

APPRAISAL OF THE CLINICAL OUTCOME AND ANORECTAL FUNCTION AFTER POSTERIOR SAGITTAL ANORECTOPLASTY FOR HIGH ANORECTAL MALFORMATIONS: A PROSPECTIVE COMPARATIVE STUDY OF ONE-STAGE VS. MULTISTAGE PROCEDURE.

By

Mohammed Abdel-Salam Shehata MD & Saber M. Waheeb MD.

Department of Surgery, Faculty of Medicine, University of Alexandria.

Background: PSARP procedure is claimed to have a better chance of enabling normal continence in later years. Questions have arisen regarding whether PSARP is superior to other repair methods.

Objective: This study was designed to analyze quantitatively the clinical, manometric and functional results of PSARP and to compare the results of one stage PSARP with the multistage PSARP.

Patients: A prospective study of eighty patients with high anorectal malformation who were selected out of 193 cases admitted in the period from June 1997 to March 2000 to the Main Alexandria University Hospital.

Methods: Twenty patients were selected at random for the one-stage PSARP (Group I). Multistage PSARP were carried out for the remaining sixty patients (Group II). All patients were assessed by electrostimulation, MRI, manometry, and FCS. Prospective follow up recorded the efficacy of PSARP, the clinical and the functional outcome together with complications. All patients were followed up for a period that ranged from three years to six years with a mean of 4.52 ± 0.63 years.

Results: Electrostimulation revealed that in only 49 patients (61.25%), the new anal site was found to be central within the muscle complex. 43.75% were continent with good FCS. 28.75% were intermittently continent. 27.5% had involuntary passage of stools at least once a day. One stage operation resulted in a much more superior FCS than the multistage procedure with highly significant difference in the good FCS and poor FCS cases. RAP was < 40 cm H₂O in patients complaining of soiling. All continent patients showed MSP > 135 cm H₂O. There was no clear correlation between RV and soiling, but patients with severe soiling had an RV > 150 mL. 76.25% showed a rectal sensation "urge to go". 36.25% showed a normal RAIR. Results of MRI correlated well with FCS and electrostimulation. Eleven patients had postoperative complications.

Conclusion: PSARP allows preservation of the anatomy of pelvic floor muscles and limits affection of fecal continence. One stage PSARP is a safe effective procedure which gives the superior results in treatment of patients with high Anorectal malformations. It minimizes postoperative complications, colostomy drawbacks, costs, hospital stay and psychological problems.

INTRODUCTION

BEFORE Peña and De Vries (1982)⁽¹⁾ introduced the posterior midsagittal approach for anorecto-plasty (PSARP) of anorectal malformations, the major concern of surgeons had been how to position the rectum in an anatomically normal position without damage to the voluntary muscles.⁽¹⁻³⁾ Although PSARP has been enthusiastically adopted over previous techniques, there are few careful long term follow-up studies,⁽⁴⁻⁶⁾ and questions have arisen

regarding whether PSARP is superior to other repair methods.⁽⁷⁾

Recently, several surgeons⁽⁸⁾ have paid attention to the internal anal sphincter during operations on anorectal malformations. Is it possible to maintain normal continence without the internal anal sphincter? We were unable, however, to find any experimental study designed to estimate in an objective way the potential harm that PSARP

could have on normal bowel function.

David PB⁽⁹⁾ reported that the most important part of the care of imperforate anus in the newborn is to do the operative repair within the first 7 days of life, without a prior colostomy, because of the very narrow window of opportunity for the development of normal "activity-driven" anocortical neurocircuitry.

To resolve contradictions and to establish the actual degree of continence in patients with a high anorectal malformation corrected by PSARP, this study was designed to: 1. Analyze quantitatively the clinical, manometric and functional results of PSARP. 2. Compare the results of one stage PSARP with the multistage PSARP to evaluate the effect of the development of normal "activity-driven" anocortical neurocircuitry.

PATIENTS AND METHODS

A prospective study of eighty patients with high anorectal malformation who were selected randomly out of 193 cases admitted in the period from June 1997 to March 2000 to the Unit of Pediatric Surgery and the Unit of Colon and Rectal Surgery: Alexandria Main University Hospital. This established a minimum follow-up period of 4 years (to allow sufficient age for toilet training). This study did not include females with recto-vestibular fistula, cases associated with tethered cord or other spinal cord abnormalities that may affect their continence, cases with major sacral malformations or recurrent cases. An informed consent was obtained from each patient's parents. The study protocol was registered and approved by the committee of Postgraduate Studies and Medical Research, Faculty of Medicine, University of Alexandria. Patients with advanced disease or previous history of surgical intervention were excluded from the study.

Twenty patients, out of the eighty patients of this study, were selected at random for the one-stage PSARP (Group I). Multistage PSARP were carried out for the remaining sixty patients (Group II). All patients of this study were subjected to the following:

1. *Thorough clinical evaluation:* Full clinical history and complete systemic examination with special stress on pelvis and abdomen.
2. *Routine laboratory investigations.*
3. *Colostomy:* Transverse colostomy was carried out, in group II patients, within 72 hours after birth.
4. *Preoperative electrostimulation:* The first electrostimulation was carried out, under general anesthesia, at the time that the

colostomy was made in group II patients and at the time of operation in group I patients by using the Peña muscle stimulator. The perineum was electrostimulated in order to determine the quality and quantity of the pelvic floor muscles. The quality was expressed in mAmp required for minimal contraction of the pelvic floor muscles; the quantity described the area (mm²) of contracting pelvic floor muscle.

5. *Preoperative radiological evaluation:* With special focus on fistula location and sacrum abnormalities. Plain x-ray chest, abdomen and pelvis. Distal loopogram with gastrografin through the colostomy. M.R.I was done for visualization of the anatomy of the pelvis with its good identification of muscles, fat, and different structures that are less sharply clarified by the other radiological tools and for detection, visualization and assessment of associated fistula.
6. *Preoperative preparation:* A venous line is established. General anesthesia is carried out with endotracheal intubation. The stomach is aspirated and vitamin K is administered. A urethral catheter is placed. Patients are positioned in the Jack-knife position with a pillow under the groin, and another smaller one beneath the chest.
7. *Operative procedures:* PSARP was performed as described by Peña and De Vries⁽¹⁾ with one modification: the neoanorectum was not narrowed dorsally, but ventrally (Fig. 1).
8. *Postoperative management:* Immediate postoperative management emphasizes the immediate postoperative care of the patient, wound care and record of any postoperative morbidity. Postoperative anal dilatation: Three weeks after operation careful calibration and dilation of the neoanus was begun. This usually started with a size 6 Hegar dilator and gradually increased to a size 12. When a Hegar size 12 dilator could be inserted without difficulty (usually within one year), a contrast radiograph (defecogram) was done to assess whether the neoanorectum lay at a satisfactory angle, i.e., whether it maintained a normal position in relation to the muscles of the pelvic floor. If so, the colostomy was closed. Postoperative electrostimulation: Electrostimulation was repeated after PSARP at the time of colostomy closure in group II patients and after one year in group I patients. The stimulator was applied to

the perineum around the site of the new anal orifice. The results of the post-PSARP electrostimulation were compared with those of the pre-PSARP electrostimulation. Thus, it could be established whether the quality and quality of the pelvic floor muscles had been impaired as a result of the PSARP. Postoperative MRI evaluation: To assess the development of the muscle complex and its relationship to the anorectum. To correlate the results of postoperative MRI with the clinical findings. To detect postoperative complications and fistula recurrence. Postoperative manometry: Pressures were recorded using Smart Lab (Sandhill Scientific, Inc., Denver, Colorado) with pressure amplifiers. The data were analyzed by Anal graph® computer software (Sandhill Scientific, Inc., Denver, Colorado). Inhibitory reflex and urge sensation were recorded using a rectal balloon, size Ch 8 and volume 10 mL for children under the age of 1 year, and size Ch 12 and volume 60 mL for older children.^(11,12) Postoperative assessment of continence: Children under the age of 4 years were considered not to have completed toilet training, whereas older children were expected to be continent to the same degree as children of the same age without an anorectal malformation. The patients and their parents were interviewed, and continence was assessed by: 1. A telephone questionnaire (Table I) to collect data regarding the use of anal dilation after both PSARP and colostomy closure and for assessment of continence. 2. Fecal continence score (PCS),⁽²⁰⁾ for each patient to evaluate continence quantitatively. Follow-up: Prospective follow up recorded the efficacy of PSARP, the clinical and the functional outcome together with complications. All patients were followed up for a period that ranged from three years to six years with a mean of 4.52 ± 0.63 years, the patients were followed-up at one month then every three months till one year, then every six months afterwards. Statistical Analysis: The Statistical Package for Social Sciences (SPSS) was utilized for statistical analysis and tabulation. Mean, standard deviation, and median were calculated. Chi-square test was used as a test of significance for comparison of distribution of qualitative variables between the study groups. Whenever Chi-square test is not appropriate, Fischer-exact test was used. For comparison of mean and standard deviation, t-test was used. Mann-Whitney test was used whenever t-test is not appropriate. 5% level was used as level of significance in any statistically significant test

used in this study.

RESULTS

Out of the eighty patients of this study, 11 patients were females (13.75%) and 69 were males (86.25%). The mean patient age at the time of follow up was 5.3 years (range, 4 to 7 years). Seventeen patients presented without fistula, 3 females & 14 males (21.25%), while in sixty-three patients a fistula was detected, 8 females & fifty-five males (78.75%) (Table III).

Out of the 60 patients of group II, 43 have had their colostomy closed following a defecogram that showed a satisfactory anatomical result with a good anorectal angle.

Electrostimulation: On comparison of pre-PSARP and post-PSARP electrostimulation of the perineum; there was little change from the values recorded preoperatively, indicating that the PSARP had not caused loss of pelvic musculature. In 49 patients (61.25%), the new anal site was found to be central within the muscle complex which showed variable degrees of contractility. On correlation with these patients' FCS, 35 patients showed good FCS and 14 patients showed fair FCS. In 15 patients (18.75%), the new anal site was found to be anterior to the point of maximum muscle complex contraction. On correlation with these patients' FCS, 4 patients showed fair FCS and 11 patients showed poor FCS. In 12 patients (15%), the new anal site was found to be posterior to the point of maximum muscle complex contraction. On correlation with these patients' FCS, 5 patients showed fair FCS and 7 patients showed poor FCS. In 4 cases (5%), the elicited muscle complex contraction was very weak and any point of maximum contraction could not be identified.

Telephone Survey: Of the 80 patients (69 males, 11 females), 74 (92.5%) were successfully contacted to complete the telephone questionnaire. Toilet training for bowel continence was successful in 33 patients (44.59%) and occasionally successful in 31 (41.89%), but 10 patients (13.52%) had no awareness of impending stool. Soiling accidents never or rarely occurred in 18 patients (24.32%); however 37 patients (50.00%) had < 3 accidents per week, and 19 (25.68%) had >3 accidents per week, with 17 of these patients (22.97%) involuntarily stooling once a day. Eighteen patients (24.32%) had required previous visits to their physician for constipation. Sixty-nine patients (93.24%) were physically active, but 23 (31.08%) had social problems related to offending odor. The parents of 41 patients (55.41%) felt that the birth anomaly had adversely affected their child's emotional behavior.

Fecal continence: Out of the eighty patients operated upon by PSARP, thirty-five patients (43.75%) were continent with good FCS. However, seven of these had one

or two minor soiling episode a week; another one had occasional smearing when her stools are loose. Twenty-three patients (28.75%) were intermittently continent; they had periods of complete continence, but frequently had fecal soiling, which they describe as an inconvenient experience. Stress and certain foods might cause involuntary passage of stools. The parents reported that the defecation pattern of their child with a corrected anorectal malformation was strikingly different from that of the other children in their family. Twenty-two patients (27.5%) have involuntary passage of stools at least once a day, requiring them to change their underclothes. Twenty of these patients had pseudo-continence with the aid of an enema regimen. The enema (120 mL) was used once a day to evacuate the distal large bowel, enabling the patient to remain clean for the rest of the day. On comparing the results of fecal continence score after one stage PSARP versus multistage PSARP (Table IV), it was found that one stage operation resulted in a much more superior FCS than the multistage procedure with highly significant difference in the good FCS and poor FCS cases, ($P = 0.004$ & 0.001 respectively). Fair FCS patients, also, showed a statistical difference, ($p = 0.02$).

The mean FCS for the entire study group was 3.0 ± 1.4 . No improvement in FCS was demonstrated with increasing age or increase in time since the operation. The fecal continence score was evaluated for various subgroups of patients as denoted by fistula anatomy, and use of diet modifications, medications, or enemas (Table V). No statistically significant differences were observed in any of these analyses. No difference in FCS was demonstrated when patients with long-term follow-up were compared with those who had short follow-up.

Patient Diaries: Prospective continence data were documented in diaries from 39 of the 80 patients/families (48.75%). Day and night time voluntary and involuntary stooling data were used to calculate percent continence for the 7-day period. Thirty-five of the 39 patients (89.74%) could accomplish voluntary bowel movements; the mean number of voluntary bowel movements per day was 1.1 ± 0.8 . Defining percent continence, as the number of voluntary bowel-movements per total stooling episodes (excluding smears), the mean was $70.7\% \pm 33.4\%$. Sixteen patients (41.01%) had no major stooling accidents in the 7-day period, and 26 (66.67%) had no smear accidents. The FCS determined by telephone questionnaire data, (subjective), was correlated with the percentage of continence calculated from the patient prospective diary data, (objective), and demonstrated a positive correlation ($r = 0.44$, $P = 0.08$).

Anorectal manometry

Resting Anal Pressure (RAP): The mean RAP for the

whole studied patients was 47.69 ± 10.64 cm H₂O which is reduced by approximately 27% if compared with the normal⁽¹¹⁾ (64.9 ± 11.90 cm H₂O). RAP was < 40 cm H₂O in patients complaining of soiling. All continent patients showed RAP > 40 cm H₂O. One year after PSARP, the mean RAP for group I patients was 53.18 ± 13.82 cm H₂O versus 51.20 ± 9.14 cm H₂O for group II patients. The difference was not statistically significant, Mann-Whitney test, ($p = 0.748$).

Maximum Squeeze Pressure (MSP): The mean MSP for the whole studied patients was 171.60 ± 51.99 cm H₂O which is reduced by approximately 33% if compared with the normal⁽¹¹⁾ (254.53 ± 78.93 cm H₂O). MSP was < 135 cm H₂O in patients complaining of soiling. All continent patients showed MSP > 135 cm H₂O. One year after PSARP, the mean MSP for group I patients was 190.17 ± 22.32 cm H₂O versus 178.55 ± 26.74 cm H₂O for group II patients. The difference was not statistically significant, Mann-Whitney test, ($p = 0.098$).

Rectal Volume (RV): The mean RV at 40 cm H₂O distension pressure did not differ significantly from normal. The rectal motility pattern also appeared normal with an almost complete absence of spontaneous contractions. There was no clear correlation between fistula location and RV, but it was notable that that 6 of 19 prostatic fistula patients had a RV < 150 mL. Constipation appeared to be more common among patients with a large RV. Thus, patients with a RV > 150 mL were constipated as compared with those with a RV < 150 mL. There was no clear correlation between RV and soiling, but it was notable that patients with severe soiling also had an RV > 150 mL. There was neither a statistically significant difference between mean RV in group I and group II nor a clear correlation between age and rectal volume.

Rectal Sensation to Balloon Distension: Sixty-one patients, (76.25%), showed a rectal sensation "urge to go" at rectal distension. Among the nineteen patients who failed to feel anything, eight reported constipation and nine reported soiling.

Rectoanal Inhibitory Reflex (RAIR): Twenty-nine patients, 36.25%, showed a normal RAIR i.e., an anal relaxation in response to rectal distension (11 of group I & 18 of group II). Thirty-four patients, 42.5%, showed a reverse RAIR i.e., an anal contraction in response to rectal distension (8 of group I & 26 of group II). No anal response to rectal distension was found in seventeen patients, 21.25%, (1 of group I & 16 of group II). Normal RAIR correlated significantly with high RAP and FCS.

MRI

Postoperative follow up using MRI helped much to

assess the development of the muscle complex and its relationship to the anorectum, to correlate the results of postoperative MRI with the clinical findings and to detect postoperative complications and fistula recurrence. Results of MRI correlated well with FCS and electrostimulation. Figures of six cases from the present study were selected to demonstrate the importance of the role of MRI. The selection included the following:

- Two cases that showed clinically a good continence score rate to correlate the clinical findings with the MRI findings.
- Two cases with postoperative fistulas "rectourethral and rectovaginal".
- Two cases with successful repair, yet, clinically they show fair continence score rate. This was attributed to moderately developed muscle complex. Post-operative follow up examination using M.R. imaging revealed: - The first case, a male with high type of anorectal anomaly with rectourethral fistula treated successfully by PSARP technique. The rectum and anal canal passed through the muscle complex that was well developed. Midline sagittal plane showed successive layers of circumferential muscle coat around the rectum. The axial cuts clarified the fat in the ischioanal fossa in contrast with the muscular shadow that was well-developed (Fig. 2: A). This case showed a good continence score rate. - The second and the third cases were males with anorectal agenesis and rectourethral fistulas who were treated successfully by PSARP technique. The midsagittal plane showed successive layers of circumferential muscle coat columns of mucus membrane with moderately developed muscle complex (Fig. 2: D, E). They had fair continence score rates. - The fourth case was a female who suffered from rectovaginal fistula and treated successfully by PSARP technique. The rectum and anal canal passed normally through the muscle complex (Fig. 2: B). The continence score rate for this girl was good. - The fifth case

was anorectal agenesis. He was treated by PSARP technique and after closure of his colostomy, the child suffered from a rectourethral fistula that was proved latter on to be a missed original rectourethral fistula (Fig. 2: C). This child showed a poor continence score rate. - The sixth case was a female with originally rectovaginal fistula and treated by PSARP technique. The rectum was shown to be anterior to the muscle complex. She developed a recurrent rectovaginal fistula (Fig. 2: F). Her continence score rate was poor.

Postoperative Complications at Follow up

Eleven patients had postoperative complications (13.75%). Anal stricture occurred in three patients (3.75%). Mucosal prolapse was found in four patients (5%). Rectourethral fistula was detected in two cases (2.5%). Rectovaginal fistula was detected in two cases (2.5%). All patients with postoperative complications recovered without long-term sequelae. *Anal Stricture:* Of the three patients in whom anal stricture was detected by rectal examination, two were treated with regular anal dilatation using Hegar dilators and in one patient an anoplasty operation was carried out followed by regular anal dilatation. *Mucosal Prolapse:* Three out of the four patients who developed mucosal rectal prolapse, were treated by resection of the prolapse via a limited posterior sagittal approach. The prolapse in one case only necessitated mucosal trimming. *Fistula:* One patient developed a recurrent rectovaginal fistula while in three patients fistulas were discovered after closure of the colostomy. It was confusing to differentiate between a missed fistula and an iatrogenic fistula. Two fistulas were rectourethral and one was rectovaginal. Re-do PSARP was carried out successfully in all cases.

Table I Items Included in the Telephone Questionnaire.

-
1. History of anal dilation after PSARP and after colostomy closure.
 2. Degree of success in toilet training.
 3. Frequency of soiling accidents.
 4. Presence or absence of symptoms including abdominal pain, perianal rash, perianal itch, rectal bleeding, and tenesmus.
 5. Medications.
 6. Diet modifications.
 7. Enema use.
 8. Anal pad use and frequency.
 9. Visits to physicians for constipation.
 10. Level of physical activity.
 11. Social problems related to incontinence.
 12. Parent's (or patient's) assessment of emotional problems related to incontinence or other medical problems.
-

Table II Fecal Continence Score (PCS). (20)

<i>Parameter</i>	<i>Result</i>	<i>Point Assessed</i>
1. Toilet training for stool:	Successful.	1
	Occasionally successful (Awareness of impending stool).	0.5
2. Accidents:	No awareness of impending stool.	0
	None or rare.	1
	≤ 3 per week.	0.5
3. Extra underpants or pads needed:	> 3 per week.	0
	Never.	1
4. Social problems:	Only on having diarrhea.	0.5
	Always.	0
	None.	1
5. Activity restrictions:	Infrequent odors; does not miss school, but no overnights, dates, etc.	0.5
	Frequent odor affects school & play.	0
6. Rashes:	None.	0.5
	Avoids swimming, sports, etc.	0
	No current problems.	0.5
	Some current problems.	0

Note: Scoring system is as follows: Good = 4 to 5 points; Fair = 2 to 3.5 points; poor = 0 to 1.5 points.

Table III Fistula distribution and detection in the studied patients.

<i>Fistula type & distribution</i>	<i>Number</i>	<i>Percentage</i>
No fistula	17/80	21.25%
With fistula:	63/80	78.75%
Bulbar	11/63	17.46%
Prostatic	44/63	69.84%
Vaginal	8/63	12.70%
Fistula detection:		
Clinical (passage of meconium)	31/63	49.21%
Distal loopogram (in group II)	38/47	80.85%
MRI:	61/63	96.83%
At surgery:	2/63	03.17%

Table IV Fecal continence score after one stage versus multistage PSARP.

Fecal continence score	Group I		Group II		F. test
	Number	Percentage	Number	Percentage	P
Good: 4 - 5	12	60%	23	38.33%	0.004*
Fair: 2 - 3.5	7	35%	16	26.67%	0.022*
Poor: 0 - 1.5	1	5%	21	35.00%	0.0002*
Total	20	100%	60	100%	

*Statistically significant ($p < 0.05$)

Table V Correspondence of FCS to the studied patient subgroups.

Patient Subgroup	Number	Mean FCS
Fistula location in males:		
Bulbar	11	2.5
Prostatic	44	3.4
None	14	3.1
Fistula location in females:		
Vaginal	8	2.4
None	3	2.9
Diet modifications		
Yes	17	3.3
No	63	3.2
Medications use		
Yes	29	3.5
No	51	3.3
Enema use		
Yes	20	3.7
No	60	3.0



Figure 1: One stage PSARP.

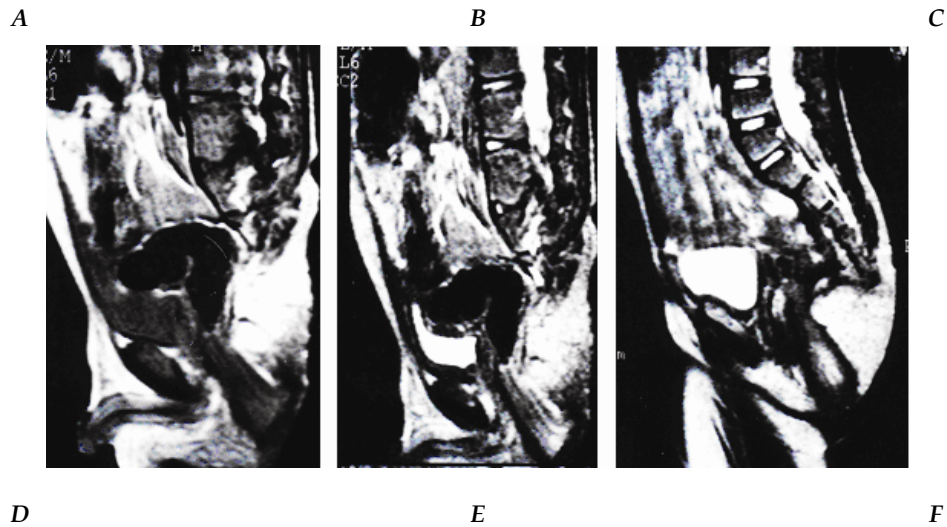
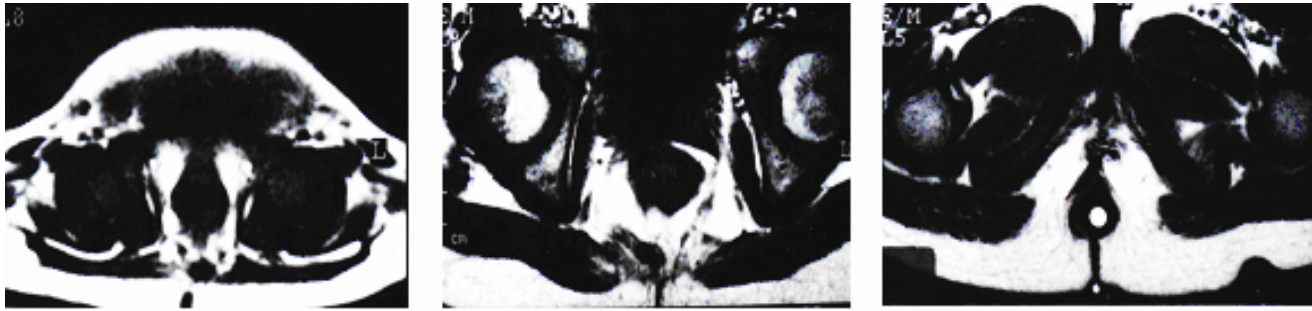


Figure 2: Postoperative MRI. **A:** Axial cut showing well developed muscular shadow. **B:** Rectum passed through the muscle complex. **C:** Axial cut of a male with recto-urethral fistula. **D & E:** Mid-sagittal planes showing moderately developed muscle complex. **F:** Mid-sagittal plane of a female with rectovaginal fistula.

DISCUSSION

The popularity of the PSARP as treatment for imperforate anus is not only explained by the disappointing results of previous methods, but also; by the fact that this approach allows for a satisfactory control during operation making it easier to avoid serious complications and mislocations of the bowel.⁽¹¹⁾ The technique is appealing because it is anatomically exact and the posterior midline approach minimizes injury to neurovascular structures of the anorectum and urinary tract. However, objective data, such as those obtained by manometry, are missing.⁽¹¹⁾ Detailed postoperative follow-up of continence had not been evaluated by many independent investigators. The present study was performed in a group of high imperforate anus patients who had no associated anomalies that could be

expected to affect the results. The analysis presented herein is reasonably complete and unbiased.

MALE versus FEMALE: The percentage of males, in this study, was 86.25%, and that of females was 13.75%. Male preponderance is due to many embryological factors, anatomical situations rendering the susceptibility of males more evident than that of females.⁽¹²⁾

FECAL CONTINENCE SCORE: Vague measurements of continence have plagued evaluations of surgical techniques for patients with high imperforate anus. Therefore, quantitative fecal continence described by Ditesheim and Templeton⁽¹⁰⁾ were used to score the results of each of the two procedures done. Use of such a quantitative score has several important advantages: -* It is

more sensitive than a qualitative score of good, fair and poor.* It provides a more precise means of charting each patient's progress.* It facilitates statistical analysis in comparing one procedure with another.* It helps in suggestion of which patient should be offered a secondary procedure. In this study, thirty-five patients (43.75%) were continent with good FCS, twenty-three patients (28.75%) were intermittently continent, and twenty-two patients have involuntary passage of stools at least once a day. Richard A. and Langemeijer,⁽⁷⁾ reported that 28% of cases showed good continence score rate, 44% showed fair continence score rate while 28% showed poor continence score rate. On comparing the results of fecal continence score after one stage PSARP versus multistage PSARP, it was found that one stage operation resulted in a much more superior FCS than the multistage procedure with highly significant difference in the good FCS and poor FCS cases. This potentiates the role of the development of normal "activity-driven" anocortical neurocircuitry in the early postnatal days.

Peña ELECTROSTIMULATION: The use of Peña muscle stimulator was applied mainly during PSARP operation to determine the site of the neoanus according to the nature of contraction of the muscle complex. Also, it was used at the end of this procedure just after anchoring of the lower end of the rectal pouch (neoanus) to the skin to verify successful positioning. Results of pre-PSARP and post-PSARP electrostimulation of the perineum; denote that the PSARP had not caused loss of pelvic musculature. All the patients, in whom the neo-anorectum was malpositioned, (27 patients), showed fecal soiling (9 fair FCS & 18 poor FCS). This finding suggests the importance of voluntary muscle in fecal continence. Thus, the results of fecal continence score rate can be strongly correlated with the site of the new anus in relation to the muscle complex and the power of its contraction. Consequently, the poor results can be mostly attributed to muscular defects.

MANOMETRY & FECAL CONTINENCE: Most patients did show subnormal values in RAP and MSP. RV and rectal sensation to distension were usually within the normal range. Rectoanal reflex patterns were also abnormal with less than half of the patients showing a rectoanal inhibition reflex. The manometry results did show some correlation with clinical results, particularly in that a low RAP and MSP were more common among patients with a soiling problem, and that constipation was more common in patients with a large RV. However, the correlation with clinical findings was incomplete. There is no general agreement about the functional importance of a high RAP and the rectoanal inhibition reflex. A normal RAP has been claimed to prevent fecal leakage during sleep and to prevent leakage of small amounts of mucus or gas.⁽¹³⁾ It is not known how much squeezing pressure has to be generated in order to counteract a propulsive bowel movement. During

manovolumetries by the method used in this study rectal contractions during distension at pressures >50 cm H₂O are extremely uncommon. Thus, the normal rectum appears to operate at low pressures, and most likely squeezing pressures in the range of 80 to 100 cm H₂O provide a sufficient safety margin to prevent leakage of solid feces. Most likely some of the soiling reported is secondary to constipation rather than the anal sphincter dysfunction, since many of patients with constipation also reported soiling. The RV and motility recordings confirm that the important rectal reservoir function is usually preserved by the PSARP. A large RV also seems to provoke constipation and one could argue that this is caused by denervation during the mobilization of the rectum to reach the perineum. However, constipation was more common in low defects with the least mobilization,⁽³⁾ indicating that this constipation represents a primary motility disturbance.

THE NEED FOR SECONDARY PROCEDURE: Dynamic graciloplasty can achieve continence in adult patients who were incontinent after operations for high anorectal malformations. The special problems associated with fecal incontinence would make it attractive to apply this technique before children start school.⁽¹⁴⁾

ANAL STRICTURE: In this study, three cases showed anal stricture. It may be due to necrosis or breakdown of the suture line by tension. It must be noted that an inelastic anus with a mucocutaneous "string" will act as a defecation block even though a small finger may pass with ease. It may be followed by constipation, colonic inertia, the development of a large hypertrophied dilated rectum with spurious incontinence (fecal soiling).⁽¹⁵⁾

RECTAL PROLAPSE: In the present study, four cases presented with rectal mucosal prolapse. Mucosal prolapse was mild in three cases, causing discomfort and occasional bleeding due to superficial ulceration, whereas in the fourth case, it was considerably symptomatic that mucosal trimming, was performed to relief these symptoms. Rectal prolapse is a frequent complication after any pull-through operation for imperforate anus.⁽¹⁶⁾ The incidence of rectal prolapse following surgery for high imperforate anus depends on one's definition on this entity. It varies from a slight mucosal ectropion to a large full thickness rectal prolapse. This may explain the wide range of reported incidence, between 4% and 60 %.⁽¹⁷⁾

Frequency of defecation: In the present study, meticulous history taking via the standard questionnaire revealed that more than 25% of cases had the frequency of defecation by 6 times daily. This can be explained on the basis of Scharli's observation⁽¹⁸⁾ who stated that in patients with imperforate anus examined at various times after pull through procedures, the rectosigmoid segment does not suddenly assume anorectal function. The anorectal muscles and the

new rectum undergo a certain maturational process that develops in several reasonably distinct stages.

M.R.I: It can demonstrate operative complications affecting rectal continence, such as misplaced neorectum.⁽¹⁹⁾ M.R.I was useful and helpful in determination of the cause of incontinence in questionable cases. To be cost effective, the use of M.R.I should be directed to study cases of poor continence score rate to, whom secondary procedure might be applied as well as to cases with specific complications such as recurrent fistulae.

Based on the results of this study, it can be noticed that:

1. The most important task in the management of anorectal agenesis is a faultless first operation.
2. The posterior sagittal approach allows a more precise perirectal dissection and less muscle damage. Hence, preservation of the anatomy of pelvic floor muscles limits affection of fecal continence.
3. One stage PSARP is a safe effective procedure which gives the superior results in treatment of patients with high Anorectal malformations.⁽⁴⁾ One stage PSARP minimizes postoperative complications, colostomy drawbacks, costs, hospital stay and psychological problems.⁽⁵⁾ The most important part of the care of imperforate anus in the newborn is to do the operative repair within the first 7 days of life, without a prior colostomy, because of the very narrow window of opportunity, of only a very few days after birth, for the development of normal "activity-driven" anocortical neurocircuitry.⁽⁶⁾ The use of quantitative score can lead to an earlier decision regarding whether or not a secondary procedure should be performed.⁽⁷⁾ Pena muscle stimulator is a helpful good guide during PSARP operation in positioning of the new anus. It offers an accepted indicator for the continence status of the patient. All patients with malpositioned neo-anorectum will show fecal soiling.⁽⁸⁾ M.R.I is superior to other radiological tools in postoperative evaluation.⁽⁹⁾ Correction of a congenital anorectal malformation never results in a resitutio ad intergrum.⁽¹⁰⁾ Both parents and physicians must be cautious when predicting the results of the operation because most of the patients undergoing PSARP will not become continent. Incontinence to a greater or lesser degree will frequently remain a life-long handicap.⁽¹¹⁾ The acceptance of incontinence by the patients and their families is the essential first step leading to appropriate treatment and care. Thus, although these patients may not become continent, they have a good chance of being content.⁽¹²⁾ The long-term functional results are better for females than males.⁽¹³⁾ In cases with poor fecal continence score rate, the use of daily cleansing enema program gives excellent results and enable the child to mix freely thus avoid the bad psychological sequences of isolation.⁽¹⁴⁾ Decreased frequency and increased consistency of the stool, the appearance of the sensation of fullness, and the urge to defecate, are postoperative indicators of approaching continence.⁽¹⁵⁾ Clinical examination of the rectum estimating reflex activity

of the external sphincter, tested by stroking the perineal skin, and digital examination of the anorectum estimating the tone of the external sphincter and the sensitivity of the muscle, have been found to be useful.

CONCLUSION

We recommend the use of one stage PSARP in the management of all high Anorectal malformations.

REFERENCES

1. Peña A, de Vries P. Posterior sagittal anorectoplasty. *J Pediatr Surg.* 1982;17: 638-643.
2. Peña A, de Vries P. Posterior sagittal anorectoplasty: Important technical considerations and new applications. *J Pediatr Surg.* 1982;17:796-811.
3. Peña A. Surgical management of anorectal malformations: A unified concept. *Pediatr Surg Int.* 1988;3:82-93.
4. Peña A: Atlas of Surgical Management of Anorectal Malformations. New York, NY, Springer-Verlag, 1990
5. Peña A. Current management of anorectal anomalies. *Surg Clin North Am.* 1992;72:1393-1416.
6. Rintala RJ, Lindahl H. Is normal bowel function possible after repair of intermediate and high anorectal malformation? *J Pediatr Surg.* 1995;30:491-494.
7. Langemeijer RATM, Molenaar JC: Continence after posterior sagittal anorectoplasty. *J Pediatr Surg.* 1991;26:587-590.
8. Lamhrecht W, Lieser W: The internal sphincter in anorectal malformations: Morphological investigations in neonatal pigs. *J Pediatr Surg.* 1987;22:1160-1168.
9. David PB, David T. Does posterior Sagittal Anorectoplasty in patients with high imperforate anus provide superior continence? *J Pediatr Surg.* 1996;31:26-30.
10. Templeton JM Jr, Ditesheim JA. High imperforate anus—Qualitative results of long-term fecal continence. *J Pediatr Surg.* 1985;20:645-652.
11. Henrik H, Peña A. Long-term Anorectal function in imperforate anus treated by a posterior Sagittal Anorectoplasty: manometric investigation. *J Pediatr Surg.* 1992;27:906-909.
12. Peña A, Amroch D, Baeza C. The effect of posterior Sagittal approach on rectal function (experimental study). *J Pediatr Surg.* 1993;28:773-778.
13. O'Connell PR, Stryker SJ, Metcaif AM et al. Anal canal pressure and motility after ileoanal anastomosis. *Surg Gynecol Obstet.* 1988;166:47-54.

14. Baten CGMI, Konsten J, Heinmann E. Dynamic Graciloplasty for anal atresia. *J Pediatr Surg.* 1994; 29:922-25.
15. Nakayama D K, Templeton J M, Zeigler M M J R, Walker A B. Complications of posterior sagittal anorectoplasty. *J Pediatr Surg.* 1986;21:488-92.
16. Caoutte L, Yazbek S, Laberge J, Ducharme J. Multiple-flap anoplasty in the treatment of rectal prolapse after pull-through operation for imperforate anus. *J Pediatr Surg.* 1987;22:65-67.
17. Laberge J, Bose O, Yazbek S et-al. The anterior perineal approach for pull-through operation in high imperforate anus. *J Pediatr Surg.* 1983;18:744-778.
18. Scharii A F. Anorectal incontinence: Diagnosis and treatment. *J Pediatr Surg.* 1987;22:693-701.
19. Sato Y, Pringle KC, Bergman RA, Yuh WTC, Smith WL, Soper RT, FrankenE A. Congenital anomalies: MR imaging. *Radiology.* 1988; 157-62.