

TABLE OF CONTENTS

POSTERIOR SAGITTAL APPROACH FOR OTHER CONDITIONS	PAGE
Posterior Sagittal Transrectal Approach for the Treatment of Urogenital Sinus with the Normal Rectum	2
The Posterior Sagittal Trans-sphincteric and Trans-rectal Approaches	10
The Posterior Sagittal Approach for Genitourinary Pathology	20

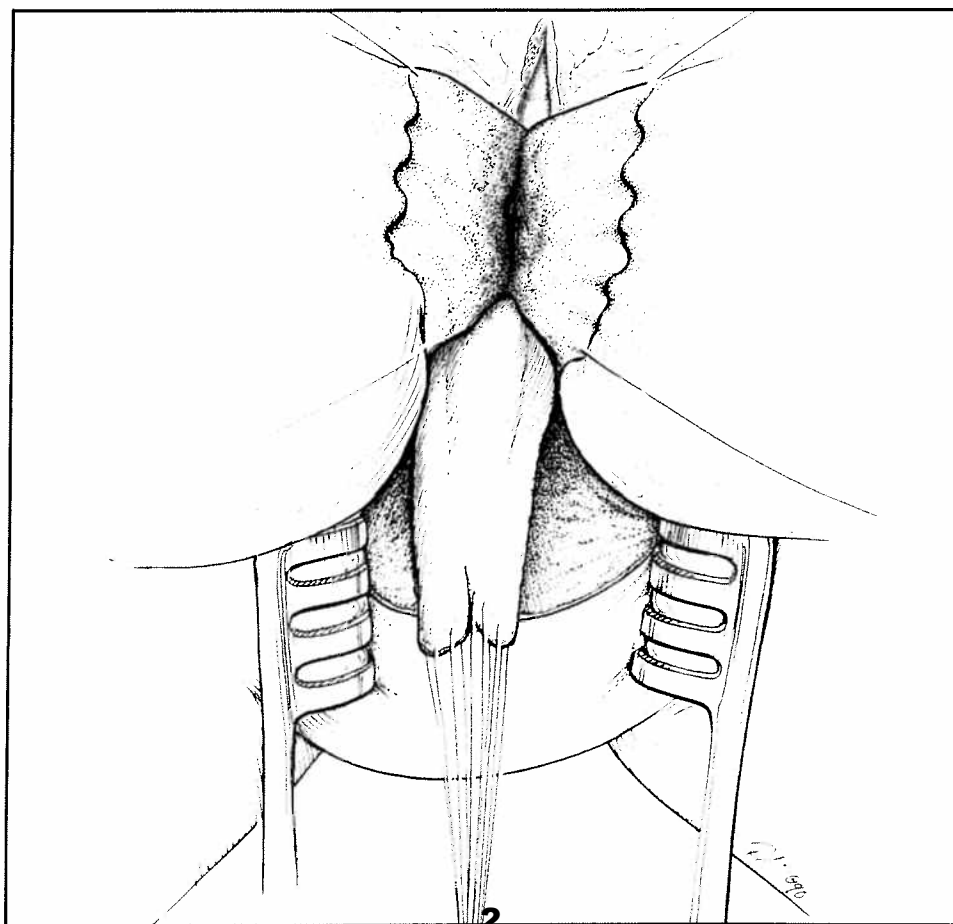
Current SURGICAL TECHNIQUES in UROLOGY

Carl A. Olsson, MD, Editor

Posterior Sagittal Transrectal Approach For the Treatment of Urogenital Sinus With Normal Rectum

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The treatment of urogenital sinus with normal rectum still presents a challenge to pediatric surgeons and urologists. When the vagina is connected to the urethra—very low and close to the external opening of the sinus—treatment is relatively easy via a perineal approach with widening of the vaginal opening with or without the use of a skin flap. However, when the vagina connects with the urethra higher in the pelvis (more than two centimeters), this type of perineal approach may not be good enough to achieve a functional vagina with a good external opening. For this specific type of defect, some surgeons have designed more aggressive types of operations, including an abdominoperineal pullthrough.

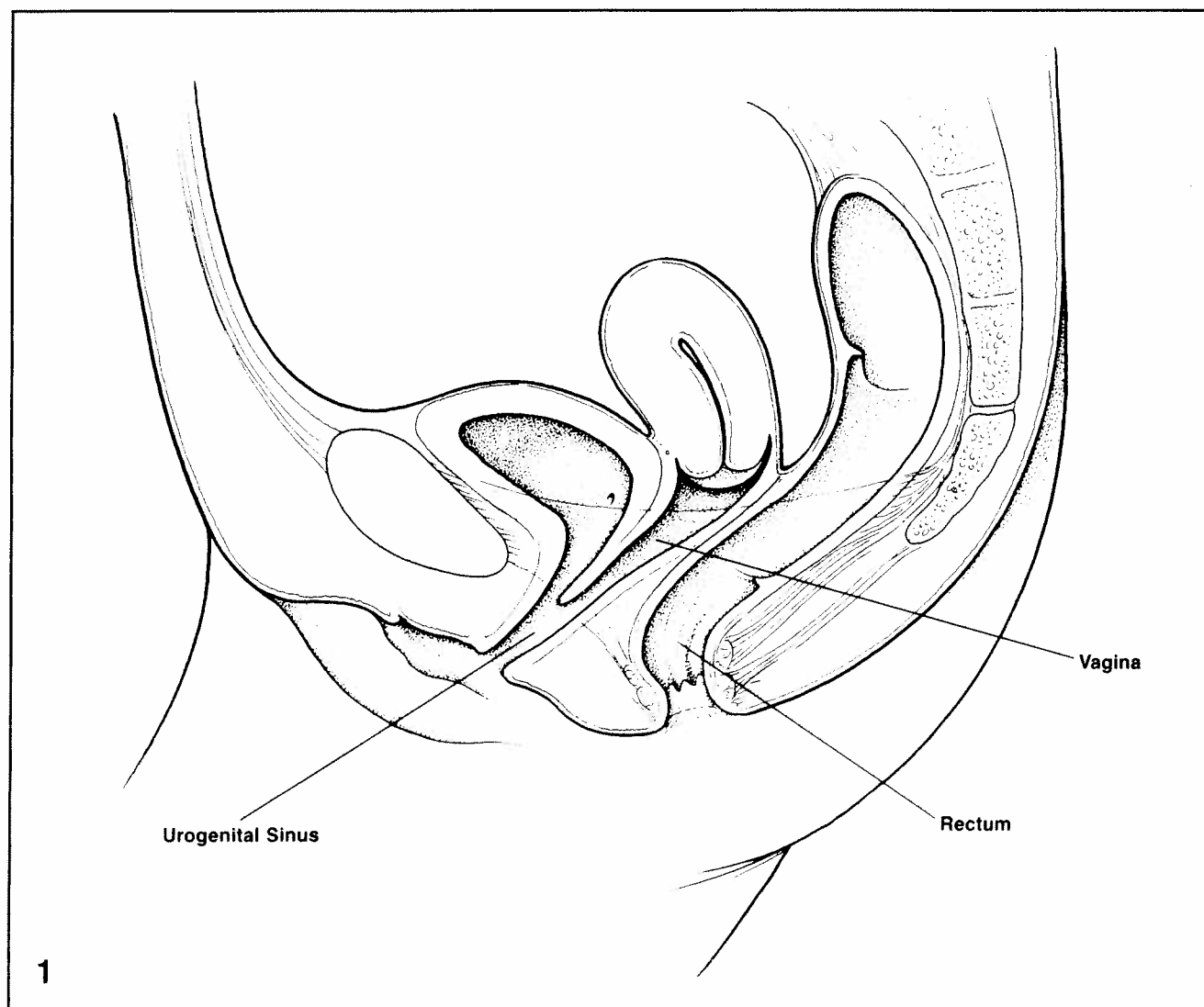
The vagina and urethra share a com-

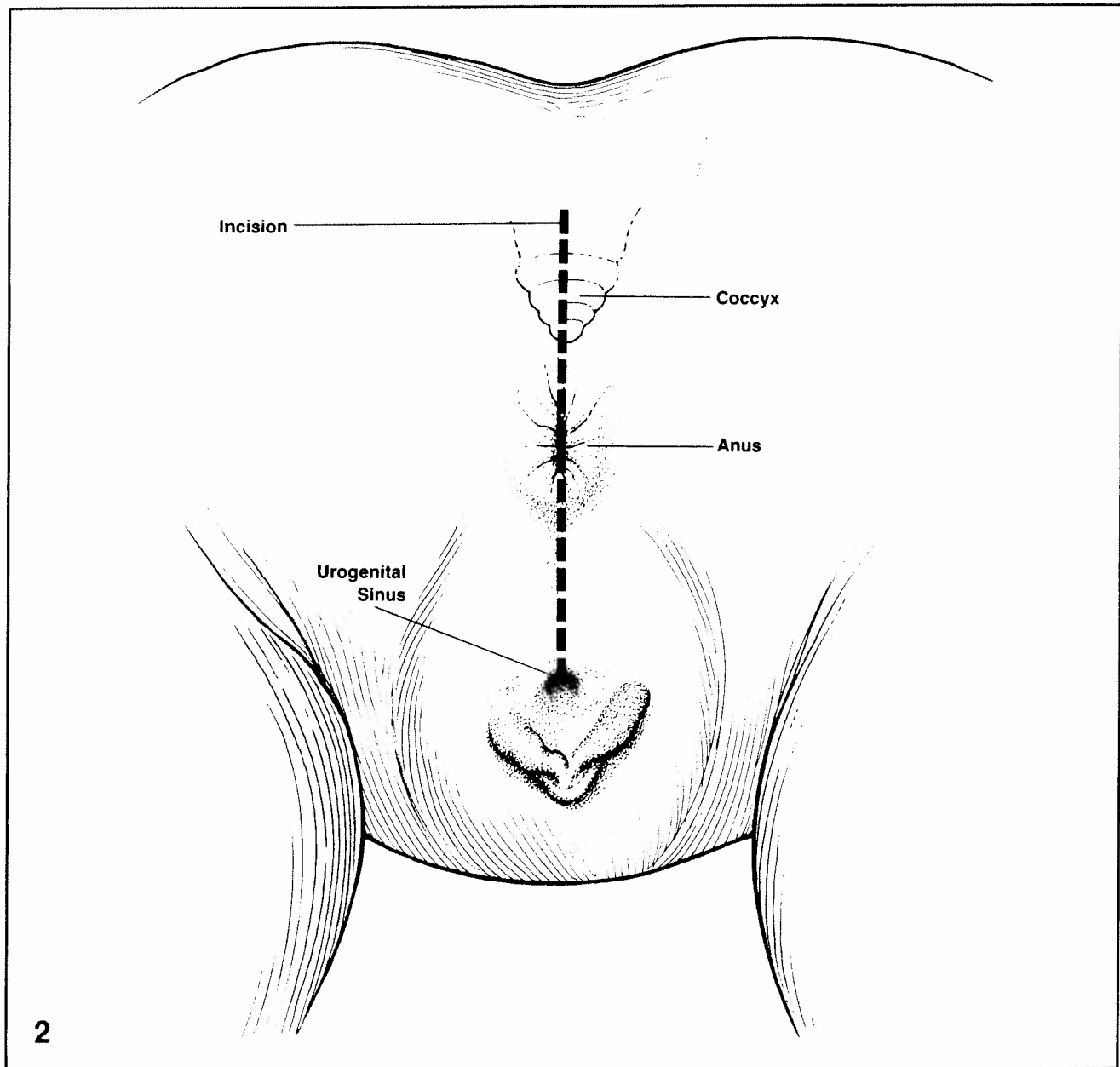
mon wall immediately above their common channel (urogenital sinus), as shown preoperatively in Figure 1. The separation of the anterior vaginal wall from the posterior urethral wall is a difficult task, but failure to separate these two structures increases the chances of a poor result in the repair of this defect.

During the last ten years, I have used the posterior sagittal approach for the treatment of anorectal malformations, including persistent cloacas. The repair of a persistent cloaca includes the separation of the rectum from the vagina and then the separation of the vagina from the urinary tract, as in cases of urogenital sinus. On the basis of my experience with more than 80 cases of persistent cloaca in which I operated via a posterior sagit-

tal approach, I recently used a similar approach to repair a urogenital sinus. The main difference between these two conditions is that the urogenital sinus has a normal rectum.

Total mobilization of the rectum, including a circumferential dissection, leads to denervation and may lead to fecal incontinence. Therefore, a transrectal approach was designed. The rationale for this technique consists in opening all the muscle structures, posterior sagittally, exactly in the midline to avoid any nerve damage. The posterior and anterior rectal walls are also divided in the midline to approach the perineum. With this technique, the rectum is opened like a book and the exposure of the operative field is excellent.





Description of the operation

The perineum of a child with a urogenital sinus and normal rectum is shown in Figure 2. A midline incision

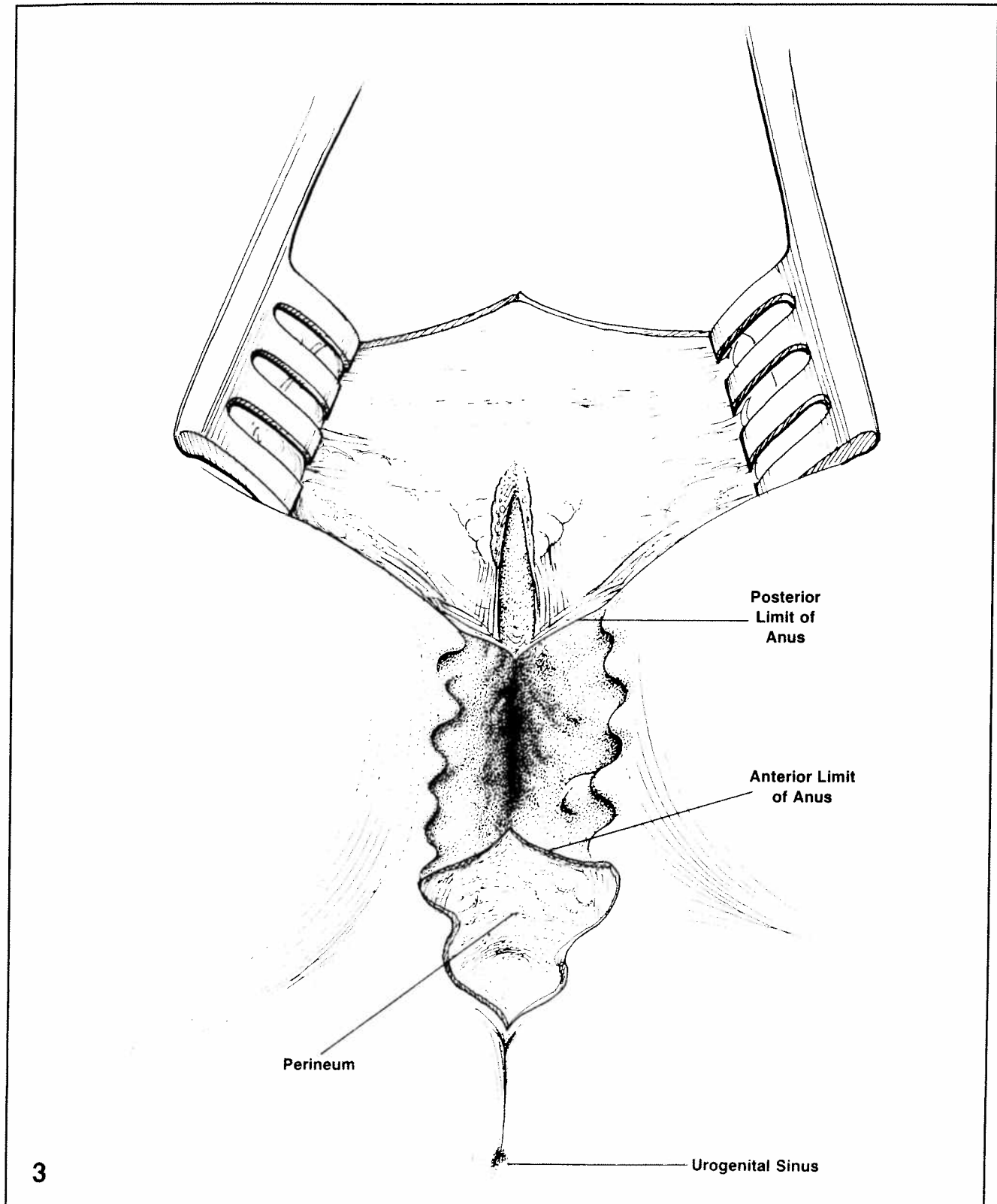
is made beginning a few centimeters above the coccyx. The use of an electrical stimulator facilitates the identification of muscle structures

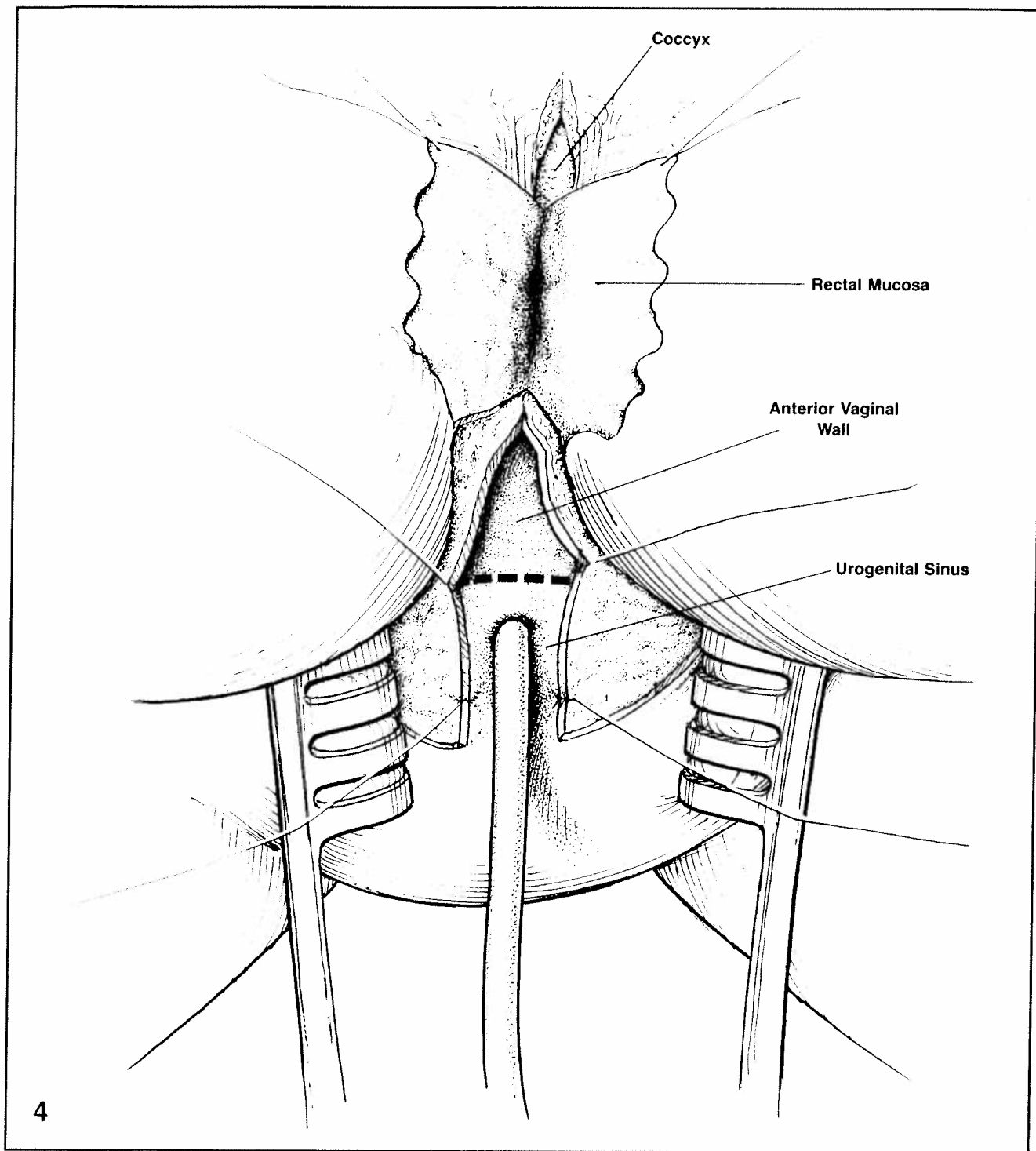
and guarantees that the incision is made in the midline. The intention is to leave an equal quantity of muscles on both sides of the midline.

The beginning of the incision with a split coccyx is shown in Figure 3. The posterior rectal wall has been divided, as has the anterior; the pec-

tinate line dividing the rectum from the anal canal is appreciated and the incision is continued into the perineum. The operation is performed

with the use of a very fine, needletip cautery to provide meticulous hemostasis.

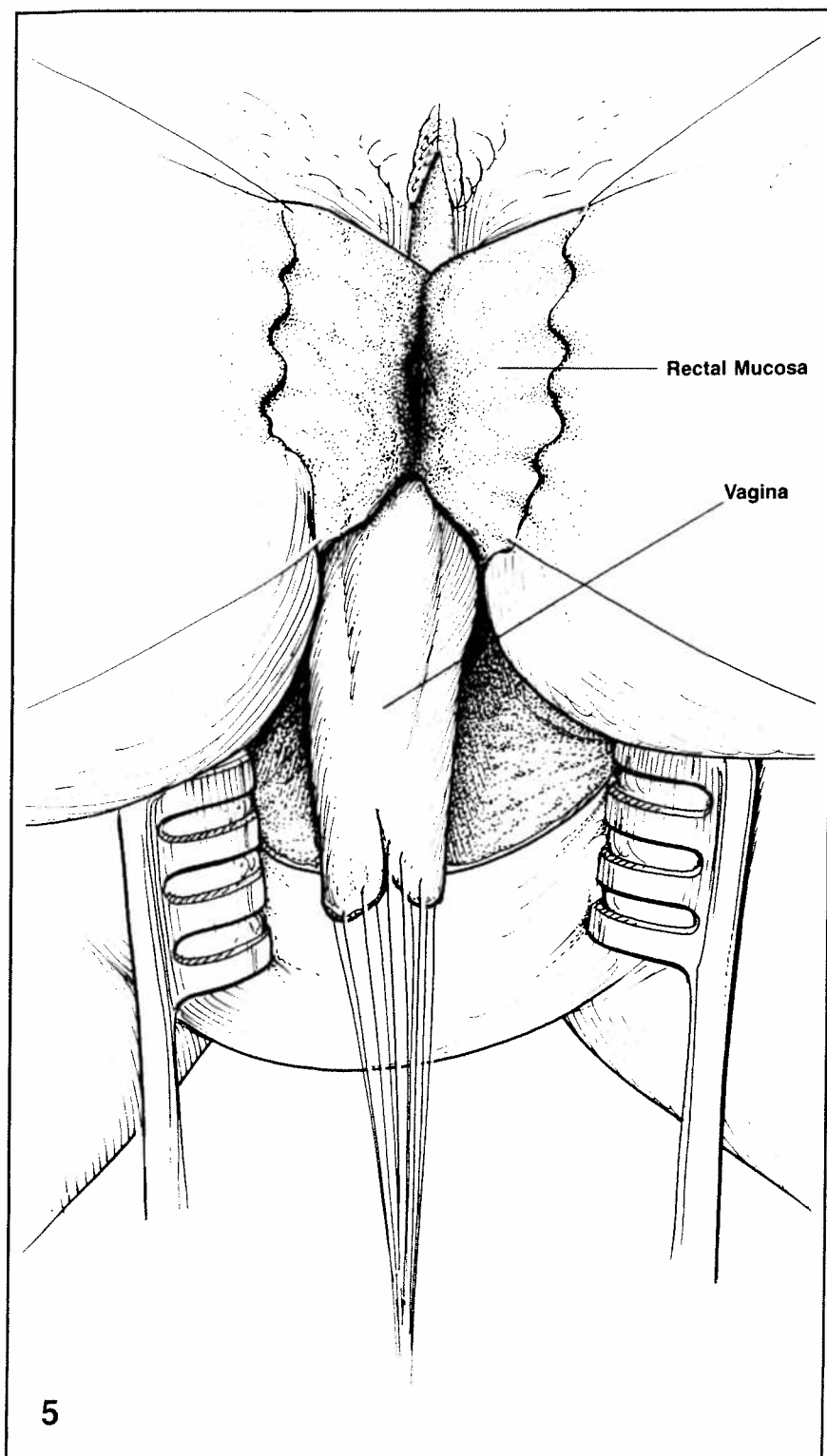




The complete division of the rectum, as shown in Figure 4, exposes the opening of the urogenital sinus. The lumen of the vagina is easily seen; the urogenital sinus, in this case, is approximately 2.5 cm long and is opened. A Foley catheter has been

inserted into the bladder. The vagina is now separated from the urethra. Multiple 5-0 silk stitches are placed and grasp the mucosa of the anterior vaginal wall. These stitches are used to exert uniform traction on the vagina during its separation from the

urinary tract, because it is important that the operation create a plane of separation between these two structures (since there is no natural anatomical plane between them).



The completely mobilized vagina is shown in Figure 5. Once the vagina has been separated from the urinary tract, circumferential dissection is carried out. This is done while placing sufficient traction on the silk stitches of the vagina to obtain enough length to create a comfortable, tension-free anastomosis between the vagina and the perineal body. The urethra is then reconstructed over the Foley catheter. This reconstruction is performed in two layers with interrupted, long-lasting, absorbable sutures. Then the vagina is anastomosed to the perineum, immediately behind the urethra. The anastomosis between the vagina and the skin or the labia is done with interrupted, 5-0, long-lasting, absorbable sutures.

The perineal body is reapproximated (with interrupted, 4-0, long-lasting, absorbable sutures), including the anterior portion of the parasagittal fibers of the external sphincter. Then, the anterior rectal wall is reconstructed in two layers (with the same suture material), as is the posterior rectal wall. Special attention is given to the reconstruction of the muscle mechanism posterior to the rectal wall; this includes the reapproximation of the parasagittal fibers, muscle complex, and levator muscle.

The complete repair of this defect is shown in Figure 6. The Foley catheter is left in place in the bladder for five to seven days. In unique situations in which the length of the urethral reconstruction was particularly long, or when a need for extra protection is anticipated, a suprapubic cystostomy tube is placed in the bladder.

It is imperative that these repairs be protected with a descending colostomy with separated stomas created during a previous procedure. Without the protective colostomy in these patients with normal innervation and bowel control, a severe infection could develop in this area and jeopardize the patient's bowel control. Laterally mobilizing the rectum in order to avoid establishing a colostomy would also be incorrect, as it could denervate the rectum.

Ampicillin and gentamicin should be administered to these patients at the time of surgery and continued post-operatively for three days. ■

Suggested Reading

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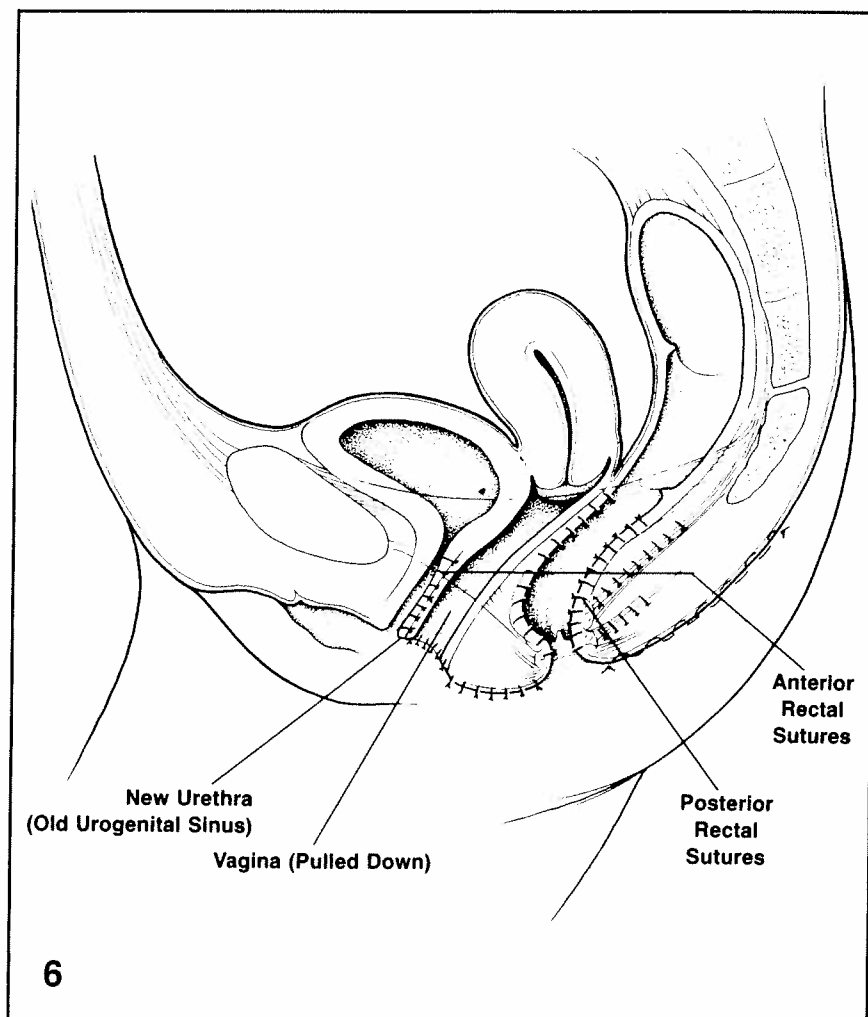
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ORIGINAL ARTICLE

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The posterior sagittal trans-sphincteric and trans-rectal approaches

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Abstract Background The posterior sagittal, transphincteric approach to treat different pelvic problems has been known since the last century. Although some surgeons have embraced it and have enthusiastically advocated its use, it has never become an overly popular technique. The purpose of this study is to evaluate the advantages and disadvantages of the approach, both from a historical perspective and from the authors' experience. **Methods** The international literature on the subject was reviewed since 1877 up to the present date. A retrospective evaluation of the authors' experience was conducted. Specific attention was paid to the final result obtained in the treatment of the original condition, surgical complications and the effect of the surgical approach, on bowel and urinary control. **Results** The review included 114 patients divided into two groups. Group A included 85 patients who underwent a posterior sagittal trans-sphincteric approach. Group B included 29 patients who underwent a posterior sagittal transanorectal approach, in which the anterior wall of the rectum and the sphincter were divided. Postoperative bowel control was normal in all patients except in those whose basic condition had resulted

in fecal incontinence, or who had sustained an irreversible injury prior to the operation. Urinary control was normal except in cases with pre-operative incontinence. Complications included recurrence of rectogenito-urinary fistulae in 3 cases, rectocutaneous fistula in 3 patients with Hirschsprung's disease, and 2 partial wound dehiscences. **Conclusions** The posterior sagittal trans-sphincteric approach represents a useful technical alternative. It seems to be particularly useful to treat complications after surgery for Hirschsprung's disease, presacral masses, acquired rectogenito-urinary fistulae and idiopathic rectal prolapse. The transanorectal approach provides excellent exposure to the posterior urethra and vagina. Bowel and urinary control are not compromised.

Key words Trans-sphincteric approach • Trans-rectal approach • Hirschsprung's disease • Presacral mass • Urogenital sinus • Rectal prolapse

Introduction

There are multiple clinical conditions, including congenital anomalies, tumors and complications from trauma and injury, that require difficult surgical exposures for treatment. These lesions, located in the region posterior to the pubis and anterior to the concavity of the sacrum, seem to be located too low to be approached comfortably through the abdomen. On the other hand, when approached through the perineum, the lesions then appear to be very high. The inability to achieve adequate exposure in this particular area, perhaps, is the most plausible explanation for many anatomic misconceptions and surgical technical errors that occur during operations performed in this territory.

A posterior approach, between the buttocks, provides a definite advantage to operations performed for these conditions. There are, however, different modalities and variants

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to this approach. It is possible to approach these patients posteriorly, but not through the mid-line, which can be called "posterior parasagittal approach". Also, a posterior incision can be extended laterally to the sacrum, in order to reach higher places in the pelvis. This could be called a "parasacral approach". When the incision is located in the mid-line and divides the entire sphincter mechanism posterior to the rectum and anus, the approach is called "posterior sagittal trans-sphincteric" (PSTS).

The posterior approach has been used in the pelvis not only for the repair of rectal conditions, but also to have access to pelvic structures located anterior to the rectum. When the rectum is mobilized laterally to achieve exposure of the genitourinary structures, the approach receives the name of "posterior sagittal pararectal approach".

Finally, the senior author A.P. has experience with the posterior sagittal incision dividing both posterior and anterior rectal walls as well as posterior and anterior sphincter mechanisms, which then is called "posterior sagittal transanorectal" (PSTA) approach.

The name Paul Kraske [1] has been extensively and repeatedly used when referring to the origin of the posterior sagittal approach. Dr. Cripps [2], in England in 1877 (eight years before Kraske), discussed 36 cases of rectal cancer operated by him using a PSTS approach: he did not use a colostomy. In 1901, Weir [3] published 3 cases of patients with rectal cancer operated on via a PSTA. Arthur Bevan in 1917 [4] is perhaps the surgeon who should be credited with the initiation of this approach in the United States. Between 1943 and 1969, other authors [5, 6] presented short series of patients operated on with this kind of approach.

The most prominent contemporary leader of the trans-sphincteric approach in adults is unquestionably Dr. York Mason [7–9]. When treating recto-urethral fistulae using this approach, he worked with Dr. Kilpatrick, a urologist [10]. From the 1970s and until this day, several authors have developed a degree of experience with this approach [11–50]. Most of them have published short series. The most prominent are represented by Stephenson [43], Carbonell [45], Madsen [46] and Huber [47].

Diverting colostomy as an adjunct to prevent post-operative complications was first recommended by Kilpatrick and Mason [10]. The overwhelming majority of surgeons that used the trans-sphincteric approach reported that bowel control after that operation was good. Through history, there have been enthusiastic surgeons that have supported the use of this approach. Yet, nowadays, it is used rather rarely; at least that is the impression that one gets from the present day literature. This paper represents a retrospective review of the senior author's experience in the use of this approach, mainly in adults, in conditions other than congenital anorectal malformations. The main purpose is to re-evaluate the applications and advantages of this approach, as well as its limitations and potential complications.

Materials and methods

A Medline search of the international literature on the subject was performed, going as back as far as the last century, and concluding with the present date. Only papers that described a midline PSTS approach were included in this review. The senior author's experience includes 1325 patients with anorectal malformations operated on posterosagittally, and 114 patients, mainly adults, with other conditions. This last group represents the material of this publication.

On 10 August 1980, the senior author, for the first time, explored a child suffering from an anorectal malformation using the PSTS approach and dividing the entire sphincter mechanism located posterior to the urethra. All the available techniques prior to 1980 were based on the belief that children with anorectal malformations, particularly those born with the so-called high malformations, had only one potentially useful muscle that played a role in fecal continence. This muscle, called the puborectalis, theoretically inserted in one side of the posterior aspect of the pubic bone, extended posteriorly to surround the urethra and then swung anteriorly again to insert into the other side of the posterior pubis [51]. It was believed that this muscle was the only functionally useful structure in the reconstruction of patients with anorectal malformations. However, there was significant disagreement related to the actual location and characteristics of this structure. In reality, no one had actually seen the muscle except in post-mortem dissections. The anatomic structures found that particular day, and during all the following explorations, were radically different to what had been previously described. Figure 1 shows the general characteristics of the sphincter mechanism in a male child with imperforate anus and recto-urethral fistula, which is the most common defect seen in males [52, 53]. Further experience in female patients revealed findings that are generally similar to those depicted in Fig. 1 [54]. These findings are considered the basis for current techniques used to repair these malformations. Our clinical experience,

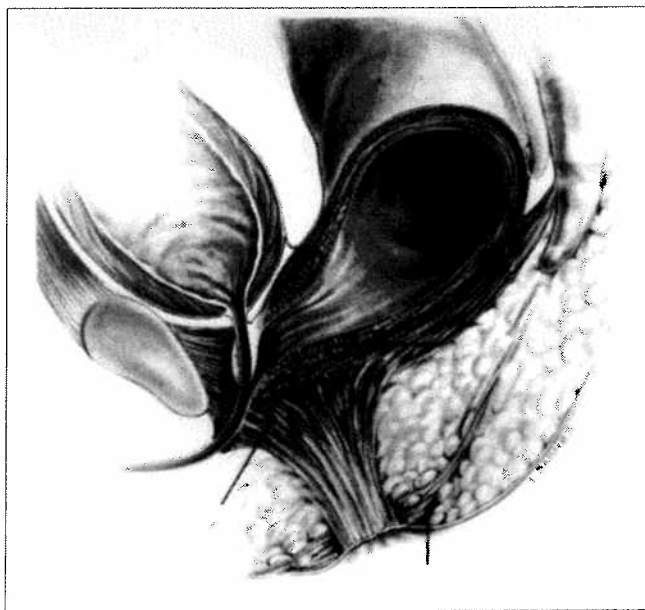


Fig. 1 Sagittal view showing the general characteristics of the sphincter mechanism seen in the most common type of anorectal malformation in male patients (From [54], with permission)

before and after an experimental study [55], made us believe that the division of the sphincteric mechanism followed by a meticulous reconstruction did not interfere with bowel control. This has also been studied by another group [56].

We retrospectively evaluated the senior author's series, including only patients approached posterosagittally by trans-sphincteric and transanorectal approaches, for the treatment of pelvic conditions other than anorectal malformations. The medical charts were reviewed; patients were contacted by letter, phone or personal interview. Information was obtained concerning type of condition, operative complications, functional sequelae such as fecal or urinary incontinence, and results in the treatment of the specific conditions. One hundred and fourteen cases were reviewed. The ages varied from 1 month to 85 years with a mean of 16 years. The follow-up varied from 16 years to 3 months.

Results

The patients were distinguished into two groups (Table 1):

- Group A: 85 patients operated on by a posterior sagittal trans-sphincteric (PSTS) approach. This group included 49 cases of Hirschsprung's disease, 15 presacral masses, 10 rectal tumors (6 carcinoma, 2 villous adenomas, 1 inflammatory pseudotumor and 1 leiomyosarcoma), 7 acquired recto-urinary fistulae and 4 patients with idiopathic rectal prolapse.
- Group B: 29 patients operated on by a posterior sagittal transanorectal (PSTA) approach. This group included 12 women with a urogenital sinus with normal rectum; 8 patients with acquired urethral stricture or atresia and 9 patients with a posterior urethral mass.

Table 1 Medical conditions indicating surgery in 114 patients, by type of surgical approach

Clinical indication	Patients, n
Posterior sagittal trans-sphincteric approach	
Hirschsprung's disease	49
Primary operation (n=21)	
Secondary operation (n=28)	
Presacral mass	15
Rectal tumor	10
Acquired rectogenito-urinary fistula	7
Rectal prolapse	4
Total	85
Posterior sagittal trans-anorectal approach	
Urogenital sinus	12
Urethral stricture or acquired (post-traumatic) atresia	8
Posterior urethral mass	9
Total	29

Table 2 Posterior sagittal trans-sphincteric (PSTS) approach for Hirschsprung's disease

Patients, n	49
Age, years	6.8 (0.5–23) ^a
Previous operations, n	28
Primary cases, n	21
Covering stoma, n	15
Postoperative fecal incontinence, n	5
Rectocutaneous fistula, n	3 ^b

^a Values are mean (range)

^b None had a covering stoma

PSTS approach

Hirschsprung's disease

A total of 49 patients were operated on posterosagittally for the treatment of Hirschsprung's disease (Table 2). Complications that led to referral included strictures, anastomotic dehiscence and retraction, rectocutaneous fistulae, or acquired recto-urethral or vaginal fistulae. Three patients had previously undergone Duhamel's operation, and suffered from intractable constipation. The PSTS approach allowed the resection of the aganglionic pouch, resection of any strictured bowel and closure of any abnormal fistula when indicated, and dissection of the normo-ganglionic bowel and reanastomosis above the pectinate line.

This experience gained in re-operative surgery prompted us to use the approach in primary cases of Hirschsprung's disease. Twenty-one patients underwent primary repair by this approach. In each of the three patients, who developed rectocutaneous fistulae, a colostomy was then created and the fistulae closed. In retrospect, it is not surprising that a fistula formed, given that in each case a sphincter mechanism was present that closed the rectum below the anastomosis. Furthermore, an aggravating factor is the fact that it is actually a T-shaped anastomosis, since it is a posterior sagittal incision plus a transverse bowel anastomosis. Because of this, we now use the transanal approach for most cases of primary Hirschsprung's disease, and use the posterior sagittal approach for re-operations. It truly seems to be the ideal way to treat many of the patients who have suffered catastrophic complications after previous failed operations.

Presacral Masses

Fifteen patients with presacral masses were operated on by this approach. The average age was 19.2 years, with a range of 3 months to 47 years. Histologic diagnoses included teratoma, dermoid, lipoma, anterior meningocele or a combination of these. Most patients complained of constipation pre-operatively. One patient came to the hospital for the first time when she was 19 years old and suffered from an unexplained abscess in the area of the coccyx. She was found to have an infected teratoma. Magnetic resonance imaging (MRI) renders the best images of this type of condition. Figure 2 pre-

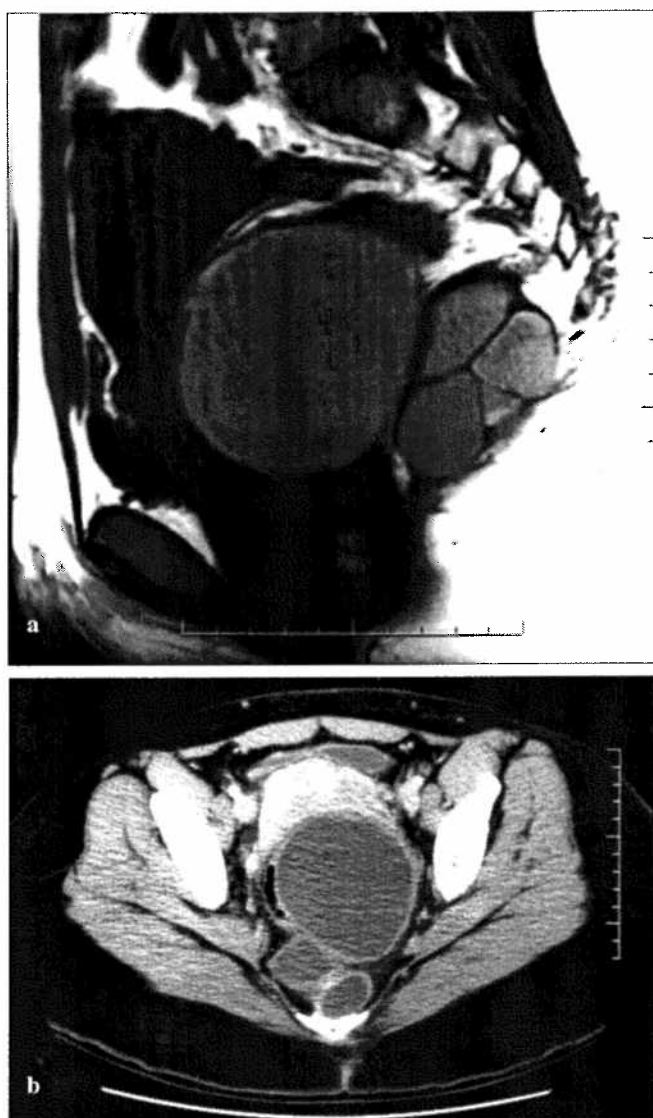


Fig. 2a, b MR images of a presacral mass. **a** Sagittal view. **b** Transverse view

sents an MR study, showing a presacral mass. Included in this group are two patients that suffered from chronic draining sinuses previously operated on multiple times under the belief that they had a recurrent pilonidal sinus. In reality, both of the patients had chronically infected teratomas.

The approach includes the complete division of the posterior sphincter mechanism, removal of the mass, and reconstruction of the sphincter. Postoperative bowel control was unchanged in all cases. There were no cases of postoperative fecal incontinence, and those patients who had significant constipation prior to the procedure continued to have the same problem.

Rectal tumors

Our experience has been limited to 10 cases (Table 3). All patients were approached posterosagittally; the entire posterior sphincter mechanism and distal posterior rectal wall

Table 3 PSTS approach for rectal tumors

Patients, n	10
Age, years	68 (14–85) ^a
Rectal cancer, n	6
Large villous adenoma, n	2
Inflammatory pseudotumor, n	1
Rectal leiomyosarcoma, n	1
Postoperative complications, n	0
Postoperative fecal incontinence, n	0
Cancer recurrence, n	2

^a Values are mean (range)

were divided. The rectum was divided transversely 1 cm above the pectinate line, and then dissected proximally in a circumferential manner, pulling it down until an adequate margin above the tumor was reached. The upper rectum was then anastomosed to the lower rectum above the pectinate line. Figure 3 shows the details of the surgical technique used to resect a rectal tumor. All patients recovered from the procedure without complication, and all of them had bowel control after the operation. The operations were found to be technically easy. This experience demonstrates that this approach may be useful for tumors in the rectum. However, the limited number of cases does not allow us to give an opinion about the value of the technique from an oncologic point of view. Of the 6 patients with cancer, 2 died within the first year for unrelated medical reasons.

Acquired rectogenito-urinary fistulae

Seven patients were treated for acquired fistulae (Fig. 4a) between the rectum and the vagina or urethra. All 7 cases were associated with radiation therapy: 6 men had prostatic cancer and one woman had cervical cancer. The average age was 61 years (range, 55–66 years). All patients were approached posterosagittally. The technique used was similar to that described for rectal tumors, except that once the proximal rectum was mobilized, the opening in the vagina or urethra was repaired and new rectosigmoid was pulled down, leaving a completely normal anterior rectal wall in front of the urethral or vaginal sutures (Fig. 4b). Three patients, 1 woman and 2 men, experienced recurrences. All three had giant fistulae, measuring 3–4 cm diameter, before surgery. The recurrent fistulae were all small, and healed after repeat operations. Five patients kept bowel control. Two patients have a degree of occasional soiling, most likely due in part to loose stool associated with radiation enteritis.

Idiopathic rectal prolapse

Four patients underwent surgery to treat rectal prolapse after all predisposing medical conditions were ruled out. The average age was 5.6 years (range, 2–8 years).

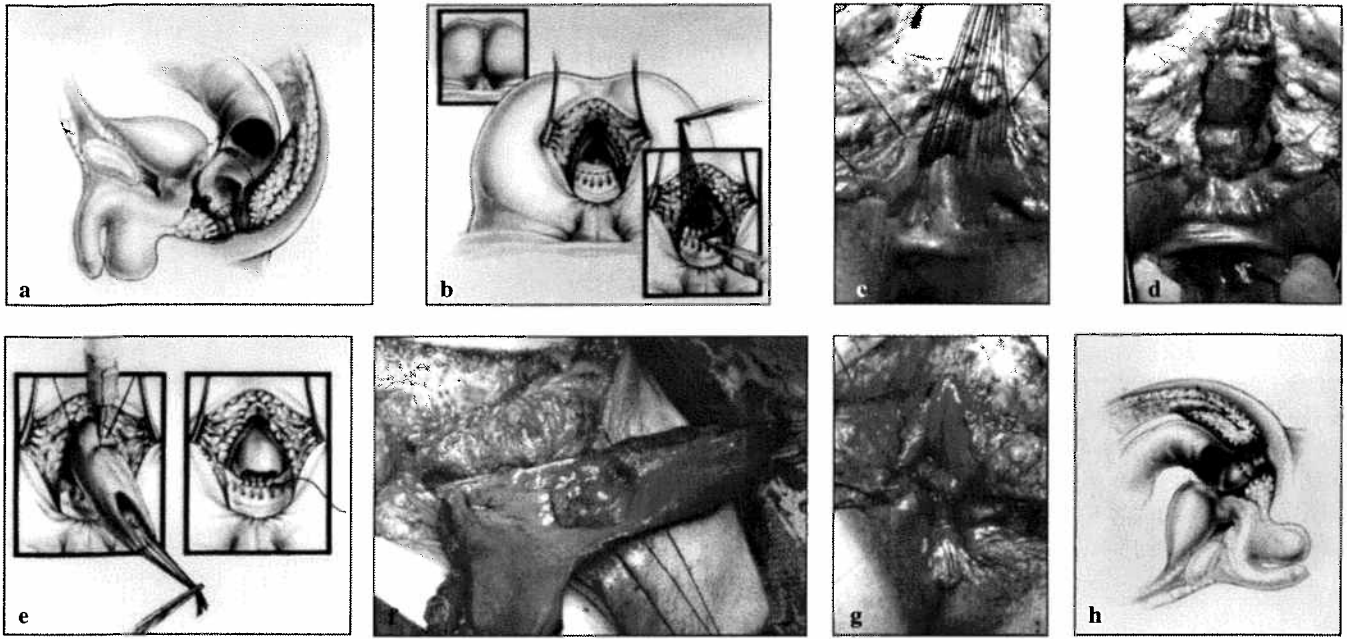


Fig. 3a-h Resection of a rectal tumor. **a** Sagittal view of the rectum with a tumor. Dotted lines represent the limits of the resection. **b** Posterior view of the incision, with the rectum open. The dotted line shows the limits of the resection. Multiple silk stitches allow significant and uniform traction to be placed on the rectum. **c** Operative field. **d** The rectum has been divided above the pectinate line and is being lifted and dissected. **e** The rectum is fully mobilized and is being resected with the tumor. The upper, healthy rectum is anastomosed to the distal anorectum above the pectinate line. **f** Operative field showing the rectum open, fully mobilized with a villous adenoma. **g** Posterior view of the rectum sutured above the pectinate line. **h** Sagittal view of the operation finished. (From [54], with permission)

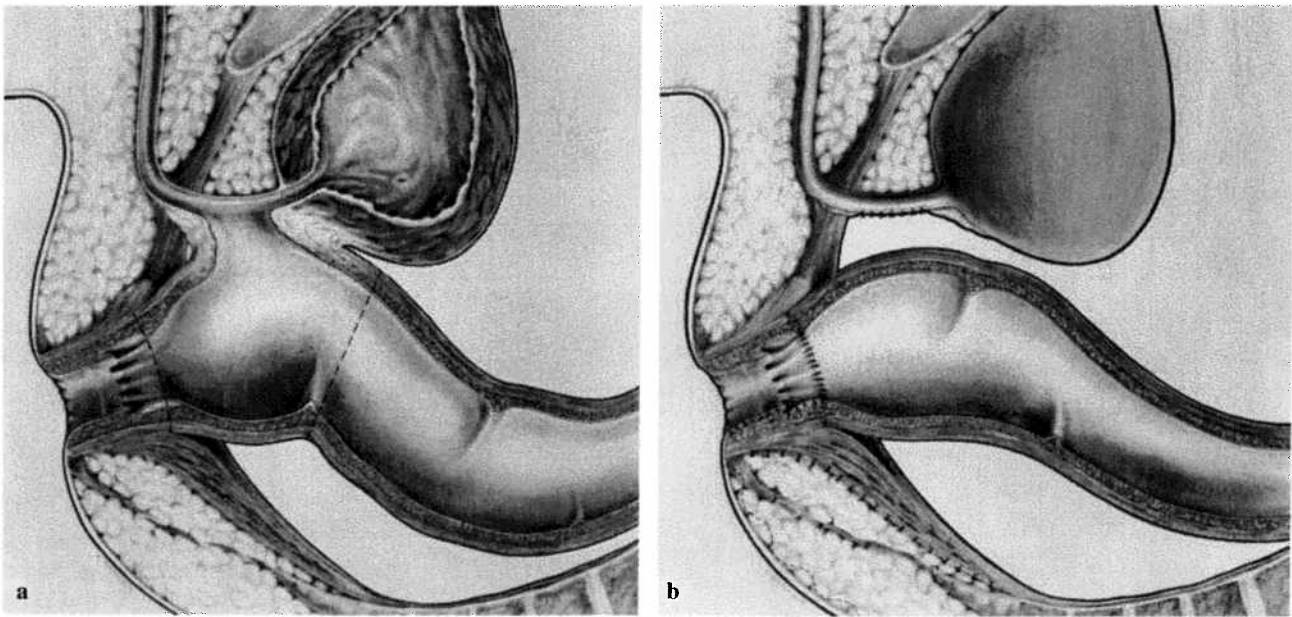


Fig. 4a, b Acquired recto-urethral fistulae. **a** Sagittal view. **b** Finished operation: the fistula is closed and new healthy rectum has been pulled down and anastomosed to the rectum above the pectinate line. (From [54], with permission)

The operation consisted of a posterior sagittal midline incision, with division of the upper part of the sphincter mechanism. The anus itself was not divided. The rectal wall was identified and fixed with stitches to the cartilage of the coccyx and sacrum.

The procedure was done on ambulatory basis. Postoperative pain was minimal. The patients have been followed for 1–10 years, and there has been one recurrence. All patients have normal bowel control.

PSTA approach

Twenty-nine patients were operated with a posterior sagittal trans-anorectal (PSTA) approach. In all cases, the posterior as well as the anterior sphincters, anus and rectum were divided at the midline, allowing exposure of the lesion. After repair or resection, the anterior and posterior walls were meticulously reconstructed.

Urogenital sinus

The average age of these patients was 5.6 years (range, 6 months to 12 years). Figure 5b shows a diagram of a posterior view of the rectum completely divided. Deep in the wound lies the urogenital sinus. Figure 5c shows the vaginal and urethral openings after the urogenital sinus has been opened posteriorly. The technique to repair the urogenital sinus itself is termed a "total urogenital mobilization." Originally developed

for the repair of cloacal malformations [61], it is also useful to repair this abnormality. The common channel is divided posteriorly, and the urethral and vaginal openings are exposed. The urethra and vagina are mobilized and pulled down together until the urethral opening reaches a normal position. Figure 5d shows a picture of the operative field during one of these operations. These patients have been followed for 1–9 years. They all have normal postoperative bowel function as well as urinary control. The vaginal opening appears to be adequate, although none have become sexually active as of this time.

Post-traumatic acquired urethral strictures or atresias

Eight male patients suffered from severe urethral strictures or acquired urethral atresias after trauma. All were associated with severe pelvic fractures. The average age was 13.9 years (range, 7–22 years). Figure 6a shows a diagram of a sagittal view of an acquired urethral atresia. The subframe

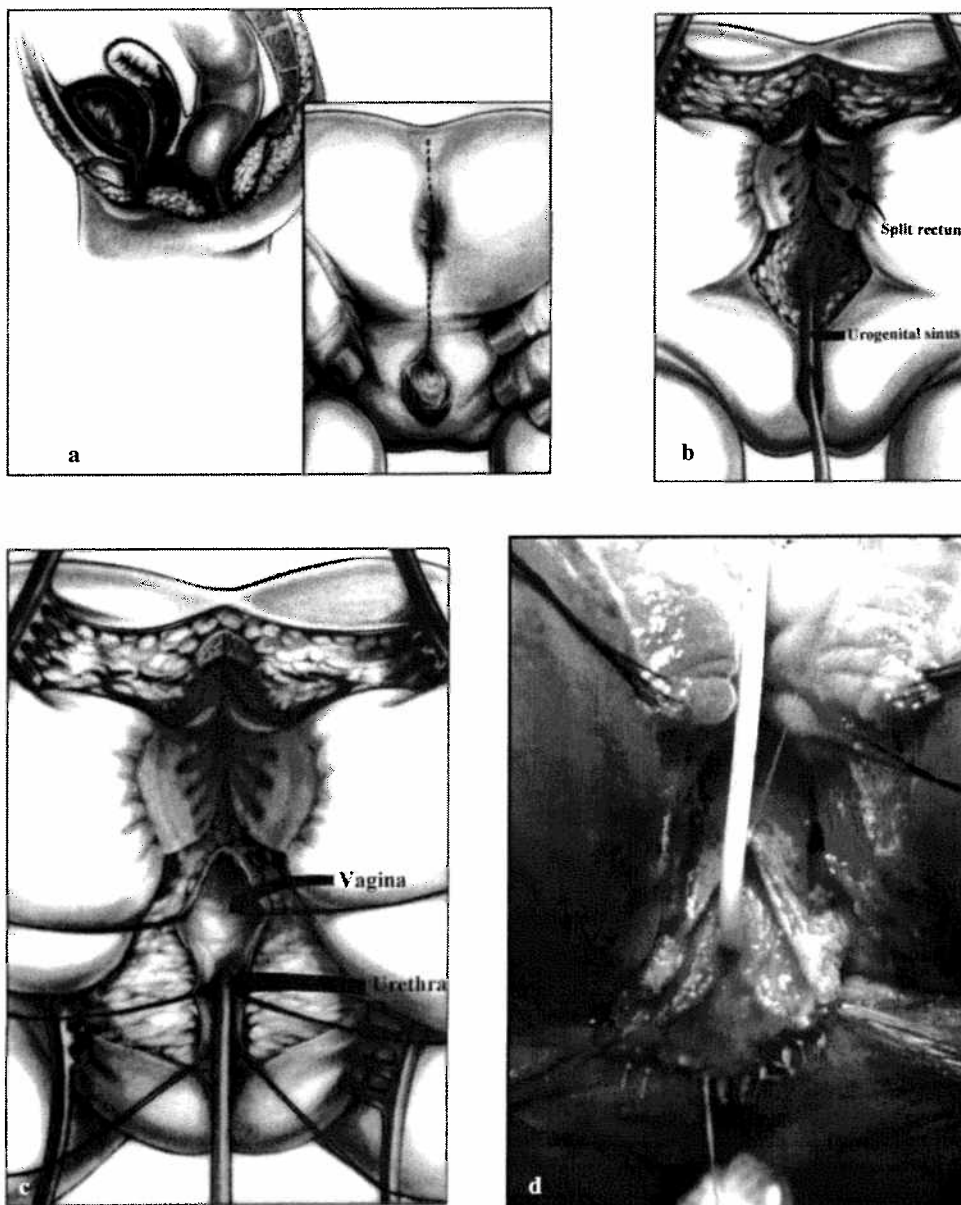


Fig. 5a-d Urogenital sinus with a normal rectum. **a** Sagittal view. **b** Posterior view of a sagittally divided rectum. Deep in the wound lies the urogenital sinus. **c** The urogenital sinus has been opened posteriorly, showing the vaginal and urethral openings. **d** Operative field after the urogenital sinus has been mobilized and the urethra has been positioned in a normal location. (From [32], with permission)

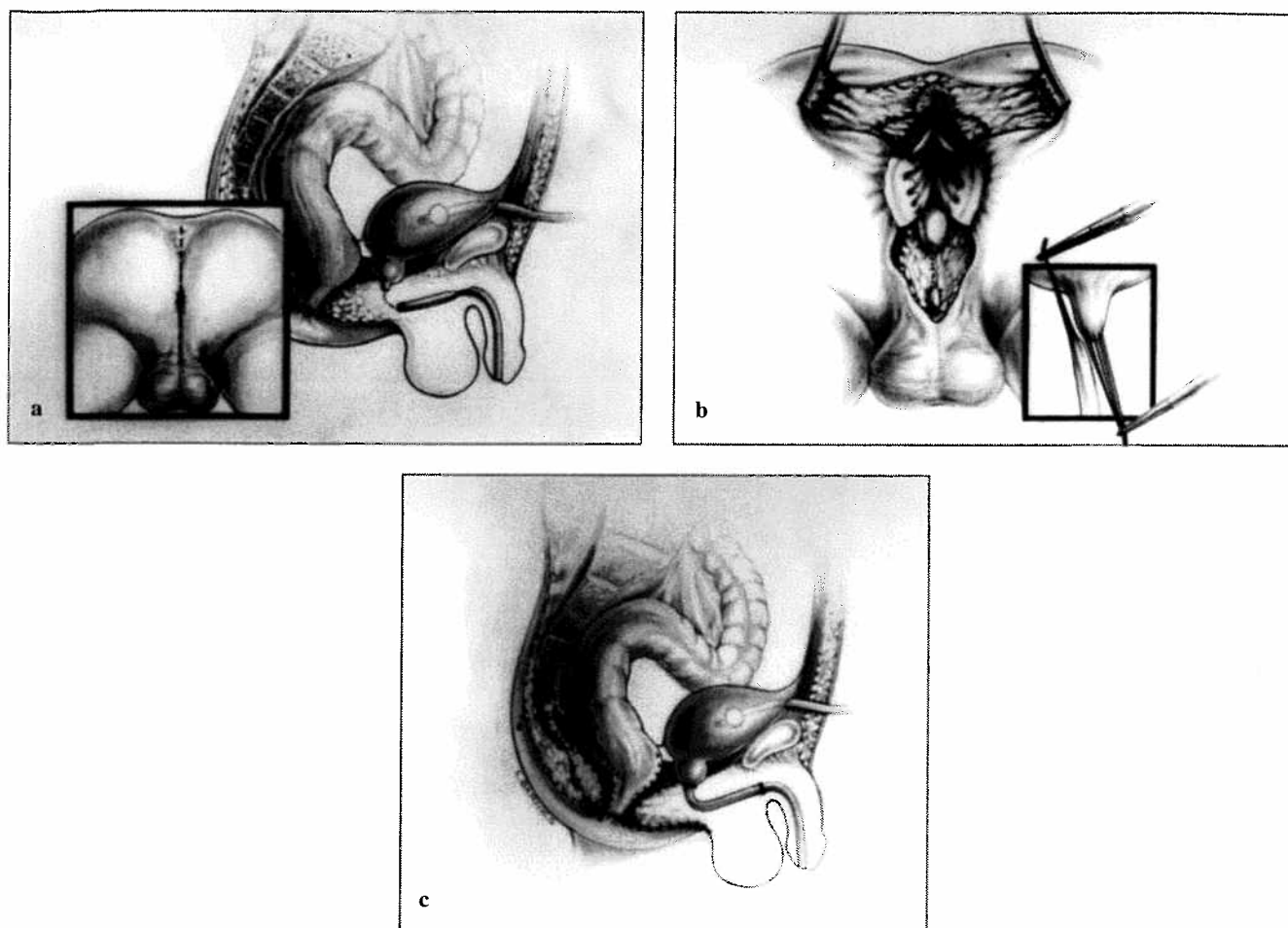


Fig. 6a-c *Acquired urethral atresia.* **a** Sagittal view showing the incision used in the transanorectal approach. **b** Posterior view of the transanorectal approach. Both proximal and distal urethral blind ends are mobilized and anastomosed. **c** Sagittal view of the completed repair

shows the incision line used for the transanorectal approach. This approach allows excellent exposure and comfortable repair of the urethra (Fig. 6b, c). The patients have been followed for 1.5–9.0 years. There were no recurrences. Bowel function is completely normal in all patients. Six of the 8 patients have urinary control, and two patients have urinary incontinence. Both had a frozen pelvis due to severe fibrosis at the time of the repair. We believe that the magnitude of the initial trauma is associated with their incontinence.

Posterior urethral masses

Nine male patients were operated on for posterior urethral masses (Table 4). Seven of them had giant infected seminal

vesicles that resulted in recurrent orchioepididimitis (Fig. 7). Follow-up ranges from 1 to 8 years. No recurrent infections have been seen. All patients have normal bowel and urinary control.

These types of operations have been reported in the past [37, 41, 44.] Some have described using a posterior sagittal approach in which the rectum is not divided, but rather mobilized and retracted laterally [65–68.] An endoscopic treatment has also been reported [69]. Two of our patients had failed attempted endoscopic treatment prior to our operation. Both patients operated on for rhabdomyosarcoma are alive and free of tumor 4 years after those operations. Bowel control is normal. Urinary control is normal in the patient in whom the urethra was preserved.

Table 4 PSTA approach for posterior urethral masses

Patients, n	9
Age, mean (range)	8.6 years (1 month–40 years)
Giant infected seminal vesicles, n	7
Rhabdomyosarcoma of the prostate, n	2

Diverting colostomy

Early in this series, we used a protective colostomy in all patients. The colostomy was usually constructed at the same time as the main procedure. One or two months after the definitive repair, the colostomy was closed. Subsequently, and mainly because of pressure from patients and their fami-

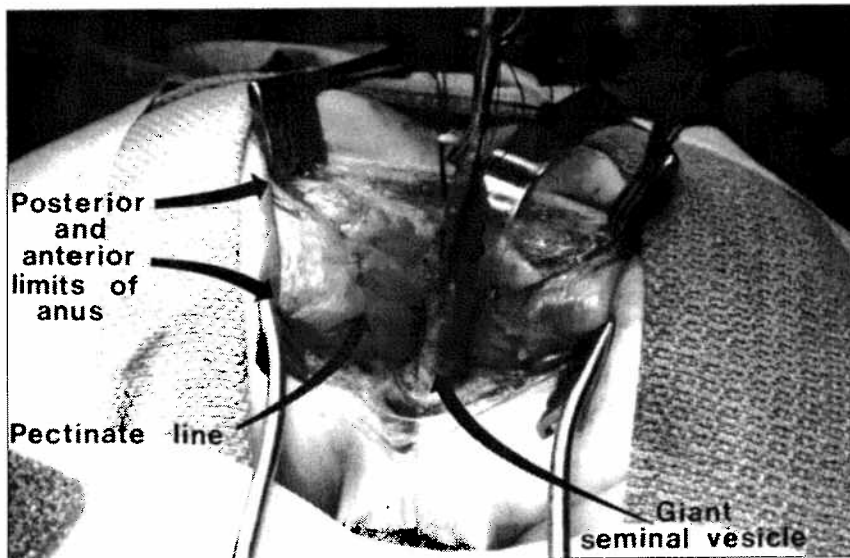


Fig. 7 Operative field of a transanorectal approach used to resect a giant, infected seminal vesicle

lies, we compromised and decided to attempt these operations without a protective colostomy. However, in order to prevent complications, the patients undergo a complete bowel prep with Go-Lytely. A central line is placed at the time of the operation, and the patients were given nothing by mouth for 10 days, receiving parenteral nutrition. Using this protocol, most patients have done very well. Three patients with Hirschsprung's disease developed postoperative rectocutaneous fistulae, and two patients suffered from a superficial wound infection that healed without further complications.

Discussion

Two other authors [57, 58] have used this approach to treat patients with Hirschsprung's disease. They were happy with the exposure, but both were preliminary experiences and they have not reported on the long-term follow-up. The posterior sagittal approach appears to be ideal for the treatment of presacral masses.

In the adult surgical literature, rectal tumors have been one of the main indications for the use of the posterior approach [1–10, 12, 14, 15, 19–22, 24, 26, 27, 31, 33, 34, 36, 42, 45–48].

The use of posterior sagittal approach for this problem requires further study and evaluation. Our short series does not have statistical significance, but the two early recurrences are obviously concerning. The approach may be a useful technique for the palliation of patients in which an abdominal-perineal resection is not possible.

Technically, the operation is straightforward and provides excellent exposure for acquired rectogenito-urinary fistulae. The risk of recurrence is clearly very high because of the effects of radiation therapy. The posterior approach has been used extensively for the treatment of this condition

[10, 11, 13, 14, 17, 20, 22, 23, 25–27, 29, 49, 50]. A larger experience with this type of operation for idiopathic rectal prolapse has been published by others [59, 60]. This congenital defect is defined as an abnormal junction of the vagina and urethra, forming a common channel that opens externally as a single orifice located where the urethral opening should be. These patients are born with a normal rectum and may or may not have adrenal hyperplasia [32].

Figure 5a shows a diagram of a urogenital sinus. In those cases of a very short common channel, where the junction of the vagina and the urethra is located very close to the perineal skin, almost any technique can be used to repair this problem. However we believe that, for those patients in whom the vagina joins the urethra at a distance of 2 cm or more from the perineum, the transanorectal approach is the best.

This approach has been reported in the past [32, 39]. Some authors [62–64] have used an approach in which only the anterior aspect of the anal sphincter and the anterior rectal wall were opened. This has been termed ASTRA (anterior sagittal transanorectal approach). There is no question that a limited incision can be enough to repair many of these defects. However, one must keep in mind that we are dealing with a spectrum of defects and, therefore, one must be prepared to deal with more complex anomalies that require greater exposure.

Our series reinforces the fact that the transanorectal approach does not interfere with bowel control in patients with post-traumatic acquired urethra strictures or atresias. A similar experience has been published by others [38]. The decision to proceed with or without a colostomy must be based on the individual circumstances of each case. That decision should be based on the surgeon's degree of experience and the patient's disease process and overall condition. In any case, we always obtain consent for a colostomy prior to the definitive operation. A surgeon should not hesitate to divert if the preparation has been inadequate or the repair is compromised by marginal blood supply.

The posterior sagittal approach appears to be a useful alternative for the treatment of pelvic conditions when they are difficult to reach through the abdomen or through the perineum. We believe that both of the variations of the technique discussed in this paper should be part of the armamentarium of general surgeons, colorectal surgeons and urologists. We highly recommend this approach for patients with Hirschsprung's disease who previously underwent repair and require re-operation for complications. We think that this is also the ideal way to approach presacral masses. The surgical treatment of rectal tumors is much more controversial and our experience is not large enough to draw final conclusions. However, it certainly is an alternative to be considered in certain circumstances. The transanorectal approach has emerged as an important technical alternative for the surgical care of conditions such as posterior urethral cystic masses, malignant tumors of the posterior urethra, post-traumatic acquired urethral strictures and atresias and congenital urogenital sinuses. The fear that division of the sphincters will lead to fecal incontinence does not appear to be well founded, as long as a midline approach is used, and a meticulous repair is accomplished.

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The Posterior Sagittal Approach for Recurrent Genitourinary Pathology

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Purpose: The posterior sagittal transanorectal approach offers the surgeon excellent exposure to the lower genitourinary system. The approach has been successfully used for revisional surgery involving the urinary tract and rectum. We have used this approach to treat müllerian remnants, acquired or congenital fistulas and acquired urethral strictures. In the setting of revisional surgery abdominal or perineal approaches may not provide the same level of exposure to the lower urinary tract.

Materials and Methods: Of 911 males who underwent a posterior sagittal approach 12 were identified in whom this approach was used to manage lower urinary tract problems without associated anorectal malformation (group 1). An additional 58 patients with associated anorectal malformations were included in analysis (group 2).

Results: All cases were approached with a posterior sagittal incision to facilitate exposure after failed prior surgical attempts to treat traumatic strictures of the proximal urethra in 4 and müllerian remnants in 8 (group 1). In group 2 there were 19 urethral diverticula, 8 strictures and 31 persistent rectourethral fistulas. Followup was 6 months to 15 years. There were no recurrences identified in group 1. In group 2 there were 5 postoperative urethrocutaneous fistulas. Data on potency were available on 4 patients in group 1 and 14 in group 2. All 14 patients in group 2 reported intact potency after surgery. One patient in group 1 was impotent before and after surgery.

Conclusions: The posterior sagittal approach is helpful for addressing lower urinary tract pathology when exposure is inadequate from a perineal or abdominal approach. We propose that better exposure with this approach may limit inadvertent injury to nerves and result in more complete treatment of the presenting pathological condition. This approach provides an alternative that warrants careful consideration when dealing with the lower genitourinary tract in pediatric patients, especially in the setting of revisional surgery.

Key Words: abnormalities, reconstructive surgical procedures, urinary tract

The posterior sagittal approach provides excellent exposure to the structures of the perineum and anorectal canal, and it was originally described for treating anorectal and cloacal malformations.^{1,2} It allows visualization of the anatomy of the perineum, especially for pathological conditions located in the space between the concavity of the sacrum and the posterior pubis.³ For the genitourinary surgeon this would provide an alternate way to access the posterior urethra, bladder neck and seminal vesicles, especially in settings in which prior surgical treatment had failed.

Access to the structures of the pelvis has been performed successfully with a transabdominal, retropubic, retroperitoneal or perineal approach. However, exposure can be lacking, especially in the setting of revisional surgery. Scar can obliterate tissue planes and even with meticulous dissection the delicate structures of the perineum can be damaged in this setting. Laparoscopy also has an important role in addressing this pathological conditions but the technique becomes limited in the setting of revisional surgery.

In the adult literature, the York-Mason approach has been used to address acquired rectourethral fistulas with good success.^{4,5} The posterior sagittal approach with splitting of the rectum (transanorectal) has also been applied to children with urogenital sinus anomalies in the setting of a normal anus.⁶ It

seems logical that a posterior approach could also benefit pediatric patients by addressing symptomatic müllerian remnants, fistulas, seminal vesicle cysts or even proximal urethral strictures that are located too high to allow comfortable access via a perineal approach and too low to reach from the abdomen.

The anterior sagittal transrectal approach has also been used by urologists in the past to address lower urinary tract pathology. This approach is a modification of the posterior sagittal approach.⁷ The difference between the 2 approaches is patient positioning and the avoidance of splitting the posterior rectal wall. However, in the setting of revisional surgery, ie after perineal surgery the posterior sagittal approach allows one to access the perineum without going through prior scar.

We have successfully used the posterior sagittal approach for acquired genitourinary pathology in the setting of associated anorectal malformations.⁸ This includes acquired urethral atresia, posterior urethral diverticula and persistent fistulas (fig. 1). Success in managing urethral pathology in these patients prompted us to use the approach in patients without associated anorectal malformations in the setting of revisional surgery.

MATERIALS AND METHODS

A total of 911 males underwent a posterior sagittal approach from 1981 to 2006. Of these patients 12 were retrospectively

Study received institutional review board approval.

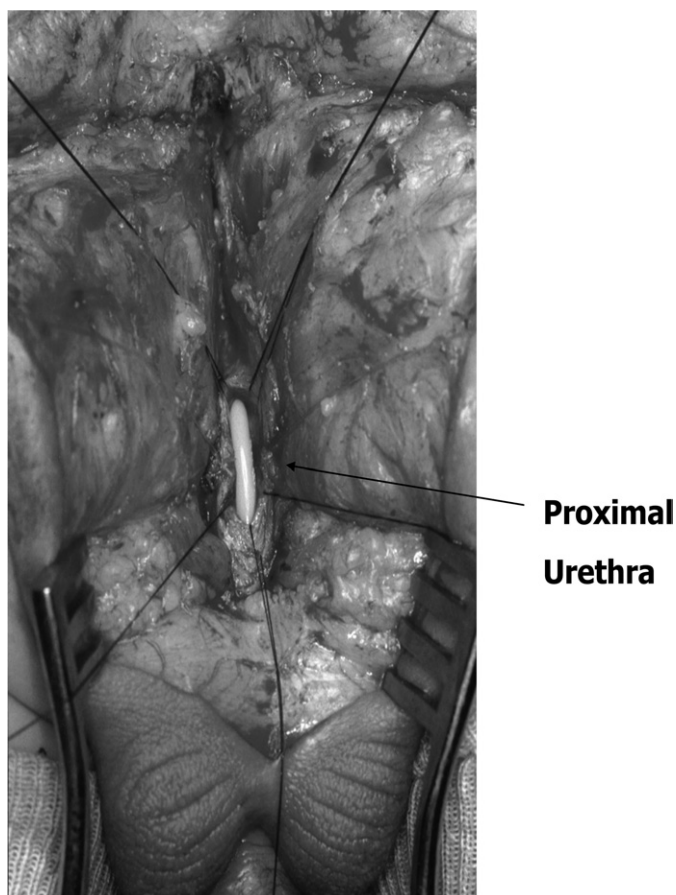


FIG. 1. Child with anorectal malformation and urethral stricture. Child is prone and rectum was mobilized so that it is out of field. Proximal urethra is easily visualized.

identified as having undergone posterior sagittal transanorectal approaches for genitourinary pathology without associated anorectal malformations (group 1). These 12 patients underwent surgery performed by one of us (AP). An additional 58 patients were identified for comparison with urinary tract pathology as well as associated anorectal malformations (group 2). All patients underwent revisional surgery using a posterior sagittal approach. The patients were assigned to different groups to compare outcomes after performing a posterior sagittal approach in the setting of revisional surgery in those with and without an associated ARM. Institutional review board approved retrospective analysis was used.

All patients were male and 2 to 43 years old at surgery. Followup was 6 months to 15 years. Females were excluded from analysis. We have used the transanorectal approach in men with acquired fistulas after prostate cancer treatment but they were not included in analysis. Patients referred without a prior attempt at repair regardless of associated genitourinary pathology were also excluded from analysis.

RESULTS

All patients in group 1 underwent a midline posterior sagittal transanorectal approach after failed abdominal or perineal surgery. Those in group 2 underwent a posterior sagittal approach with mobilization of the rectum to ex-

pose the posterior urethra. These patients had also undergone a prior attempt at repair. In the patients without associated anorectal malformations (group 1) there were 4 traumatic strictures of the proximal urethra and 8 müllerian remnants (table 1). To date there have been no recurrences in this group. Two patients in the series were lost to followup. All patients were continent at a minimum of 6 months of followup. Potency data were known on 4 patients with 3 (75%) reporting intact erections and ejaculation. One patient who had a stricture following a crush injury was impotent before and after surgery (table 2). There was 1 documented case of paternity in a patient with a large seminal vesicle cyst.

There were 3 patients in whom urethral strictures were managed with cystostomy tubes and diverting colostomies before referral. One patient in this group was treated with a suprapubic tube alone and underwent repair without fecal diversion. Only 1 of the patients with posterior urethral pathology underwent diversion with colostomy. No patient in this series was in urinary retention postoperatively.

The 4 patients with urethral strictures were unique because 3 (75%) underwent diversion with colostomy before referral. These patients were victims of blunt trauma with pelvic fractures and they received diversion because of associated injuries. All 4 patients underwent a prior attempt at stricture repair, in addition to surgery related to the trauma.

The patients with müllerian remnants were also unique. They were referred not for simple excision of the pathological conditions, but rather because prior attempts at excision had failed and the patients were symptomatic with recurrent urinary tract infections and orchiepididymitis. Only 1 patient in this group underwent diversion before surgery. Diversion was performed because in this patient several prior attempts at repair had failed and he was considerably older at operation (40 years).

Surgical success in group 1 was defined as treatment of the primary pathological conditions without evidence of recurrence. To our knowledge no patients have required urinary diversion or further procedures. Followup studies, such as formal urodynamics or noninvasive uroflowmetry, were unfortunately not readily available at the time of this chart review. Institutional review board approval is currently being sought to contact patients to determine long-term outcomes after repair.

In the remaining 58 patients with ARM (group 2) indications for surgery were urethral diverticula in 19, acquired strictures in 8 and persistent rectourethral fistulas in 31 (table 1). One patient with a persistent rectourethral stricture had what was thought to be a low anorectal malformation and he was treated with perineal anoplasty. He also had a delayed diagnosis of posterior urethral valves. It was not until after transurethral incision of the valve leaflets that an unrecognized rectourethral fistula became apparent.

TABLE 1		
	No. Group 1	No. Group 2
Stricture	4	8
Posterior urethral diverticulum	8	19
Persistent fistula	0	31
Totals	12	58

TABLE 2

Group	No. Group 1 (%)	No. Group 2 (%)
Continent urine	10 (100)	38 (74.5)
Continent stool	10 (100)	41 (80)
Potent with/without ejaculation	3/4 (75)	14/14 (100)
Urethrocuteaneous fistula	0	5
Lost to followup	2	8

A total of 38 patients (74.5%) were continent of urine in group 2 after surgery. Residual urethral pathology did not influence the preservation of continence. Rather, the number of failed prior attempts at repair or associated neurological anomalies were more predictive in this group, as described. No patient in this group was incontinent as a result of surgery.

There was postoperative urinary retention in 1 patient with recurrent urethral stricture, which was managed by a suprapubic tube. Overall there were 5 failures (8%) in group 2.

In group 2, 14 of 14 patients (100%) reported erections sufficient for penetration, of whom 8 reported successful ejaculation. These patients represent those in whom these data were known. There were no reports of impotence in group 2. There were 2 documented cases of paternity among these patients. Eight patients were lost to followup (table 2). No patients reported loss of potency after repair.

DISCUSSION

Our intent is to expose the pediatric genitourinary surgeon to another option for addressing posterior urethral and perineal pathology, especially after the more traditional approaches have failed. We described the posterior sagittal approach for addressing urethral pathology in the past as a primary means of surgery. The novelty of this series of patients is to suggest that the posterior sagittal approach can be used safely even after multiple failed prior attempts at repair. It was demonstrated in the past that the posterior sagittal transanorectal approach does not lead to an increased rate of fecal incontinence, stenosis or infection in children with or without anorectal malformation.^{1,8,9} This aspect makes the approach for patients without ARM a viable alternative for consideration. The success that we have had using the transanorectal approach in females with a urogenital sinus anomaly and normal anus serves to further this argument.¹⁰

The concept of splitting the rectum is not the initial choice of most urologists. We believe that the exposure afforded by the posterior sagittal transanorectal approach and the minimal morbidity noted by splitting the rectum justifies this approach.¹⁰ Exposure afforded by splitting the rectum is unparalleled via any other approach (fig. 2). The rectum in ARM reoperations is usually moved out of the way to care for an associated mislocated anus, stricture or prolapse, which allows excellent exposure of the posterior urethra. In patients with a normal anus the anus and rectum are split, preserving its function after reconstruction.

We used a protective colostomy in the majority of revisional surgeries for anorectal malformation because of the need for rectal tapering, extensive mobilization or opposing suture lines. Four patients in group 1 received a protective

colostomy. There was no increased complication rate in cases that were not diverted because the rectum was only split and then precisely reconstructed to help with exposure.

Colostomy can be safely avoided in patients with a normal rectum when the bowel is adequately prepared. We use standard 1 day bowel preparation before surgery. A peripherally inserted central catheter is placed preoperatively in anticipation of total parental nutrition. Postoperatively the patient receives nothing by mouth for 7 to 10 days. We have not observed wound infections or breakdown of repair without diversion and we do not believe that diverting colostomy is necessary when these guidelines are followed. In the case of a mislocated rectum with associated ARM colostomy can also be avoided, provided that there is no need for tapering or extensive dissection.

Although longer followup and a larger sample population are needed to make definitive statements with regard to the preservation of potency, the posterior sagittal approach allows the surgeon to remain midline and away from the neurovascular bundles. In addition, there is little to no blind dissection with this approach. The preservation of potency is always a concern when addressing pelvic pathology in the setting of revisional surgery and this direct anatomical approach would likely facilitate that goal.

In our series we have also observed that continence of stool or urine is not affected by this approach. Of course, this is a concern when addressing residual pathological conditions in children with associated ARM but in a normal individual this does not apply. Although the preservation or creation of urinary continence cannot be demonstrated in every patient with ARM, one must remember the high incidence of neurological issues in children with an ARM.^{11,12} In children without an ARM the confounding variable may be the preexisting condition, especially in the setting of trauma. An important measure for assessing the value of this approach is the recurrence of pathological conditions, which we did not note in our series.

CONCLUSIONS

The posterior sagittal transanorectal approach is a safe and reasonable alternative for accessing difficult perineal anatomy, especially in the setting of revisional surgery. The few patients who have demonstrated that they are potent with intact ejaculation help further the argument in favor of this approach.

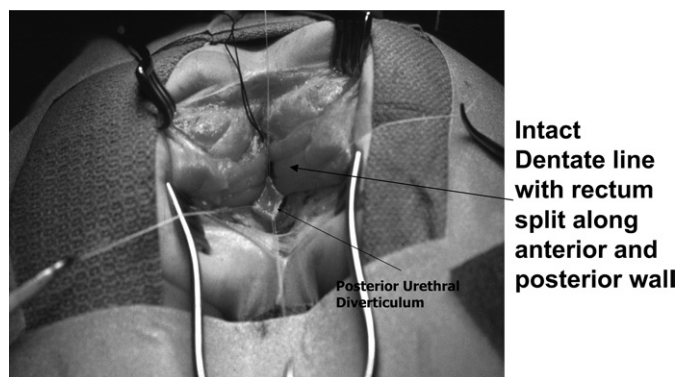


FIG. 2. Child without ARM. Müllerian remnant is easily addressed by dividing rectum.

The benefits of the posterior sagittal approach are the ability to stay midline, excellent exposure and visualization, and in this series the avoidance of an incision through prior scar (fig. 2). In our small series we observed no increased rate of damage to the urinary tract or deleterious effects on potency after surgery. The posterior sagittal transanorectal approach should be included in the decision process, especially in settings in which prior surgical attempts have failed.

Abbreviations and Acronyms

ARM = anorectal malformation

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EDITORIAL COMMENT

To me the interest of the current report centers around the 12 patients without anorectal malformation. These 12 patients include 4 with previously operated posterior urethral strictures and 8 with müllerian diverticula. It is reassuring to know that bowel and urinary control are not affected by this approach. Unfortunately these authors provide little information to understand the justification of such an approach in cases of urethral stricture. The nature of the previous operations and the length of the stricture are not reported, and data on postoperative urinary flow rates are not presented. Good results after failed initial repair can be achieved in most cases by repeat perineal anastomosis with or without partial pubectomy.^{1,2}

Regarding the excision of müllerian diverticula, it has been my experience that this operation is rarely indicated. The authors failed to mention whether these patients underwent previous hypospadias repairs or how the previously attempted excision was performed. In cases of hypospadias a symptomatic müllerian diverticulum is usually secondary to a distal urethral stricture, for which the treatment usually solves the problem. In rare cases in which excision is required the laparoscopic approach has given good results.

Finally, in difficult cases of vaginal reconstruction or rectourethral fistulas I have found the anterior sagittal transrectal approach (reference 7 in article) without diverting colostomy and with prompt resumption of enteral nutrition to be satisfactory.³

The authors again bring to our attention this approach, which expands the available options to resolve these difficult cases.

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REPLY BY AUTHORS

As stated in the article the purpose of this presentation is not to revolutionize the way in which these relatively rare pathological conditions are addressed, but rather to add to the options available to the surgeon.

With respect to the specific question concerning children with müllerian remnants, all had undergone prior abdominal or perineal attempts at repair. Of these cases 7 were associated with hypospadias, and 1 was associated with a seminal vesicle cyst and ipsilateral renal anomaly. In this group transabdominal attempts at resection failed in 2 patients. One patient had a failed endoscopic attempt at unroofing of the diverticulum. The remainder of the group had undergone multiple attempts as hypospadias repair, about half of whom were hypospadias cripples. All patients had problems with repeat infections, and 1 had an orchiectomy before presentation while 2 underwent vasectomy secondary to recurrent epididymitis. There were no documented cases of stricture after repair but several fistulas were noted in the charts.

All 4 patients in the stricture group had multiple failed attempts at repair. We agree that the perineal approach is an option, but this was already attempted in 2 of these patients without success. We acknowledge the limitation in documenting continence without postoperative uroflow studies and this is a weakness of our study. Attempts are being made to contact the patients for long-term followup.