The posterior sagittal trans-sphincteric approach

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The posterior sagittal, transsphincteric approach to treat different pelvic problems has been known since last century. Although some surgeons have embraced it and have enthusiastically advocated it, 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 an historical perspective and from the authors experience. The international literature on the subject was reviewed since 1877 up to the present date. A retrospective evaluation of the authors experience was conducted, and the results reviewed. 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. The experiential review included 114 cases. They were divided into two groups. A included 85 patients who underwent a posterior sagittal transsphincteric approach that included 49 cases of Hirschsprung’s disease (primary 21, secondary 28), 15 presacral masses; 10 rectal tumors; 7 acquired recto-genito-urinary fistulae; and 4 cases of idiopathic rectal prolapse. Group B included 29 patients who underwent a posterior sagittal trans-anorectal approach, in which the anterior wall of the rectum and the sphincter was divided as well. This group included 12 cases of urogenital sinuses; 8 acquired urethral stricture or atresia after trauma; and 9 posterior urethral masses. Post-operative bowel control was normal all cases except in those patients 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 recto-genitourinary fistulae in 3 cases, recto-cutaneous fistula in 3 Hirschsprung’s patients and 2 partial wound dehiscences. 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, pre-sacral masses, acquired recto-genito-urinary fistula 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: posterior approach to rectum, trans-sphincteric approach, rectal approach

INTRODUCTION AND DEFINITIONS

There are multiple clinical conditions, including congenital anomalies, tumors and complications from trauma and injury, that require surgical exposure that is frequently considered difficult to achieve. 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 lesion then appears 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. The ability to expose the anatomy widely allows technically demanding operations to be performed under direct vision, without a struggle.

There are, however, different modalities and variants 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 lateral to the sacrum, in order to reach higher places in the pelvis. This could be called a para-sacral approach. When the incision is located in the mid-line and divides only part of the sphincter mechanism below the coccyx but is not extended all the way down to
the anus, it is called posterior sagittal non-trans-sphincteric 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.

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 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 trans-anorectal approach. The actual clinical results in this paper are based on experience with the posterior sagittal trans-sphincteric and trans-anorectal approaches.

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.

**BRIEF HISTORY**

The name Paul Krasske, has been extensively and repeatedly used when referring to the origin of the posterior sagittal approach. This German surgeon, in 1885, published his experience in the treatment of rectal tumors using a posterior approach. Careful reading of his paper indicates that, in actuality, Dr. Krasske used an incision that extended rather laterally cutting part of the sacrum and did not divide the entire sphincter mechanism. For those who like use of an online dictionary, the name of Harrison Cripps is more appropriate when discussing the history of the posterior sagittal trans-sphincteric approach. Dr. Cripps, in England, in 1877 (eight years before Krasske), prepared an essay that won the Jacksonian Prize. In that document, he discussed 36 cases of rectal cancer operated by him using a posterior sagittal trans-sphincteric approach.

He did not use a colostomy. He mentioned that 23 of his patients were able to retain feces when not too fluid, and he recommended leaving the wound open post-operatively. Cripps document seems to be the first comprehensive, clear paper describing the use of the trans-sphincteric approach. In 1901, Weir published 3 cases of patients with rectal cancer operated on via a posterior sagittal trans-sphincteric approach. Arthur Bevan in 1917, is perhaps the surgeon who should be credited with the initiation of this approach in the United States. In his paper, he did not mention a specific number of cases, but instead stated that he had operated on quite a number of patients with cancer. Between 1943 and 1969, there were other authors, who 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. When treating recto-urethral fistulae using this approach, he worked with Dr. Kilpatrick, a urologist.

Dr. Mason presented 24 cases in his first publication in 1970; nearly 100 in 1972, and 150 cases in 1977. These were patients operated on for cancer, recto-prostatic fistulae, villous adenoma, short segment Hirschsprung's disease, complications after pull-through operations, and rectovaginal fistulae.

From the 1970s and until this day, there have been several authors that developed a degree of experience with this approach. Most of them have published short series. The most prominent are represented by Stephenson, Carbonell, Madsen and Huber.

Diverting colostomy as an adjunct to prevent post-operative complications was first recommended by Mason and Kilpatrick. The overwhelming majority of surgeons that used the trans-sphincteric approach reported that bowel control after that operation was good. Some have reported that a few patients suffered from some bowel control problems immediately after the operation, but then ultimately gained bowel control. Most of the complications presented by all those authors were related to pelvic infections, abscesses and recurrences of fistulas. All those complications occurred mainly in patients that did not have a protective colostomy.

There is a conspicuous lack of references to this approach in the international literature. The question is then why most surgeons prefer not to use this kind of approach in order to treat pelvic conditions. Although the answer is unknown, we suspect that there is a general impression amongst surgeons who treat these conditions that the approach has a significant complication rate, including the possibility of infection and that division of the sphincter will lead to loss of bowel control.

**THE AUTHORS EXPERIENCE**

The senior author's experience includes 1325 patients with anorectal malformations operated on posterior sagittally, and 114 patients, mainly adults, with other conditions. This last group represents the material of this publication. On August 10, 1980, the senior author, for the first time, explored a child suffering from an anorectal malformation using the posterior sagittal approach and dividing the entire sphincter mechanism located posterior to the urethra. That operation was performed without an awareness of the large historical experience in adult patients mentioned above. The purpose of the operation was mainly to elucidate the answer to a controversial issue related to the characteristics of the sphincter mechanism available in children born with anorectal malformations. This was considered crucial, since 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\textsuperscript{5}. It was believed that this muscle was the only functionally useful structure in the reconstruction of patients with ano-rectal 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 number one shows the general characteristics of the sphincter mechanism in a male child with imperforate anus and rectourethral fistula, which is the most common defect seen in males\textsuperscript{3,33}. Further experience in female patients revealed findings that are generally similar to those depicted in Picture 1\textsuperscript{35}.

These findings are considered the basis for current techniques used to repair these malformations.

The experience in pediatric patients subsequently led to the referral of adult patients with conditions who might benefit from this approach. However, as previously mentioned, the approach has been less well received by our adult general surgical colleagues. The most common criticism of this approach has been related to the potential for incontinence that ameision in the sphincter mechanism may provoke. This prompted an experimental study in animals\textsuperscript{35}. The goal of that study was to determine the potential effect that the different posterior approaches could have on bowel control. It became very clear from our experimental study that division of the posterior sphincter mechanism, if followed by a meticulous reconstruction, did not affect bowel control in experimental animals. The same study also demonstrated that the complete division of both the posterior and the anterior sphincter mechanism also did not interfere with bowel control. On the other hand, a large percentage of the group of animals who underwent a perirectal dissection, performed without injuring the sphincter mechanism, suffered from a degree of postoperative fecal incontinence\textsuperscript{35}.

The assumption was that the dissection led to denervation of the lower rectum and anal canal which most likely interfered with the exquisite sensation of the area which is so necessary to achieve bowel control. Our clinical experience, before and after that experimental study made us believe that the division of the sphincter mechanism followed by a meticulous reconstruction did not interfere with bowel control. This has also been studied by another group\textsuperscript{35}.

**MATERIAL 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 adjuvant posterior sagittal trans-sphincteric approach were included in this review. The senior author's

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**Figure 2B**

THE RECTUM IS FULLY MOBILIZED AND IS BEING RESECTED WITH THE TUMOR. UPPER. HEALTHY RECTUM IS ANASTOMOSED TO THE DISTAL ANO-RECTUM ABOVE THE PECTINATE LINE.

**Figure 2F**

OPERATIVE FIELD SHOWING THE RECTUM OPEN, FULLY MOBILIZED WITH A VILLOUS ADENOMA.

**Figure 2G**

POSTERIOR VIEW OF THE RECTUM SUTURED ABOVE THE PECTINATE LINE.

series was retrospectively evaluated, including only patients approached posteriorly sagittally for the treatment of pelvic conditions other than ano-rectal malformations. The medical charts were reviewed; patients were contacted by letter, by phone or personal interview.
One hundred and fourteen cases were reviewed. The ages varied from 1 month to 85 years with a mean of 16 years old. The follow-up varied from 16 years to 3 months.

**RESULTS**

The series were divided into two groups: (Table 1) A.) 85 Patients operated on by a posterior sagittal trans-sphincteric approach. This group included 49 cases of Hirschsprung's disease (21 primary and 28 secondary operations); 15 presacral masses; 10 rectal tumors (6 carcinomas, 2 villous adenomas, one inflammatory pseudotumor and one leiomyosarcoma); 7 acquired recto-urinary fistulas and 4 patients with idiopathic rectal prolapse.

B.) 29 Patients operated on by a posterior sagittal trans-anorectal approach. This group included 12 cases of females with a urogenital sinus with normal rectum; 8 patients with acquired urethral stricture or atresia and 9 patients with aposterior urethral mass. Hirschsprung's Disease

Forty-nine patients have been operated on posterior sagittally for the treatment of Hirschsprung's disease. The average age was 6.8 years with a range of 6 months to 23 years.

Twenty-eight of them underwent previously attempted repairs at other institutions that failed and were subsequently referred to us. Complications that led to referral included strictures, anastomotic dehiscence and retraction, recto-cutaneous fistulae, or acquired recto-urethral or vaginal fistulae. Three patients had previously undergone a Duhamel operation, and suffered from intractable constipation due to the presence of an enlarged, atonic, aganglionic rectal pouch left in the pelvis. This appears to be a common complication seen in patients who have undergone this particular operation. The posterior sagittal approach allowed the resection of theganglionic pouch, resection of any strictured bowel and closure of any abnormal fistula when indicated, and dissection of the normo-ganglionic bowel and re-anastomosis above the pectinate line. The posterior sagittal approach proved to be an excellent alternative to treat this group of complicated patients, mainly because of the excellent exposure achieved. Bowel control was normal, except in five patients in whom previous complications had led to irreversible damage to the sphincter mechanism.

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. We found that the technique allowed a meticulous dissection and resection of theganglionic bowel, as well as mobilization and pull-through of the normo-ganglionic bowel. A precise anastomosis above the pectinate line was accomplished; preserving, in all cases, bowel control. Most of these patients were operated on with the benefit of a protective colostomy.

More recently, we have used this approach in 6 patients without a protective colostomy. Unfortunately, three of them developed a midline incisional recto-cutaneous fistula. In each of these patients, a colostomy was then created and the fistulas 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. We have concluded that a protective diverting colostomy is necessary if this approach is to be used for Hirschsprung's disease. Because of this, we now use the trans-anal 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 that have suffered catastrophic complications after previous failed operations.

Two other authors 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.

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 rendered the best images of this type of condition. Figure 3 shows the picture of an MR study, showing a presacral mass. Included in this group are two patients that suffered from chronic draining sinususes 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. Post-operative bowel control was unchanged in all cases.

There were no cases of post-operative fecal incontinence, and those patients who had significant constipation prior to the procedure continued to have the same problem. The posterior sagittal approach appears to be ideal for the treatment of presacral masses.

Rectal Tumors

In the adult surgical literature, rectal tumors have been one of the main indications for the use of the posterior approach.

Our experience has been limited to 10 cases. We have collaborated with our colorectal colleagues in the treatment of 8 adult patients who suffered from large villous adenomas of the rectum (2 cases) or rectal cancers (6 cases) that did not invade the entire rectal wall and were located at least 1 cm above the pectinate line of the rectum. In addition, we have treated one patient with a giant inflammatory pseudotumor of the rectum and another with leiomyosarcoma of the rectum.
Average age was 68 years with a range of 14 to 85 years. All patients were approached posterior sagittally, divided the entire posterior sphincter mechanism and distal posterior rectal wall. 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 2 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 approaching 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. Two patients recurred within the first two years, and the remaining two patients are doing well and are free of disease, one year after surgery. When this experience has been presented to surgical oncologists, the main criticism has been that oncologic principles were violated and that a true cancer operation was not performed.

We agree that this is probably the case. However, none of our patients developed post-operative neurogenic bladder or impotence. We attribute this to the fact that the dissection is performed as close as possible to the rectal wall, in order to avoid injury to any of the important nerves in the pelvis. The use of the 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.

The young patient with the inflammatory pseudotumor is disease free and has bowel control 10 years after the operation. The patient with the leiomyosarcoma was also a success, and has been followed for 6 years.

**Acquired Recto-Genito-Urinary Fistula**

Seven patients were treated for acquired fistulae between the rectum and the vagina or urethra. All 7 were associated with radiation therapy; 6 for prostatic cancer and one female with cervical cancer. The average age was 61 years with a range of 55 to 66 years. Figure 4-A shows a diagram of one of these fistulas. Figure 4-B shows the repaired lesion. All patients were approached posterior sagittally. The technique used is similar to that described for rectal tumors, except that once the proximal rectum is mobilized, the opening in the vagina or urethra is repaired and new rectosigmoid is pulled down, leaving a completely normal anterior rectal wall in front of the urethral or vaginal sutures. Three patients, 1 female and 2 males, recurred. All three had giant fistulas, measuring 3-4 cm diameter, before surgery. The recurrent fistulas were all very small, and healed after repeat operations. Five pa-
tients kept bowel control. Two patients have a degree of occasional soiling, most likely due in part to loose stool associated with radiation enteritis. Technically, the operation is very straightforward and provides excellent exposure. The risk of recurrence is clearly very high because of the effects of the radiation therapy.

The posterior approach has been used extensively for the treatment of this condition. Perhaps the only difference between our approach and those previously described is in the emphasis that we put on leaving completely normal bowel wall in front of the urethra or vaginal repair.

**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 old with a range of 2 to 8 years.

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

The procedures are done on an ambulatory basis. Postoperative pain was minimal.

They have been followed for 1-10 years, and there has been one recurrence. All patients have normal bowel control.

A larger experience with this type of operation has been previously published by others.

**THE TRANS-ANORECTAL APPROACH**

Twenty-nine patients were approached with a posterior sagittal trans-anorectal operation.

In all cases, the posterior as well as the anterior sphincters, anus and rectum were divided in the midline, allowing exposure of the lesion. After repair or resection, the anterior and posterior walls were meticulously reconstructed.

**Urogenital Sinus**

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. Figure 5-A shows a diagram of a urogenital sinus. In those cases of 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 2 cm or more from the perineum, the trans-anorectal approach provides the best approach. The average age of these patients was 5.6 years with a range of 6 months to 12 years. Figure 5-B shows a diagram of a posterior view of the rectum completely divided. Deep in the wound lays the urogenital sinus.

**Figure 6A**
DIAGRAM OF A SAGITTAL VIEW OF AN ACQUIRED UREThRAL ATRESIA AND THE INCISION USED FOR THE TRANS-ANORECTAL APPROACH

**Figure 6B**
POSTERIOR VIEW OF THE TRANS-ANORECTAL APPROACH, BOTH, PROXIMAL AND DISTAL URETHRAL BLIND ENDS ARE MOBILIZED AND ANASTOMOSED

**Figure 6C**
SAGITTAL VIEW OF THE COMPLETED REPAIR

Figure 5-C 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
Posterior Urethral Masses

Nine male patients were operated on for posterior urethral masses. The average age was 8.6 years, with a range of 1 month to 40 years. Seven of them had giant infected seminal vesicles that resulted in recurrent orchioepididymitis (Figure 7). The approach allowed the section of the abnormal seminal vesicle with relative ease. Follow-up ranges from 1 to 8 years.

No recurrent infections have been seen. All patients have normal bowel and urinary control.

The resection of the seminal vesicle includes an unavoidable vasectomy on the involved side. Although this sacrifices sperm cell delivery, the endocrine function of the testicle that would have been otherwise destroyed by the frequent episodes of orchioepididymitis is saved.

These types of operations have been reported in the past. Some have described using a posterior sagittal approach in which the rectum is not divided, but rather mobilized and retracted laterally. Also, an endoscopic treatment has also been reported. Two of our patients had failed attempted endoscopic treatment prior to our operation.

Two patients have been treated for rhabdomyosarcoma of the prostate and bladder neck. The first had received chemotherapy and radiation therapy, and then developed recurrent disease. The recurrence was surgically resected, and the urethra was preserved. The second patient had a large tumor, with only minimal response to chemotherapy. Surgical resection included the tumor, the entire posterior urethra, and the bladder neck. Bladder emptying was accomplished by construction of continent conduit using the cecal appendix implanted in the bladder with an anti-reflux technique. Both patients 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.

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 families, 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 are kept NPO for 10 days, receiving parenteral nutrition. Using this protocol, most patients have done very well. Three patients with Hirschsprung’s disease developed post-operative recto-cutaneous fistulas, and two patients suffered from a superficial wound infection that healed without further complications.

The decision to proceed with or without a colostomy must be made 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 prep has been inadequate or the repair is compromised by marginal blood supply.

CONCLUSIONS

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 that previously underwent repair and need to re-operate 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 as to draw final conclusions. However, it certainly is an alternative to be considered in certain circumstances.

The trans-anorectal 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 sinus.

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.

REFERENCES