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ORIGINAL ARTICLE

Risk Factors for Wound Dehiscence After Posterior Sagittal Anorectoplasty In Children With Anorectal Anomalies

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ABSTRACT

Background: Wound dehiscence after PSARP is a considerable complication which may affect the functional outcome. The aim of our study is to assess the frequency of wound dehiscence after posterior sagittal anorectoplasty done for children with ARM and to identify the possible risk factors predisposing for it.

Methods: A retrospective chart study where files of children with ARM who underwent PSARP in Pediatric Surgery Department in Zagazig University between 2015 and 2020 were reviewed and analysed regarding the incidence of post-operative wound dehiscence and the possible predisposing factors including type of surgery, was it single- or multi-staged, gender, age, prematurity, birth weight, type of ARM, associated anomalies and use of antibiotics.

Results: Eighty-six patients with ARM operated by PSARP were included. Multi-staged repair was done in 49 patients and single-staged in 37 patients. Wound dehiscence was significantly more common in single-staged repair (43.2%), while only 20.5% of patients of multi-staged group experienced dehiscence. ARM associated with cardiac anomalies is another significant risk factor. None of the other studied factors was identified to be considered as a risk factor for dehiscence.

Conclusion: Wound dehiscence was more common in single-staged PSARP. Association of cardiac anomalies is another significant risk factor for wound dehiscence. We recommend to avoid single-staged PSARP in patients of ARM associated with cardiac anomalies, to avoid adding of another risk factor. No other significant risk factor for wound dehiscence was detected in our study. Further studies are recommended to search for other possible contributing factors.

Keywords: Wound Dehiscence, Anorectoplasty, Anorectal Anomalies.



INTRODUCTION

Posterior sagittal anorectoplasty (PSARP) described by Pena is still the most common technique for repair of anorectal malformations (ARM)^[1,2,3]. PSARP reconstructive surgery could be conducted through a single-staged procedure or a multi-staged procedure with proximal diverting colostomy, depending on the type of ARM^[1,4]. Fecal diversion by proximal colostomy in multi-staged repair facilitates the repair and theoretically decreases the risk of post-operative wound complications. However, if colostomy prevents post-operative wound complications or not is still a matter of debate^[5,6,7]. PSARP has many post-operative complications which may be mild like anal stenosis requiring simple dilatation, or severe complications like urinary tract infection or damage, recurrent fistula or wound dehiscence. The post-operative complications are known to increase morbidity, patient suffering, consuming the health care resources and may affect the final outcome and the state of continence^[5,8].

Wound dehiscence is one of the considerable early post-operative complications of PSARP. Dehiscence can be classified as superficial (skin dehiscence only) or deep dehiscence including disruption of the repaired muscles. The prevalence of wound complications in ARM and the risk factors for them has not been fully investigated despite the probable relevance for patient morbidity and final outcome^[5].

So, the aim our study is to assess the frequency of wound dehiscence after PSARP, with trial to identify the possible risk factors that may predispose for the post-operative wound disruption.

METHODS

Study Design: This study is a retrospective cohort study. The medical records of all patients with anorectal anomalies (ARM) admitted and managed in Pediatric Surgical Department, Zagazig University, Egypt during the period from Jan, 2015 to Jan, 2020. All admitted patients were treated by posterior sagittal anorectoplasty (PSARP), limited

PSARP, or posterior sagittal anorectovagino-urethroplasty (PSARVUP).

The study population included all patients who had complete documented records. Patients with incomplete records, who had missed data, who did not attend for post-operative follow up, and who continued their management in another facility were excluded from our study.

The included patients' records were revised and evaluated concerning: the type of ARM according to Krickenbeck classification^[9], gestational age, birth weight, associated other congenital anomalies. Operative data concerning the type of repair, was it PSARP, Limited PSARP or PSARVUP, was it single-staged or multi-staged repair with colostomy. Patient age and weight at surgery was also evaluated. Also, data concerning peri-operative routines, including operative time, post-operative fasting period and use of prophylactic antibiotics were collected.

The related complications noted during the first post-operative 4 weeks, such as complications related to the urinary tract, recurrent fistula, wound infection, sepsis, or wound dehiscence were revised and recorded. Complications were graded according to the Clavien-Dindo classification^[10]. Wound dehiscence was defined as superficial (skin dehiscence only) or deep dehiscence including disruption of the repaired muscles^[5].

Written informed consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Surgical management: According to the local protocol for the management of admitted ARM, all cases on admission were subjected to meticulous clinical examination, routine laboratory investigations, assessment of the type of ARM using different methods according to indication, including colostogram, contrast studies for urinary tract, MRI for pelvic floor muscles. Investigations for associated congenital anomalies also were done if indicated, like plain x-ray, US, echocardiogram, MRI in cases of suspected spinal malformations and chromosomal studies for suspected cases.

Patients were given clear oral fluids 24h and kept fasting 6h before surgery. Pre-operative prophylactic antibiotics (Cephalosporins 50mg/kg/dose and metronidazole 7.5mg/kg/dose) were initiated. Post-operative antibiotics were given in some cases according to the clinical evaluation (Cephalosporins twice daily and metronidazole three times per day for total of 5 days).

The operative technique was selected according to the type of the type of ARM, either PSARP, limited PSARP without supralelevator dissection, or PSARVUP in cases of cloaca. Surgery was done as originally described by Peña^[11] where an incision is created dividing the sphincter mechanism in the midline until the posterior rectal wall is identified and then opened and identification of the fistula site is done and dissected from the rectal wall and suture ligated. The dissection then continues cephalad to obtain a good length of the rectum to allow tension free anastomosis at the site of neo-anus. The sphincter is then repaired carefully in layers and skin approximated using 4/0 sutures and the rectum is anastomosed to the skin. Surgery was done as a single-staged procedure or as a multi-staged procedure with diverting proximal colostomy.

After surgery, oral feeding was started after regaining of bowel motility in patients with colostomy. Patient without colostomy were kept fasting for a period of 5–7 days after surgery, total parenteral nutrition was given in some cases according to indications.

Wound care was heterogenous with normal saline solution cleansing, betadine sol. 10%, and dressings. In cases of wound infection, a swab was taken for culture and sensitivity and the suitable parenteral antibiotics were given.

After discharge, the patients were followed up in the out-patient clinic every 7 days during the first month, then every month for 6 months. During follow up, any complication was noted, recorded and managed.

STATISTICAL ANALYSIS

Data collected throughout history, basic clinical examination, investigations, operative and peri-operative data, and outcome measures coded, entered and analysed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean \pm SD and range, the following tests were used to test differences for significance; difference and association of qualitative variable by Chi square test (X^2). Differences between quantitative independent groups by t test or Mann Whitney. P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS

Patients: A total of 86 patients with ARM, managed by PSARP, limited PSARP or PSARVUP were included in this study. Surgery was done as a single-staged posterior sagittal anorectoplasty for 37 patients and a multi-staged

repair with colostomy for 49 patients. **Table (1)** displays the detailed background of these patients. Boys were more common (50 patients). Most of babies were full term (73 patients), while 13 patients were premature. Twenty patients had low birth weight. Most of patients underwent single-staged repair were of low ARM anomalies, they were younger and lighter in weight (**Table 1**).

The subtype of the ARM in the studied group is presented in **Table (2 & 3)**, the commonest type was the perineal fistula (36 patients). Vestibular fistula was significantly associated with female gender patients and rectourethral and rectovesical were associated with male gender.

Perineal fistula was significantly associated with Single-staged repair but Rectourethral, Rectovesical and Without fistula were significantly associated with Multi-staged repair.

The number of patients with associated congenital anomalies (with at least one anomaly) in the studied group of ARM was 60 patients. **Table (4)** shows the details of these anomalies.

Patients with concomitant malformations (Urinary tract, Genital, Vertebral and spinal, GIT and VACTERL association) were significantly associated with multi-staged repair.

Wound dehiscence: Out of 86 patients operated by PSARP, wound dehiscence occurred in 26 patients (30%), 18 of them had superficial dehiscence affecting the skin only, and 8 patients

had complete deep wound dehiscence. All wound dehiscence occurred within the first 2 weeks after surgery. Most of cases occurred between 3rd to 5th post-operative day.

Swabs taken from infected wound for culture and sensitivity showed growth of E-coli, Enterococci and Staphylococci species. The severity of dehiscence according to Clavien-Dindo classification is shown in **Table (5)**. Medical treatment was significantly associated with multi-staged repair but Examination under GA and subsequent colostomy were significantly associated with single-staged repair. Wound dehiscence occurred with a significantly lesser degree among patients of multi-staged PSARP with colostomy (20.5%), while occurred in 43.2% of patients with single-staged PSARP (**Table 5**).

Patients of ARM with associated congenital cardiac anomalies also had a significantly higher incidence of wound dehiscence (**Table 6**). The wound dehiscence group showed no statistical difference regarding the gender, low birth wt., wt. and age at surgery, associated anomalies (excluding cardiac anomalies), VACTERL anomalies and use of prophylactic antibiotics in comparison to the non-dehiscence group (**Table 6**). Single-staged repair and Cardiac anomalies were significant dependent predictors for wound dehiscence.

Table (1): Patients operated by PSARP for ARM.

	Total number of patients (N=86)	Multi-staged repair (N=49)	Single-staged repair (N=37)	P value
Sex				
– Male	50 (58.1%)	30 (61.2%)	20 (54.1%)	0.51
– Female	36 (41.9%)	19 (38.8%)	17 (45.9%)	
Age at repair (Months)	15.36±9.25 (0.1-42)	16.69±10.98 (0.25-42)	13.28±7.58 (0.1-33)	0.095
Duration between colostomy and definitive surgery (Months)	-----	4.51±1.17 (3-6)	-----	-----
Weight at repair (gm)	8169.6±315.9 (2100-13000)	8234.6±795.6 (3200 – 13000)	7989.63±989.6 (2100 – 11300)	0.068
Maturity				
– Premature babies	13 (11.6%)	10 (20.4%)	3 (8.1%)	0.06
– Mature babies	73 (88.4%)	39 (79.6%)	34 (91.9%)	
Birth weight				
– Low birth wt.	20 (23.2%)	15 (30.6%)	5 (13.5%)	0.067
– Normal	66 (76.8%)	34 (69.4%)	32 (86.5%)	

PSARP: Posterior Sagittal Anorectoplasty, ARM: Anorectal Malformation, absolute number,n, percentage (%).

Table (2): Subtypes of ARM in operated patients.

	Total number of patients (N=86)	Multi-staged repair (N=49)	Single- staged repair (N=37)	P value
Perineal	36 (41.8%)	9 (18.3%)	27 (72.9%)	<0.001**
Vestibular	19 (22.1%)	11 (22.4%)	8 (21.6%)	0.87
Rectourethral	22 (25.5%)	20 (40.8%)	2 (5.4%)	<0.001**
Rectovesical	3 (3.4%)	3 (6.1%)	0 (0%)	0.039*
Cloaca	2 (2.3%)	2 (4.1%)	0 (0%)	0.095
Without fistula	4 (4.6%)	4 (8.2%)	0 (0%)	0.011*

* Significant ** Highly significant

Table (3): Subtypes of ARM in operated patients.

	Number of patients			P value
	Total (N=86)	Male (N=50)	Female (N=36)	
Perineal	36 (41.8%)	22 (44.0%)	14 (38.8%)	0.507
Vestibular	19 (22.1%)	0 (0.0%)	19 (52.7%)	<0.001**
Rectourethral	22 (25.5%)	22 (44.0%)	0 (0%)	<0.001**
Rectovesical	3 (3.4%)	3 (6.0%)	0 (0%)	0.04*
Cloaca	2 (2.3%)	0 (0%)	2 (5.5%)	0.055
Without fistula	4 (4.6%)	3 (6.0%)	1 (2.7%)	0.26

* Significant ** Highly significant

Table (4): Associated Anomalies in the studied group of ARM.

	Total number of patients (N=86)	Multi-staged repair (N=49)	Single- staged repair (N=37)	P value
Patients with concomitant malformations, Total (at least one)	60 (69.7%)	41 (83.6%)	19 (51.3%)	0.007*
Cardiac	21 (24.4%)	13 (26.5%)	8 (21.6%)	0.46
Urinary tract	24 (27.9%)	20 (40.8%)	4 (10.8%)	<0.001**
Genital	10 (11.6%)	8 (16.3%)	2 (5.4%)	0.02*
Skeletal	17 (19.7%)	12 (24.4%)	5 (13.5%)	0.072
Vertebral and spinal	23 (26.7%)	17 (34.6%)	6 (16.2%)	0.013*
GIT	10 (11.6%)	8 (16.3%)	2 (5.4%)	0.021*
VACTERL association	13 (15.1%)	10 (20.4%)	3 (8.1%)	0.024*
Trisomy	9 (10.4%)	6 (12.2%)	3 (8.1%)	0.38

* Significant ** Highly significant

Table (5): Degree of wound Dehiscence in 26 patients according to Clavien-Dindo classification.

	Dehiscence 26/86 (30.2%)	Multi-staged repair 10/49 (20.5%)	Single-staged repair 16/37 (43.2%)	P value
Degree of dehiscence:				
– Superficial (skin only)	18 (69.3)	6 (60.0%)	12 (75.0%)	0.42
– Deep	8 (30.7)	4 (40.0%)	4 (25.0%)	
Clavien-Dindo				
(1) No treatment	6 (23.1%)	2 (20.0%)	4 (25.0%)	0.37
(2) Medical treatment	16 (61.5%)	8 (80.0%)	8 (50.0%)	0.008*
(3a) Examination under GA	1 (3.8%)	0 (0%)	1 (6.2%)	0.036*
(3b) Required colostomy	3 (11.5%)	0 (0%)	3 (18.7%)	<0.001**
ICU	0 (0%)	0 (0%)	0 (0%)	—
Death	0 (0%)	0 (0%)	0 (0%)	—

* Significant ** Highly significant

Table (6): Predictors of wound dehiscence distribution among studied groups.

		Number of patients (N=86)	Patients with wound Dehiscence (N=26)	Patients without wound Dehiscence (N=60)	P value
Repair	Multi-staged repair	49 (56.9%)	10 (38.4%)	39 (65.0%)	0.022*
	Single-staged repair	37 (43.1%)	16 (61.6%)	21 (35.0%)	
PSARP	PSARP	35 (40.6%)	12 (46.1%)	23 (38.3%)	0.61
	Limited PSARP	49 (56.9%)	13 (50.0%)	36 (60.0%)	
	PSARVUP	2 (2.5%)	1 (3.9%)	1 (1.7%)	
Age (months)		15.36±9.25 (0.1-42)	13.89±8.69 (0.1-38)	16.41±9.78 (0.2-42)	0.26
Sex	Male	50 (58.1%)	16 (61.6%)	34 (56.6%)	0.67
	Female	36 (41.9%)	10 (38.4%)	26 (43.4%)	
Weight at surgery		8169.6±315.9 (2100-13000)	7998.6±563.2 (2300-9500)	8228.6±789.6 (2100-13000)	0.142
Low birth wt.		20 (23.2%)	7 (26.9%)	13 (21.6%)	0.46
Cardiac anomalies		12 (13.9%)	8 (30.7%)	4 (6.7%)	0.0001**
With associated anomalies		60 (69.7%)	20 (76.9%)	40 (66.7%)	0.41
VACTERL association		13 (15.1%)	5 (19.2%)	8 (13.3%)	0.28
Antibiotics					
	- Less than 24h	54 (62.8%)	16 (61.6%)	38 (63.4%)	0.87
	- More than 24h	32 (37.2%)	10 (38.4%)	22 (36.6%)	

PSARP: Posterior Sagittal Anorectoplasty, **PSARVUP:** Posterior Sagittal Anorectovagino-Urethroplasty

* Significant ** Highly significant

DISCUSSION

Wound dehiscence is a considerable early post-operative complication after PSARP. Wound disruption has a bad impact, as it prolongs patient suffering and convalescence, deep dehiscence may cause retraction of the neo-anus which may require redo surgical repair, also deep dehiscence may affect the final functional outcome and the state of continence. The rate of wound dehiscence after PSARP was reported by many authors^[5,11-14] and ranged between 0 to 40%. Most of these reports did not analyse the predisposing factors for the dehiscence. *Tofft et al.*^[5] did a retrospective study to search for the risk factor for wound dehiscence after PSARP. They found that dehiscence was much more frequent in case of single staged PSARP done without colostomy (43%) in comparison to multi-staged repair under colostomy cover (22%). They did not found any other valuable risk factor^[5]. Another previous study was done in our Pediatric Surgical Department in Zagazig University in 2018 which included 70 girls with vestibular anus, for comparison between single and multi-staged PSARP. In that study, the incidence of wound dehiscence was also much more common in single staged repair (29%), while dehiscence occurred only in 4.3% in cases done under cover of colostomy^[15]. In our present study, dehiscence occurred in 43.2% of cases done as a single-staged repair, while it occurred in only

20.5% of cases done as a multi-staged repair with colostomy. So, repair without colostomy is a significant risk factor. This result was in agreement with the results of *Tofft et al.*^[5]. Colostomy diverts the stool and prevents faecal bacterial contamination of the perineal wound, and protect the surgical site after PSARP.

Association of congenital cardiac anomalies is another significant risk factor for wound dehiscence recorded in our study. This is logic and expected, as healthy heart is a leading factor in wound healing^[16]. Heart diseases can negatively affect wound healing when there is reversal of blood flow through shunts or septal defects leading to tissue hypoxia or in the presence of anemia or hypotension. No other risk factors for wound dehiscence were detected in our study, regarding the gender, age at surgery, weight at surgery, association of other congenital anomalies (other than cardiac), VACTERL association, and use of postoperative antibiotics. However, it seems that the repair without colostomy is not the only risk factor, because wound dehiscence occurred also in some cases in which colostomy was done. That is why we should expect other risk factors. Actually, there are other risk factors which were not included in our study because we did not found enough documented data about it. One of these factors is the experience of the surgeon who did the operation. Expert surgeons can do this repair with

meticulous dissection, proper haemostasis, gentle handling of the tissues. Extensive dissection, rough handling of the tissues and excessive use of diathermy cause tissue damage and haematoma formation which predispose to wound infection and disruption. Another factor is the suture material used in repair, as the use of monofilamentous sutures reduces the incidence of surgical site infection^[5]. Also, another factor, which is the study of the microbiota of the gut (gut flora) of the patient, which was recently introduced as a factor affecting wound healing^[17,18]. We hope to include these factors in the following further studies.

CONCLUSION

Wound dehiscence was more common in single-staged PSARP done without colostomy. Also, dehiscence was more frequent in ARM patients with associated cardiac anomalies. So, we recommend to avoid single-staged PSARP in patients with associated cardiac anomalies, to avoid adding another risk factor. No other significant risk factor for wound dehiscence was detected in our study. Because wound dehiscence is still occurring, in a lesser degree, in some cases done under cover of colostomy, further studies are recommended to search for other contributing risk factors.

Limitations of the study: The long-term outcome of patients who had wound dehiscence and its effect on continence couldn't be evaluated as the mean age of patients was 15 months and the follow up period was not long enough to allow for toilet training and evaluation of continence.

Conflict of Interest: None.

Financial Disclosures: Nothing to declare.

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