

Rectovestibular fistula: Which surgical approach is suitable? A randomized controlled trial

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Key words: Vestibular anus; anal transposition; external sphincter preservation; anorectal malformations.

Acknowledgments: We are grateful to the surgeon at the Pediatric Surgery Unit at Assiut University Hospital in Egypt. Prof. Dr. Ahmed El Taib was the godfather in this unit. To my colleagues Dr. Tarek Sabra, Dr. Ahmed Gamal Abdelmalek, Dr. Mohammed Hamada Takrouney in Assiut University, and to Dr. Mustafa Ali Redwan at Sohag University Hospital, Egypt.

Conflict of interest: The authors have no conflict of interest to declare.

Contributions: All authors have read and approved the manuscript. SA: Data collection, data analysis, interpretation, assistant operator, follow-up for the patients, and writing the manuscript. MO: The main operator and supervision. MF: He participated in many intraoperative photo pictures. II, MM and ME: The surgeons. OA and HM: Follow up and reviewers.

Ethics approval and consent to participate: The institutional ethics committee (Aswan faculty of a medical ethical committee) reviewed and approved this study (no. 44/1/16). Written informed consent was obtained from the patient's parents after providing a thorough explanation regarding the aim of this study. The patients' parents had the right to refuse participation or withdraw (after initial consent) at a later point in the study without any explanations or any influence on their right to receive optimal medical care.

Informed consent: Written informed consent was obtained for publication of intra- and postoperative images.

Availability of data and material: The data are available from the corresponding author upon reasonable request.

Received for publication: 4 November 2021.

Revision received: 6 January 2022.

Accepted for publication: 8 March 2022.

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La Pediatria Medica e Chirurgica 2022; 44:278

doi:10.4081/pmc.2022.278

Abstract

The management of a vestibular fistula is a challenge for pediatric surgeons. We compared four different operative techniques in terms of postoperative complications, continence, and cosmetic appearance. This prospective, randomized, comparative study included female children with rectovestibular fistulae who were selected from patients with Anorectal Malformations (ARMs) treated between January 2016 and July 2020. The patients were randomly divided into four groups based on the operative technique: Trans-Sphincter Anorectoplasty (TSARP), Posterior Sagittal Anorectoplasty (PSARP), Classic Anterior Sagittal Anorectoplasty (ASARP), and modified ASARP. The incidence of vestibular fistulae among all patients with ARMs was 13.4%. The total number of patients with vestibular fistula was 112, including eighty-four (75%) with rectovestibular fistulae and twenty-eight (25%) with anovestibular fistulae. Associated congenital anomalies were found in nineteen (22.6%) patients. The percentage of parents satisfied with the cosmetic appearance and continence of their children was the highest after TSARP. PSARP had the lowest incidence regarding vaginal wall injuries. TSARP is the best operative technique for handling rectovestibular fistulae and is suitable for infants and children. In the TSARP technique, the external sphincter muscle can be preserved following complete dissection of the rectum without the need for a midline skin incision. A midline skin incision is required in the modified ASARP technique.

Introduction

A vestibular fistula is defined as an abnormal position of the anal orifice in the vestibule directly under the vaginal opening. It is the most common Anorectal Malformation (ARMs) in female children.¹ The worldwide incidence of ARMs is 1 in 5,000 live births.¹ According to the ARM classification (Wingspread classification, 1984), the vestibular fistula may be an anovestibular fistula—a short fistula with a low-lying rectum—or a rectovestibular fistula—a long fistula with the rectum located at a position higher than that noted in case of the anovestibular type but still lying low.² To distinguish between the two types of fistulae, a probe is passed through the orifice; if it can be directed toward the coccyx, it is considered an anovestibular fistula. In contrast, if the probe only passes cranially along the posterior wall of the vagina, it is a rectovestibular fistula.³ However, all vestibular fistulae are low anomaly according to their relationship with the pelvic floor. In

the Krickenbeck classification, there is no differentiation between “rectovestibular” and “anovestibular” fistulas.⁴

This anomaly in the anal position reflects the creativity of the Creator because just changing the position of the anus without muscle complex leads to complications. In addition to an abnormal cosmetic appearance, we believe that the presence of the fistula in the vestibule may lead to the recurrent urinary tract and vaginal infections as well as continence problems. In adult patients, it may also lead to dyspareunia. Several techniques have been described for the treatment of this type of anomaly. Posterior Sagittal Anorectoplasty (PSARP) is arguably the standard approach for rectovestibular fistula repair based on the extensive work of Pena and Levitt over the past three decades. No present study compared the outcomes associated with the different techniques. Our study is unique because, to the best of our knowledge, it is the only study to compare the outcomes obtained through the treatment of vestibular fistula using four different operative techniques: Trans-Sphincter Anorectoplasty (TSARP), classic Anterior Sagittal Anorectoplasty (ASARP), modified ASARP, and PSARP. In the current study, we excluded the anovestibular fistula because the length of the common wall between the rectum and the vagina is directly related to the complexity of the operation, as well as post-operative complications, operative time, and long-term fecal continence. This paper contains a photographic catalog that can use as a teaching demonstrator for the different operative procedures. This paper was written according to the consort 2010 checklist.

Materials and Methods

This study was a randomized, comparative trial involving female children suffering from vestibular fistula. The study sample was selected from patients with ARMs treated at the pediatric surgical department of a university hospital from January 2016 to July 2020. Female patients aged 1 month to 12 years who had rectovestibular fistulae that had been treated via a single-stage repair were included in this study. Exclusion criteria were patients with recurrence, previous anorectal surgery, anovestibular fistulae, rectoperineal fistulas, cloacas, imperforate anus with no fistula, cognitive impairment, or age >12 years as well as those who underwent colostomy or were lost to follow-up. The patients were randomly divided into four groups according to the procedure they had undergone. The four procedures studied were TSARP, PSARP, classic ASARP, and modified ASARP. Randomization was performed by copying the names of the techniques on four separate papers, then the surgeon blindly selected one paper for each patient. Four pediatric surgeons were trained in ARMs techniques and performed the repair. Each surgeon can perform all repair types.

Preoperative preparation

All patients underwent rectal washouts with normal saline four times a day, beginning 72 hours preoperatively or earlier if constipation and abdominal distension were present. Routine blood investigations followed by ultrasonography of the abdomen and pelvis were performed to rule out genitourinary anomalies. Whole-body and spinal X-rays were performed to exclude other bony anomalies. Echocardiography was also performed in all patients.

As preoperative prophylaxis, metronidazole syrup was administered daily starting 2 days before the operation because of the increasing evidence regarding the significance of anaerobic microorganisms in triggering nosocomial infections. A prophylactic third-generation cephalosporin was also administered intravenously with anesthesia induction.

Operative techniques

All operations were performed under general anesthesia with endotracheal intubation. A urethral catheter was inserted. Because the Peña Muscle Stimulator was not available, electrical stimulation using diathermy at a very low setting (Video 1) or the finger-prick technique (using the index finger for tingling the new anal area) (Video 2) were used to define the contraction of the muscle complex back to the fistula site and select the center of the muscle complex. The operation was performed with the patients in the lithotomy position with both lower limbs supported by a metallic ridge in all operative techniques except for PSARP, which was performed with the patients in the prone position. The perineum was exposed up to the coccyx. Adrenaline (1:400,000) was infiltrated around the fistula opening. Multiple 3-0 silk sutures were placed around the mucocutaneous junction of the fistula opening for traction.

PSARP

A midline incision was made a few centimeters below the coccyx and was extended to the fistula; the incision was continued through the subcutaneous tissue and muscle complex, leaving an equal mass of muscles on both sides (Appendix, Figure 1).

Sharp dissection with scissors separated the fistula from the common wall shared by the rectum and vagina. Mobilization of the rectum must be sufficient to allow its relocation within the muscle complex without tension (Appendix, Figure 2).

Then the anterior perineum was reconstructed, and anoplasty was performed within the limits of the sphincteric complex that had been demarcated and identified previously. The posterior edge of the muscle complex was reapproximated, bringing together the posterior limit of the sphincteric complex and relaying muscle to the rectum to create the anorectal angle. The perineal skin was closed with a 3-0 Vicryl suture (Appendix, Figures 2 and 3).

Classic ASARP

A midline incision was made from the posterior margin of the fistula to that of the previously identified putative anal site, dividing all tissues in the line, including the muscle complex (Appendix, Figure 4).

Blunt dissection separated the rectum from the posterior encircling muscles up to the level of the sacral hollow. Sharp dissection with scissors separated the fistula from the surrounding tissues laterally. The fistula was then cordoned off by continuing the midline incision, cleaving between the fistula and posterior vaginal wall. The rectum was adequately mobilized to allow positioning of the prospective anus without tension (Appendix, Figure 5).

The edges of the muscle complex were sutured together in front of the rectum, taking bites of the rectal serosa. The perineal muscles were restored in the midline between the rectum and vagina, thus reforming the perineal body (Appendix, Figure 6). After the midline skin was sutured, anoplasty was formed with mucocutaneous stitches, generally with 4-0 Vicryl sutures (Appendix, Figures 6 and 7).

TSARP

The perifistular circumference was sharply dissected (Appendix, Figure 8A). Care was taken to avoid causing any injuries to the rectal or vaginal wall. The dissection extended anteriorly to the cervix and posteriorly to the sacral promontory. No incision was made over the perineum, which was kept intact (Appendix, Figures 8B and C).

A vertical incision of approximately 2 cm was made at the previously proposed anal site. An orifice was created at the center of the muscle complex using artery forceps. Smooth sustained dilation to the new orifice in the center of the muscle complex created

using Hegar dilator no. 14 or 15. Then, the mobilized rectum was pulled through the opening by grasping its traction sutures and fixing it to the muscle complex with a 4-0 Vicryl suture (Appendix, Figure 9A and B).

The vestibular wound and its underlying perineal muscles were closed in two layers with interrupted stitches using 4-0 Vicryl sutures (Appendix, Figure 9C). Anoplasty was then performed with 12 stitches using 4-0 Vicryl sutures (Appendix, Figure 10).

ASARP with external sphincter preservation or modified ASARP

A midline skin incision was made from the posterior margin of the fistula to the previously identified putative anal site, allowing visualization of the anterior portion of the muscle complex. Then, a sharp circumferential dissection of the fistula opening was performed (Appendix, Figure 11A).

The rectum was bluntly separated from the posterior encircling muscles up to the level of the sacral hollow. Sharp dissection divided the common wall between the vagina and rectum up to the level of the cervix (Appendix, Figure 11B).

A cruciate incision was made at the putative anal site (Appendix, Figure 11C). An artery forceps was inserted through the center of the muscle complex, deep into its anterior rim, without cutting it. The traction sutures were grasped, and the neorectum was inserted into the center of the muscle complex without tension (Appendix, Figure 12).

The perineal muscle defect in the vestibule was approximated in two layers using 4-0 Vicryl sutures to reconstruct the perineal body. The perineal skin was closed with 4-0 Vicryl sutures. Anoplasty was then performed with mucocutaneous Vicryl sutures, generally 4-0 (Appendix, Figure 13 and 14A).

Postoperative care

The urethral catheter was maintained in situ till the fifth postoperative day. The dressing was changed after 24 hours, and the wound was left exposed. Patients' mothers were instructed to apply the povidone-iodine solution (Betadine) over the operated wound and neanus several times a day and after a bowel movement. Intravenous administration of the third-generation cephalosporin and metronidazole antibiotics were continued for up to the fifth postoperative day. The patients were beginning gradual feeding with fluid then semisolid on the third postoperative day after insuring bowel movement. Patients were discharged on the sixth postoperative day unless complications occurred. Anal dilatations with Hegar's dilator were started on the 14th postoperative day.

Follow-up

The assessment period ranged from 1, 3, and 6 months to 1 year. The scheduled dilatation was followed. Data regarding early (up to 2 weeks) complications, such as wound infection, wound dehiscence, and skin excoriation, and delayed (1 month to 1 year) complications, such as mucosal prolapse, fistula formation, and stenosis, were collected.

The anorectal function was measured based on the age of continence; younger children who had not reached the age of continence (<3.5 years) showed anocutaneous reflex and anal squeeze response on rectal digital examination. Anocutaneous reflex is the contraction of the corrugator cutis ani in response to an anal pinch or scratching the perianal skin. Anal squeeze is a similar response to an elderly neonate if the tip of a little finger is introduced into the anal canal.

Children older than three and half years had fecal continence rated according to the Templeton score.³ It designates the operative

outcome as "good," "fair," or "poor." The scoring performed prospectively during each follow-up visit.

Statistical analysis

The SPSS version 17 software was used for statistical analysis. Descriptive statistics such as percentages were used for qualitative variables, and arithmetic means and range were used for quantitative variables.

The numerical data with normal distribution were analyzed using a one-way analysis of variance. Kruskal–Wallis's test was performed for numerical data with the nonnormal distribution. For categorical data, Pearson's chi-square test was used. *P* values of <0.05 were considered significant.

Results

Of the 834 patients who were admitted with a diagnosis of ARMs, 112 (13.4%) had vestibular fistulae, including eighty-four (75%) with rectovestibular fistulae and twenty-eight (25%) with anovestibular fistulae. Only eighty-four patients with rectovestibular fistula were included in the study. The number of patients in each operative technique group followed: classic ASARP, 13; TSARP, 30; modified ASARP, 22; and PSARP, 19.

To compare the operative techniques, we divided the patients according to the age of continence and time of toilet training, which was 3.5 years. At the time of surgery, 74 patients (84%) were younger and 10 were older than the age of continence (3.5 years). The patients' mean age \pm standard error was 24 ± 18 (range: 1–144) months.

Associated congenital anomalies were found in nineteen patients (22.6%). Three patients had multiple anomalies (Table 1; Appendix, Figure 14B). Only one patient was twelve years old had sacrococcygeal teratoma with duplicated vagina and uterus, but teratoma was type I, and the patient had an intact sacrum. All other patients had a good quality of sacrum and absence of tethered cord.

Only 6 minutes shorter operative time for TSARP (69 ± 1) versus PSARP (75 ± 2); although it is statistically significant ($P = 0.01$) but not clinically important. There was no statistically significant difference among the different surgical approaches regarding the mean lengths of postoperative hospital stay ($P = 0.050$).

There was no statistically significant difference in the incidence of intraoperative vaginal wall injury among the operative techniques (Table 2). We believe that PSARP allowed the best visualization among the operative techniques. The vaginal tears were repaired with interrupted stitches using Vicryl sutures and usually healed uneventfully. There was a statistically significant difference in the occurrence of wound infection during the early follow-up period ($P = 0.036$). The lowest percentage of patients with infection was observed in the patients who had undergone TSARP because the perineal skin was preserved. There was no statistically significant difference in delayed complications among the operative techniques except for perineal scarring. TSARP was the best technique in this regard, with no cases of perineal scarring ($P = 0.028$). PSARP was associated with the highest rate of postoperative mucosal prolapsed (21%), which was corrected by trimming and resuturing.

In the older age group, there was no statistically significant difference among the operative techniques regarding bowel habits at the 1-month postoperative follow-up (Table 3). However, we continued the anal dilatations with Hegar's dilator in the clinic.

At 3 months after surgery, the number of patients aged ≥ 3.5 years increased by five patients. There was no statistically signifi-

cant difference among the operative techniques in the older age group regarding postoperative bowel habits at the 3-month postoperative follow-up (Table 4). However, we continued the anal dilatations with Hegar's dilator in the clinic. Conservative treat-

ment in terms of meal modification, enemas, and toilet training was recommended for patients with anal soiling.

At 6 months after surgery, another five children reached the age of continence, thus, the number of patients in the older age

Table 1. Associated anomalies in the eighty-four study participants.

Associated anomaly	N (%)	Age at operation	Types of operation		
Vertebral	Vertebral scoliosis	1 (1.1)	6 months	Modified ASARP	
Cardiac	VSD	4 (4.7)	1 year and 5 months, 8 months	PSARP TSARP	
	ASD		6 months	Modified ASARP	
	PDA		2 years	TSARP	
Larynx and trachea	Laryngeal web	1 (1.1)	9 ms	Classic ASARP	
Renal	Absent left kidney	3 (3.5)	2 years and 8 months	Modified ASARP	
	Hydronephrosis		1 year and 2 months	Classic ASARP	
	Ectopic kidney		10 months	PSARP	
Limb	Right tibia agenesis	1 (1.1)	1 year and 9 months	PSARP	
Craniofacial	Hydrocephalous	3 (3.5)	2 years and 8 months	Modified ASARP	
	Cleft palate		3 years and 9 months	PSARP	
	Cleft ear lobe		6 months	PSARP	
Gastrointestinal	Congenital megacolon	2 (2.3)	7 months, 6 months	TSARP, classic ASARP	
Gynecological	Vaginal atresia	2 (2.3)	1 year and 2 months	Modified ASARP	
	Duplicated vagina, cervix, and uterus		12 years	TSARP	
Syndrome	Down's syndrome	1 (1.1)	1 year and 6 months	TSARP	
Others	Sacrococcygeal teratoma	1 (1.1)	12 years	TSARP	
Total number		19			
Patients with multiple anomalies					
Case 1	ASD	Vestibular fistula	Vertebral scoliosis	6 months	Modified ASARP
Case 2	Hydrocephalous	Vestibular fistula	Absent left kidney	2 years and 8 months	Modified ASARP
Case 3	Sacrococcygeal teratoma	Vestibular fistula	Duplicated vagina, cervix, and uterus (Appendix, Figure 14B)	12 years	TSARP

VSD, ventricular septal defect; ASD, atrial septal defect; PDA, patent ductus arteriosus; ASD, atrial septal defect.

Table 2. Intraoperative, early, and delayed postoperative complications.

Complications	Classic ASARP N = 13, n (%)	TSARP N = 30, n (%)	Modified ASARP N = 22, n (%)	PSARP N = 19, n (%)	P value (Pearson's chi-square test)
Intraoperative iatrogenic vaginal wall injury					
Vaginal wall injury	1 (7.7)	2 (6.7)	1 (4.5)	0	0.697
Early postoperative complication[^]					
Bleeding	0	1 (3.3)	0	1 (5.3)	0.648
*Superficial wound infection	4 (30.8)	1 (3.3)	2 (9)	5 (26.3)	0.036
Abscess	2 (15.4)	1 (3.3)	2 (9)	2 (10.5)	0.58
Wound dehiscence	2 (15.4)	1 (3.3)	1 (4.5)	2 (10.5)	0.468
Delayed postoperative complications					
Recurrent fistula	2 (15.4)	2 (6.7)	2 (9)	2 (10.5)	0.842
Anal stenosis	2 (15.4)	5 (16.7)	4 (18.2)	3 (15.8)	0.996
Mucosal prolapse	1 (7.7)	1 (3.3)	1 (4.5)	4 (21)	0.143
Perineal scarring	9 (69.3)	0	7 (31.8)	13 (68.4)	0.028
Anterior anal migration	1 (7.7)	0	0	0	0.137
Posterior anal migration	0	0	0	1 (5.3)	0.326

[^]Postoperative (1 day to 2 weeks) complications during the early follow-up period; *Superficial wound infection is defined as an infection involving only the skin and subcutaneous tissue of incision.

group increased up to twenty patients. Table 5 shows that the older age group had a statistically significant difference among the operative techniques in terms of the Templeton score at 6 months after surgery ($p=0.009$) as all patients who had undergone modified ASARP and TSARP had a good score. There was no statistically significant difference among the groups regarding constipation or soiling because of the improvement in the condition of most patients.

At one year after surgery, the number of children who reached the age of bowel continence during the follow-up period increased to twenty-seven children. There was no statistically significant difference among the operative techniques regarding voluntary bowel control, with the best results obtained in the TSARP (92%) and modified ASARP groups (85.7%). There was a significant improvement in constipation, anal soiling, and abdominal distension in the study groups.

In the younger age group, there was a significant difference among the operative techniques regarding constipation at the 1-month postoperative follow-up ($p = 0.01$; Table 3). The highest percentages of patients with constipation were observed in the TSARP (81.8%) and modified ASARP (90%) groups. We continued the anal dilatations with Hegar's dilator in the clinic. The younger age group also had a statistically significant difference among the operative techniques at the 1-month postoperative follow-up in terms of anocutaneous reflex and anal squeeze response on per rectal examination ($p = 0.04$). The highest percentages of patients with satisfactory responses were observed in the TSARP (77%) and modified ASARP (71.4%) groups.

At 3 months after surgery, five patients had crossed the age of 3.5 years and were moved out of the younger age group. There was a significant difference among the operative techniques in the younger age group at the 3-month postoperative follow-up in terms

Table 3. Bowel habits at the postoperative 1-month follow-up.

Patients aged ≥ 3.5 years					
Bowel habits	Classic ASARP N = 0, n (%)	TSARP N = 8, n (%)	Modified ASARP N = 1, n (%)	PSARP N = 1, n (%)	P value (Pearson's chi-square test)
Constipation	0	7 (87.5)	1	1	0.87
Soiling	0	6 (75)	1	1	0.732
Abdominal distension	0	4 (50)	1	0	0.368
Voluntary bowel control	0	2 (25)	0	0	0.732
Templeton score	0	4 Fair, 4 Poor	1 Poor	1 Poor	0.435
Patients aged < 3.5 years					
	N = 13, n (%)	N = 22, n (%)	N = 21, n (%)	N = 18, n (%)	
Constipation	4 (30)	18 (81.8)	19 (90)	5 (27.7)	0.01
Soiling	8 (61.5)	8 (36.3)	7 (33.3)	9 (50)	0.339
Abdominal distension	4 (30)	11 (50)	9 (42.8)	3 (16.6)	0.149
ARAS	6 (46)	17 (77)	15 (71.4)	7 (38.8)	0.04

ARAS: anocutaneous reflex and anal squeeze on per rectal examination.

Table 4. Bowel habits at the postoperative 3-month follow-up.

Patients aged ≥ 3.5 years					
Bowel habits	Classic ASARP N = 1, n (%)	TSARP N = 11, n (%)	Modified ASARP N = 2, n (%)	PSARP N = 1, n (%)	P value (Pearson's chi-square test)
Constipation	0	5 (45.5)	1 (50)	0	0.67
Soiling	1	3 (27.3)	1 (50)	1	0.281
Abdominal distension	0	3 (27.3)	1 (50)	0	0.732
Voluntary bowel control	0	8 (72.7)	1 (50)	0	0.281
Templeton score	1 Fair	7 Good, 4 Fair	1 Good, 1 Fair	1 Fair	0.429
Patients aged < 3.5 years					
	N = 12, n (%)	N = 19, n (%)	N = 20, n (%)	N = 18, n (%)	
Constipation	1 (8.3)	4 (21)	5 (25)	1 (5.5)	0.313
Soiling	4 (33.3)	1 (5.2)	1 (5)	5 (27)	0.046
Abdominal distension	0	1 (5.2)	2 (10)	1 (5.5)	0.706
ARAS	8 (66.6)	18 (94.7)	19 (95)	12 (66.6)	0.025

ARAS: anocutaneous reflex and anal squeeze on per rectal examination.

of anal soiling ($p = 0.046$; Table 4). The highest percentages of patients showing anal soiling were noted in the PSARP (27%) and classic ASARP (33.3%) groups. The highest percentage of patients with satisfactory anocutaneous reflex and anal squeeze response per rectal examination was observed in the TSARP (94.7%) and modified ASARP groups (95%) ($p = 0.025$). There were significant improvements in the condition of patients who had undergone PSARP and classic ASARP.

At 6 months after surgery, an additional five patients crossed the age of 3.5 years and were no longer included in the younger age group. There was no significant difference among the operative techniques in the younger age group at the 6-month month postoperative follow-up in terms of constipation, anal soiling, and abdominal distension because of the improvements achieved with conservative treatment in all groups (Table 5). The highest percentages of patients with satisfactory anocutaneous reflex and anal squeeze response per rectal examination were observed in the TSARP (94%) and modified ASARP (94.4%) groups.

The number of children who remained younger than the age of continence at 1 year after surgery was fifty-seven. There was no significant difference among the operative techniques in the younger age group at 1-year postoperative follow-up in terms of constipation, anal soiling, and abdominal distension because of the improvements achieved with conservative treatment in all groups. The anocutaneous reflex and anal squeeze response on per rectal examination improved considerably in all types of operations with satisfactory results obtained in all patients.

Only the younger group showed significant differences among operative techniques at the 1-month and 3-month postoperative follow-ups. At the 1-year follow-up, all groups showed nearly the same results regarding bowel continence as well as anocutaneous reflex and anal squeeze response on per rectal examination because of the healing power of the body.

The TSARP technique had the highest percentage of parents who were satisfied with the cosmetic appearance and continence (90%) at one year postoperative. In modified ASARP (77.2%) parents were satisfied. In PSARP and classic ASARP were (73.6%) & (61.5%) of parents satisfied.

Discussion

Patients with vestibular fistulae are born with the possibility of bowel continence. Efforts should be made toward a successful reconstruction of the muscle complex in a single operation. Several techniques have been described for the treatment of vestibular fistulae. The primary goal of these procedures is to pull down the rectum and create a new anus within the intact or repaired muscle complex to initiate normal bowel control.

In the present study, the sample size was large (84 patients with rectovestibular fistula) collected over a 4-year period; this was possible because the pediatric surgery unit at the study hospital is the largest tertiary referral center in Upper Egypt. Kamal (2012) reported the use PSARP, classic ASARP, and TSARP for the treatment of 54 patients with imperforate anus and rectovestibular fistulae.⁵ In addition, Khan and Ali reported the use of TSARP and classic ASARP to treat 43 patients with vestibular fistulae.⁶ Harjai and Sethi compared ASARP with PSARP in 27 patients with vestibular fistulae.⁷ Our study is the only study that compared the outcomes of four types of operative techniques.

Regarding the time of intervention in these cases, we observed that many patients underwent surgery at relatively older ages; this can be explained by delayed detection of the anomaly as most mothers delivered at their homes in the rural areas of Upper Egypt and lacked medical care. Furthermore, most patients presenting with difficulty in the passing stool because of anal stenosis or those with early detection were treated using frequent anal dilatation, V-Y anoplasty, or a cutback procedure with the postponement of the operative anal transposition until a later time.

We believe that the optimal age at which the operation should be performed in 6 months because, at this age, the rectovaginal septum is well developed with a width of ≥ 2 mm; this allows easy separation of the rectum from the vagina, which can lead to a decrease in the incidence of vaginal tearing. Thus, we do not favor performing surgery during the newborn period. During that time, gentle fistula dilatations are commonly applied once a month with Hegar dilators as reported in a study by Demirbilek and Atayur.⁸

Table 5. Bowel habits at the postoperative 6-month follow-up.

Patients aged ≥ 3.5 years					
Bowel habits	Classic ASARP N = 3, n	TSARP N = 11, n	Modified ASARP N = 4, n	PSARP N = 2, n	P value (Pearson's chi-square test)
Constipation	1	2	3	0	0.141
Soiling	2	1	1	1	0.177
Abdominal distension	1	2	2	0	0.497
Voluntary bowel control	1	10	3	1	0.177
Templeton score	1 Good, 2 Fair	10 Good, 1 Fair	4 Good	2 Fair	0.009
Patients aged < 3.5 years					
	N = 10, n	N = 19, n	N = 18, n	N = 17, n	
Constipation	0	3	4	1	0.278
Soiling	3	1	1	4	0.13
Abdominal distension	0	0	1	0	0.458
ARAS	7	18	17	12	0.074

ARAS: anocutaneous reflex and anal squeeze on per rectal examination.

However, Caroline and Aronson, performed surgery during the newborn period and reported satisfactory outcomes in 34% of their patients.⁹ Our explanation is that the orifice of a vestibular fistula is usually smaller than a normal anus in newborns, it would be advisable to perform the repair in the first months of life so that they already have a normal caliber at weaning when starting solid foods. In addition, waiting before repair could lead to rectal distension and dilatation that could complicate surgery.

In 2012, Mitul *et al.* reported performing vestibular fistula repair in the neonatal period.¹⁰ They explained that there is evidence that the somatosensory input from the perianal skin, which is an important component of continence, is lost if unused for more than 3 or 4 months.¹⁰ Menon and Rao suggested that the potential advantages of operating in the newborn period are that the meconium is relatively sterile for 48 hours, so bowel preparation could be avoided, and dissection of the distal rectum performed after several months of dilatation involves more blood loss than that performed in the newborn period.¹¹

In the current study, we attributed the infection rates to the use of a single-stage procedure instead of a three-stage procedure with a colostomy, as this region in the body already contains a high level of commensal bacteria because of fecal contamination. This occurs because of the immediate refeeding of the patients. Five patients with superficial wound infections improved with conservative treatment such as ampicillin/sulbactam antibiotic oral suspension, sitz baths, and povidone-iodine ointment application. The other seven patients had severe wound infection complicated by abscess formation that was treated by incision and drainage. The partial wound dehiscence improved after 3 weeks with continuous dressing in four patients, whereas in the remaining two patients, the condition worsened to complete major wound dehiscence. Patients who had wound abscess or wound dehiscence continue their antibiotic regimen according to the result of culture, and sensitivity test. A proximal diverting colostomy was performed, and revision surgery was required for these patients. If there has been major wound dehiscence the anal opening will be migrated to lie behind the vagina again (anterior anal migration) or migrated posteriorly in case of PSARP. Also, anal migration may occur as a surgical mistake that discovers later in the postoperative period.

In this study, only two patients from a total of eighty-four patients had complete wound dehiscence needed colostomy and revision surgery. So, we believe that the single-stage repair procedures are more suitable for patients who complained of vestibular fistula as most early postoperative wound infections improved with conservative treatment, only two cases worsened to major wound dehiscence and need a colostomy. Recurrent fistula occurs due to complete wound dehiscence or probably insufficient interposition of tissue between rectum and vagina as well because of vaginal damage. All recurrent fistulae were reoperated with single-stage repair except the two patients with complete wound dehiscence. All single-stage procedures in our study had a good functional prognosis. So, no need today, for lost time and the cost burden of the three stages of repair.

In the present study, constipation was more common in the modified ASARP and TSARP groups and less common in the PSARP and classic ASARP groups; this finding agrees with that of the study by Kamal, in which constipation was detected more often in the TSARP group than in the PSARP group.⁵

Anal soiling and fecal incontinence were frequently detected in the PSARP and classic ASARP groups in this study. In the study by Kamal, anal soiling was frequently detected in the PSARP and TSARP groups.⁵ This might be explained by the maintenance of an intact sphincter in the TSARP and modified ASARP groups but division and rejoining of the external sphincter muscle in the other

groups. We managed constipation with conservative treatment, and it disappeared as the child grew.

Postoperative anal soiling and incontinence improved over time with meal modification, enemas, and toilet training in the TSARP and modified ASARP groups but did not improve in some patients in the PSARP and classic ASARP groups, which might be attributed to the disruption of the nerve ending during the excision of the external sphincter and its repair. Thus, voluntary bowel control and anocutaneous reflex and anal squeeze response on rectal examination were better in the TSARP and modified ASARP groups.

There was no difference among the different operative technique groups in terms of anal stenosis. We managed postoperative anal stenosis by postoperative anal dilatations before the patients' discharge from the hospital and then with frequent anal dilation at routine follow-ups in the outpatient clinic for 6 months. Anal dilatations under general anesthesia could be performed for patients with severe anal tightness. Severe anal stenosis occurred in two out of fourteen patients. This is in line with the finding of a study by Elsawaf and Hashish that found six out of 30 patients had anal stenosis; one patient had severe stenosis and required dilatation under general anesthesia, whereas the other five patients were managed with regular daily dilatations.¹²

The TSARP group had the lowest percentage of patients with perineal scarring and the highest percentage of parents who were satisfied with the cosmetic appearance and continence; this was consistent with the outcomes of Kamal's study.⁵ We recommend this type of operation for patients with vestibular fistulae because the other types of postoperative complications such as recurrent fistula or anal migration were not significantly different among the different operative technique groups. We also believe that the external sphincter muscle can be noted after the complete dissection of the rectum without the need for a midline skin incision as required in modified ASARP. Also, PSARP is the preferred method because of the low incidence of vaginal wall injuries. It is still the most public and the easiest procedure for pediatric surgeons.

The present study has a limitation. Four different surgeons performed the operations instead of only one. More randomized studies with a larger sample size are needed.

Conclusions

All single-stage operations studied appear to be suitable for the repair of vestibular fistulae in infants as well as children. All of them resulted in good anal continence in this study. TSARP may provide the best postoperative cosmetic appearance, parent satisfaction, and functional outcome, followed by modified ASARP. PSARP allows the best visualization with the lowest incidence of vaginal tear. All single-stage operations studied had nearly the same outcomes regarding bowel continence after 6 months and 1 year because of the healing power of the body.

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