerable volume in delayed CTT group were significantly higher than that in normal CTT group and the control groups. Overall, the threshold volume, constant sensation and maximum tolerable volume did not change significantly after anorectal myectomy or between groups of good and bad results.

Rectoanal Inhibitory Reflex: Patterns of all parameters of rectoanal inhibitory reflex in both groups are illustrated in Tables 4,5. On calculating the amplitude of the reflex, by using the equation "Amplitude = RAP – Max Inhibition"(14) and at 50 cc air rectal distension, delayed CTT group were found to have an amplitude which was significantly lower than that of normal CTT group and the control group. Normal CTT group had amplitude of the reflex that was significantly shorter than that of the control group. Absence of the recto-anal inhibitory reflex was not diagnostic of ultrashort-segment Hirschsprung's disease since the reflex was present in three cases with ultrashort-segment Hirschsprung's disease and absent in two cases with normal histology.

Electromyography: Electrical activity in control group was always reduced during attempted defecation. Increased electrical activity of the puborectalis muscle during attempted defecation was detected in 68.75 % with normal CTT and 70.83% with delayed CTT. Pure colon inertia without outlet obstruction was detected by exclusion (normal standard proctography and electromyography) in three cases with delayed CTT (12.5%). 70.37% of them were in the good results group and 29.63% in the group having a poor result.

Rectal biopsy and histopathological examination: revealed aganglionosis and diagnosis of ultrashort-segment Hirschsprung's disease in five patients with normal CTT (31.25%) and four patients with delayed CTT (19.05%).

Anorectal myectomy: Aganglionosis affecting a variable length of the specimen was diagnosed via anorectal myectomy in nine patients (22.5%). In all of these patients, symptoms were improved markedly by anorectal myectomy. Furthermore, seven (63.64%) of patients with normal CTT and without aganglionosis together with twelve (75%) of patients with delayed CTT and without aganglionosis, were initially improved by anorectal myectomy and more prolonged follow-up indicated that these early results were uniformly maintained. Table 6.

Clinical outcome of constipation: After anorectal myectomy, 70% of patients (42.86% with normal CTT & 57.14% with delayed CTT) achieved a good result with a mean bowel frequency of 21.8 times a month. Poor results patients, 30% (33.33% with normal CTT & 66.67% with delayed CTT) had mean bowel frequency of 4.3 ± 1.3 times a month (P < 0-005). There was no significant difference in mean age between the two groups.

Follow up: An intersphincteric abscess developed postoperatively in two patients, but in each case, the sepsis resolved conservatively without functional impairment of continence. Three patients have had transient incontinence of flatus after surgery, but there was one patient, who had some persistent minor fecal incontinence. There was no recurrence of constipation in the patients who achieved a good result after myectomy during a follow up between 6 and 28 months. Three patients with pure colon inertia (without outlet obstruction) were treated by colectomy with satisfactory postoperative and follow up results, they had good continence despite myectomy. Four patients with normal ganlionic biopsy and normal CTT who did not improved after myectomy were treated by biofeedback with accepted results. One patient with delayed CTT had whole colon inertia and outlet obstruction, and did not respond to myectomy. Colectomy and low anterior resection was carried out for him with satisfactory results of follow up. Left hemicolectomy with low anterior resection was performed in four cases with delayed CTT who had left colon or recto-sigmoid inertia and outlet obstruction evidenced by electromyography and standard proctography, and did not respond to myectomy. Their

response and follow up was very good.

Table 1. Mean colon transit time in control group (hour ± SD).

Gender	Right colon	Left colon	Rectosigmoid	Total colon
Male (n=9)	8.9±1.1	8.7±1.5	13.0±1.7	30.7±3.0
Female (n=11)	13.3±1.6	13.7±3.1	11.8±1.6	38.8±2.9

Table 2. Mean colon transit time in patients with constipation (hour ± SD).

Patient	Right colon	Left colon	Rectosigmoid	Total colon
Normal CTT	15.6±4.7	21.0±5.9	24.6±7.4	167.0±10.6
Colon inertia	73.4±9.2	60.9±9.2	32.6±6.9	137.6±15.0
Outlet obstruction	18.5±5.3	38.2±9.0	8.9±17.8	61.0±9.8

Table 3. Anal manometric patterns and rectal sensation in the studied patients.

	Patients		Control (n=20)	F test
	Normal CCT (n=25)	Delayed CCT (n=15)		
RAP (mm Hg)				
Min. – Max.	32 - 89	56 - 74	58 - 81	1.7569
Mean + SD	68.16 ± 14	67 ± 2.98	66.7 ± 4.33	
VSI (RAP)				
Min - Max	0.63 - 0.79	0.55 - 0.78	0.65 - 0.98	2.1587
Mean ± SD	0.71 ± 0.05	0.74 ± 0.15	0.77 ± 0.02	
MSP				
Min - Max	88 - 137	99 - 244	93 - 132	0.0558
Mean ± SD	119 ± 8.9	174.3 ± 33.5	114.21 ±7.1	#,*
VSI (MSP)				
Min - Max	0.63 - 0.87	0.71 – 0.99	0.71 - 0.80	1.3246
Mean ± SD	0.68 ± 0.12	0.78 ± 0.1	0.74 ± 0.1	
Highest mean resting pressure point (mm Hg) :				
Min - Max	118 - 198	90 - 185	113 - 179	0.3543
Mean ± SD	153.14 ±30.1	146.65 ± 29.2	144.7±20.1	
Distance from the anal verge (cm):				
Min - Max	1.6 – 2.3	1.3 – 2.9	1.1 – 3.2	0.0775
Mean ± SD	1.83 ± 0.02	1.74 ± 0.5	1.87 ± 0.13	
Rectal sensation threshold (cc air)				
Min. – Max.	15.00 – 65.00	16.00 – 82.00	10.00 – 50.00	4.786*
Mean + SD	47.26 + 17.65	52.16 + 19.54	41.15 + 4.65	
Urge				
Min - Max	119 - 157	112 - 298	122 - 138	3.4536
Mean ± SD	133.12±5.13	177.54±69.21	127.3±9.54	#,*
Max. Tolerable vol.				
Min - Max	200 - 450	250 - 600	200 - 250	8.8543
Mean ± SD	290.55±51.11	386.23±21.21	224 ±13.77	#,*

* Significant difference between groups.
# Significant difference between group of delayed CTT & control group.

Table 4. Durations of RAIR in the studied patients (seconds).

Parameters of RAIR	Patients		Control (n=20)	F test
	Normal CCT (n=25)	Delayed CCT (n=15)		
Duration of relaxation:				
- At 10: Min - Max	1.8 - 5.9	2.3 - 4.4	2 - 5.3	$X^2_2 = 0.3733$
Mean ± SD	3.42 ± 1.3	3.62 ±0.99	3.8 ± 1.16	
- At 20: Min - Max	2.9 - 6.7	2.4 - 6.2	2.3 - 6.1	0.9764
Mean ± SD	4.21 ±1.09	4.37 ±1.12	4.87 ± 122	
- At 30: Min - Max	3.3 - 7.1	2.3 - 5.2	4.7 - 6.6	3.6521
Mean ± SD	4.73 ±1.21	4.4 ± 1.05	5.61 ± 0.77	
- At 40: Min - Max	3.1 - 9.5	3.2 - 9.9	4.8 - 8	0.784
Mean ± SD	5.38 ±1.99	5.83 ±2.16	6.26 ± 1.18	
- At 50: Min - Max	3.9 - 10.2	3.4 - 10.7	5.8 - 8	0.3658
Mean ± SD	6.38 ±1.75	6.10 ±2.66	6.76 ± 0.91	
Duration of recovery:				
- At 10: Min - Max	5.2 - 9.3	4.3 - 10.4	4.8 - 11.7	2.7685
Mean ± SD	6.73±1.63	6.06 ±1.87	8.2 ± 2.9	#
- At 20: Min - Max	7.0 - 9.9	6.6 - 13.6	8 - 13.7	5.8634
Mean ± SD	8.3 ± 1.43	7.26 ±2.12	11.12 ± 2.07	#
- At 30: Min - Max	7.2 - 13.4	5.8 – 16	9.3 - 16.5	2.2331
Mean ± SD	10.1±□□□9	□□□□±3.12	12.65 ±2.46	#
- At 40: Min - Max	8.6 - 18.5	5.3 - 16	10.3 - 16.9	0.9123
Mean ± SD	13.23±3.97	10.38±1.76	13.85 ± 2.37	#
- At 50: Min - Max	8.8 - 20.6	6.2 - 17.5	9.9 - 18.4	0.1267
Mean ± SD	13.66 ±4.46	11.08±2.91	13.73 ± 3.12	#
Total duration of RAIR:				
- At 10: Min - Max	7.3 - 14.2	6.2 - 15.6	7 - 17	1.8254
Mean ± SD	10.27±2.55	9.38 ±2.99	11.9 ± 3.76	#
- At 20: Min - Max	8.6 – 15.7	9.8 - 19.6	10.7 - 18.4	4.5178
Mean ± SD	12.61 ± 2.3	11.52 ± 2.88	15.99 ± 2.78	#
- At 30: Min - Max	3.6 - 18.5	10.4 - 20.3	14 - 21.5	4.2113
Mean ± SD	15.18±5.20	14.06±3.54	18.26 ±2.62	#
- At 40: Min - Max	12.3 - 26.4	9.4 - 22.1	15.3 - 23	1.0768
Mean ± SD	19.06±5.74	16.95±3.65	19.11 ± 2.92	#
- At 50: Min - Max	12.4 - 27.6	10.4 – 24.12	16.5 - 25.4	0.3325
Mean ± SD	20.07 ± 7.21	17.42±3.98	20.67 ± 3.37	#

Significant difference between group of delayed CTT & control group.

Table 5. Amplitude and latency of RAIR in the studied patients.

Parameters of RAIR	Patients		Control (n=20)	F test
	Normal CCT (n=25)	Delayed CCT (n=15)		
Latency of Excitation:				
- At 10: Min - Max	0.5 - 0.5	---	---	---
Mean ± SD	0.5 ± 0.0			
- At 20: Min - Max	0.5 - 0.7	---	0.5 - 0.5	1.0
Mean ± SD	0.6 ± 0.14		0.5 ± 0	
- At 30: Min - Max	0.0 - 0.7	0.4 - 0.5	0.5 - 0.9	0.6686
Mean ± SD	0.46 ±0.21	0.45 ±0.07	0.58 ±0.18	
- At 40: Min - Max	0.5 - 0.7	0.3 - 0.5	0.5 - 0.9	1.9482
Mean ± SD	0.53 ±0.08	0.4 ± 0.1	0.56 ±0.15	
- At 50: Min - Max	0.5 - 0.7	0.3 - 0.5	0.5 - 1.0	1.7219
Mean ± SD	0.53 ±0.07	0.4 ± 0.1	0.57 ±0.19	
Latency of Inhibition:				
- At 10: Min - Max	1.4 - 3.1	1.9 - 3.3	1.4 - 2.8	3.093
Mean ± SD	2.21 ±0.45	2.76 ±0.49	2.3 ± 0.52	
- At 20: Min - Max	1.4 - 3.1	1.9 - 3.3	1.4 - 3.3	1.1049
Mean ± SD	2.38 ±0.49	2.76 ±0.49	2.58 ± 0.67	
- At 30: Min - Max	1.9 - 3.8	2.4 - 3.8	1.4 - 3.3	0.9988
Mean ± SD	2.63 ±0.61	3.04 ± 0.6	2.77 ± 0.65	
- At 40: Min - Max	1.9 - 3.8	2.4 - 3.8	1.4 - 3.3	0.5831
Mean ± SD	2.82 ±0.72	3.1 ± 0.54	2.77 ± 0.65	
- At 50: Min - Max	1.9 - 3.8	2.8 - 3.8	1.4 - 3.3	0.8646
Mean ± SD	2.88 ±0.72	3.23 ±0.53	2.82 ± 0.67	
Amplitude (mm Hg.):				
- At 10: Min - Max	2.4 - 18.3	1.4 - 8.9 4.25 ±2.52	3.3 - 27.6	5.2191
Mean ± SD	8.49 ±5.23		11.79 ± 3.3	#,*
- At 20: Min - Max	4.1 - 15.5	2.6 - 9.8	7.0 - 29.2	9.9828
Mean ± SD	10.27 ±4.1	7.19 ±1.95	15.21 ±8.31	#,*
- At 30: Min - Max	0.7 - 25.4	4.2 - 13	6.0 - 38	5.0333
Mean ± SD	8.41 ±8.41	7.99 ±2.87	16.77 ±9.49	#,*
- At 40: Min - Max	2.4 - 30.8	5 - 12.7	6.3 - 33	4.0165
Mean ± SD	11.89±9.63	9.71 ±2.67	17.79 ±8.37	#,*
- At 50: Min - Max	3.4 - 26.9	5.7 - 16.4	8.7 - 38.5	4.5296
Mean ± SD	14.71±9.37	12.78±3.56	21.48 ±9.61	#,*

Significant difference between group of normal CTT & control group.
* Significant difference between groups.

Table 6. Treatment strategy and outcome after myectomy.

	Normal CTT		Delayed CTT	
	N=16	%	N=24	%
Anorectal myectomy:				
Aganglionic biopsy	5/9	55.56	4/9	44.44
Improved	5/5	100	4/4	100
Not improved	0	0	0	0
Ganglionic biopsy	11/31	35.48	20/31	64.52
Improved	7/11	63.64	12/20	60
Not improved	4/11	36.36	8/20	40
Colectomy	0	0	8/8	100
Conservative	4	100	0/8	0
Total	16	100	24	100

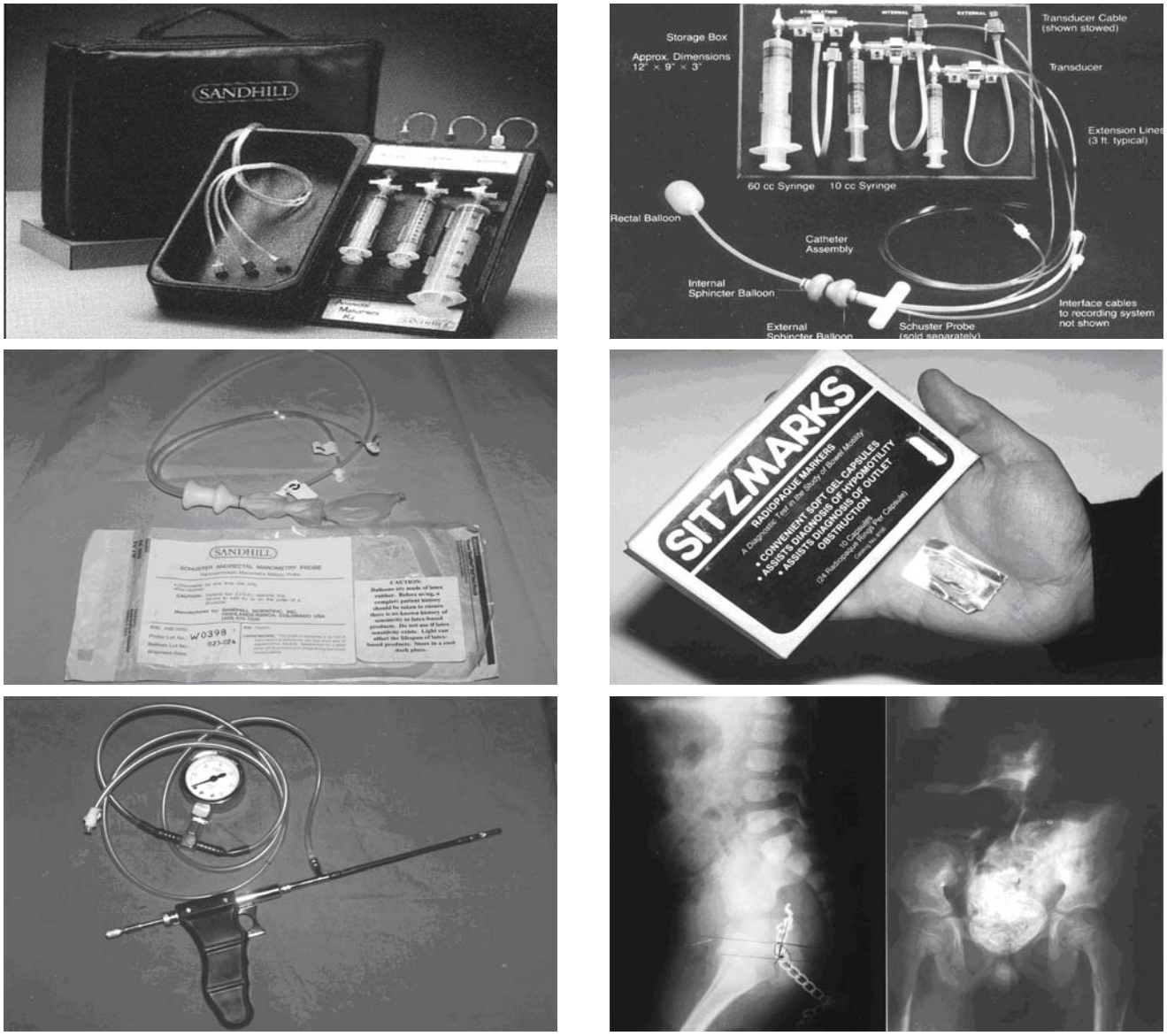
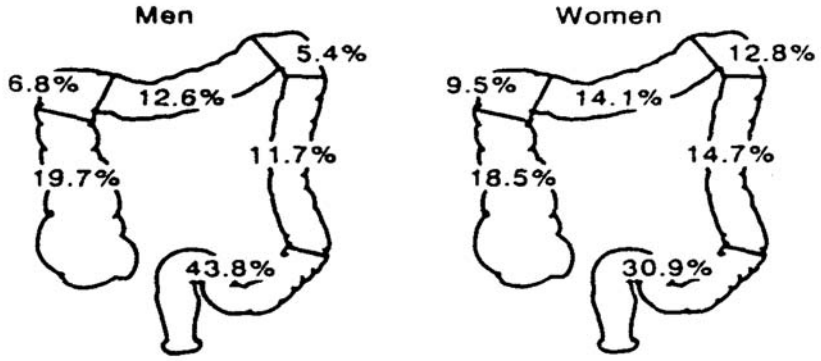


Fig 1. Upper left: Sandhill manometry kit.
Upper right: Anal manometry kit.
Middle left: Schuster anorectal manometry probe (Sandhill Scien. Inc.).
Middle right: Sitzmarks gelatinous capsules (Konsyl Pharma. Int.).
Lower left: Noblett's suction rectal biopsy device (Noblett HR 1969).
Lower middle: Standard proctography; Measurements of the anorectal angle, anal canal length and degree of perineal descent.
Lower right: CTT study (anterior view) on the 5th day showing outlet obstruction.



Mean colonic transit = 30.7 ±3.0 h ***Mean colonic transit = 38.8 ±2.9 h***

Fig 2. Proportion of total colonic transit time spent in cecum and ascending colon, hepatic flexure, transverse colon. splenic flexure, descending colon, sigmoid colon, and rectum in 20 normal subjects.

DISCUSSION

Refractory constipation is a tremendous challenge to the patient, family, physician and surgeon. Evaluation and management may be difficult and extensive. Anorectal myectomy was first described for the diagnosis and treatment of short-segment Hirschsprung's disease.[6] Martelli et al.,[2] introduced anorectal myectomy as a surgical option for the treatment of idiopathic constipation. Results in patients with anorectal outlet obstruction were spectacular.

In this study, there was no age delineation. Similar results were obtained by Martelli et al.[2] and Wald A.[7] Incidence of refractory constipation was more in males in children and more in females in adults. Other studies showed no sex delineation. The family history was positive in 17.5%, which is similar to Simpson's study (20%).[8] This is explained on the basis that siblings of one family share the same etiologic factors.

When constipation is managed in terms of results of colonic transit time and anorectal manometric studies, better results were obtained.[4] Based on the results of this study, colon transit time is a major step in the evaluation of refractory constipation. It was helpful in determination of pathophysiology and line of treatment, but alone it cannot predict the therapeutic decision or the outcome. The study of anorectal pressures and reflexes assists in diagnosing the etiology and so selecting candidates for operative treatment. Standard proctography and electromyography detected outlet obstruction in most of patients and excluded outlet obstruction in three cases with pure colon inertia.

In this study anorectal myectomy revealed aganglionosis and diagnosis of ultrashort-segment Hirschsprung's disease in 31.255% of patients with normal CTT (5/16) and 16.7% of patients with delayed CTT (4/24). Clayden et al[9] had studied 106 patients with refractory constipation, 9% were shown to have aganglionosis. Martelli et al.[2] reported 62 adult patients who had an anorectal myectomy, only 14 patients (23 per cent) had aganglionosis. Biopsy specimens were examined 2 cm above the dentate line, as recommended by Aldridge and Campbell,[10] who demonstrated a normal hypoganglionic zone. This hypoganglionic zone extends proximally from the dentate line an average of 4mm in the myenteric plexus, 7mm in the deep submucous plexus, and 10mm in the superficial submucous plexus. This study revealed improvement after myectomy in 63.64% of normal CTT without aganglionosis and in 60% of those with delayed CTT without aganglionosis. This can be explained by the therapeutic effect of myectomy in cases of normal CTT with internal sphincter achalasia or pelvic floor paradox while in cases of delayed CTT, myectomy improved those with colon inertia were secondary to outlet obstruction.

In this study, eight patients with colon inertia were treated by colectomy with satisfactory postoperative and follow up results. The precise pathogenesis of slow transit constipation has not been determined. The resting anal sphincter pressure, the rectoanal inhibitory reflex, and the rectal capacity are usually normal. The persistent symptoms following colectomy (bloating, anorexia & pain) might be derived from small bowel involvement masked by the predominant symptom of constipation, becoming apparent only after the colon has been resected.[11] Therefore, examining the esophageal, stomach and small bowel motility before colectomy for slow

transit constipation might be advisable.

In this study, anorectal myectomy improved symptoms markedly in 70% of cases. Nissan et al.[6] performed 11 cases of anorectal myectomy and symptoms disappeared following operation. In our study, the 10cm-long myectomy was associated with a significant reduction in maximum resting anal pressure. Anal dilatation can result in a sustained reduction in maximum resting anal pressure.[12] Taylor and others[13] found that anal dilatation did improve symptoms in some patients with obstructed defecation. We recommend the use of anorectal myectomy instead of anal dilatation, in patients with outlet obstruction for its diagnostic role and controlled therapeutic effect. Moreover, anal dilatation is hazardous and causes uncontrolled damage to anal sphincters.

Based on the results of this study, it can be concluded that Refractory constipation is a problem for which a standardized plan of management is necessary. No single study is pathogenomonic or a guarantee for successful outcome; therefore, diagnosis of functional disorders underlying refractory constipation must be based on collective interpretation of several studies. There is a high frequency of normal colonic transit in patients with refractory constipation. Not all patients with delayed CTT have a sort of colonic inertia. Most of patients with delayed CTT have pelvic outlet obstruction. Only few patients show pure colonic inertia with no detectable abnormality in defecation dynamics. The indications for surgery are based on colonic function and/or abnormalities detected with anorectal manometry and pelvic floor studies. Anorectal myectomy is perfect in detection and cure of ultrashort-segment Hirschsprung's disease presenting as refractory constipation. Anorectal myectomy is successful in outlet obstruction constipation as it improves mean colon transit, mean bowel habits, defecopathy and decreases the maximum resting anal pressure. No recurrence of constipation after myectomy during a follow up between 6 and 28 months, but long-term follow-up might be recommended to ensure that these early results are maintained. Colectomy is an ultimate option for colon inertia and outlet obstruction cases refractory to myectomy. A prospective randomized study with a long-term follow-up is recommended. Further studies are required to highlight the hidden problems that may be responsible for refractory constipation. A prospective study of the role of gastrointestinal hormones is recommended.

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