Rectourethral Bulbar Fistula

9

9.1 Introduction

We define this malformation as a defect in a male in which the rectum is abnormally communicating with the lowest portion of the posterior urethra (Fig. 9.1). Figure 9.2 shows the characteristic image of a distal colostogram performed in a patient with this malformation.

This is the most common anorectal malformation defect in males in our series. This, of course, should not be interpreted as an accurate reflection of the incidence of this defect in the general population, since ours is a referral center, which means that in general, we tend to receive more complex defects and less of the benign and lower type of malformations.

A literature review revealed very few publications under the name of "rectourethral bulbar fistula" [1–4] in spite of the fact that it is a very common defect. The reason for this, we believe, is that most authors unfortunately are still using the terminology of "high," "intermediate," and "low". Some authors consider this an "intermediate" malformation [1, 5].

Consistent with the concept that dictates that these malformations occur in a spectrum fashion, it is relatively common to see cases in which the fistula is connected even more anteriorly (penile urethra) (Fig. 9.3) [1, 2, 6]. Some authors use the term "ano-penile-urethral fistula" [6].

Until the moment of writing this manuscript, we have had experience with the treatment of 231 cases of rectourethral bulbar fistula. Two hundred and nine of them were primary operations and 22 were reoperations.

As we have mentioned several times, every case represents an anatomic variant. Therefore, one can expect to see cases of rectourethral bulbar fistula in which the rectum opens into the urethra a little higher than the bulbar area. In other words, the rectum connects with the urethra anywhere between the prostatic urethra (middle portion of the posterior urethra) and the bulbar portion of the urethra (the lowest part of the posterior urethra).

9.2 Associated Defects

A significant number of our patients with rectourethral bulbar fistula have some sort of associated defect, mainly urologic. Hypospadias occur in 10 % of the cases, vesicoureteral reflux in about 13 % of the cases, and absent kidney in 10 % of the cases.

The sacrum, in this type of malformation, is usually normal. The average AP sacral ratio in rectourethral bulbar fistula is 0.61. The lateral one is 0.75; 2 % of the cases have sacral hemivertebrae.

Forty-six patients with this malformation were evaluated for the presence of the tethered cord; seven of them had that defect (15 %).

Electronic supplementary material Supplementary material is available in the online version of this chapter at 10.1007/978-3-319-14989-9_9.

A. Peña, A. Bischoff, *Surgical Treatment of Colorectal Problems in Children*,
DOI 10.1007/978-3-319-14989-9_9, © Springer International Publishing Switzerland 2015

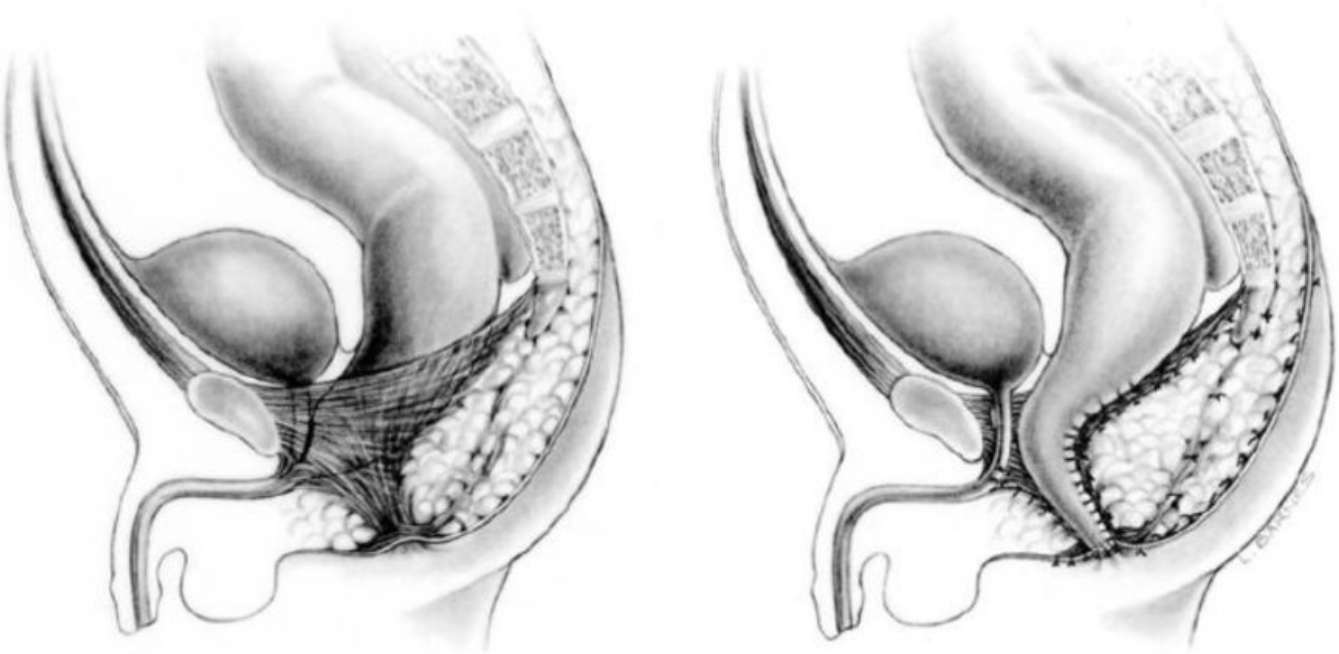

Fig. 9.1 Diagram showing a rectourethral bulbar fistula, preoperatively and postoperatively

Fig. 9.2 Distal colostogram showing a rectourethral bulbar fistula

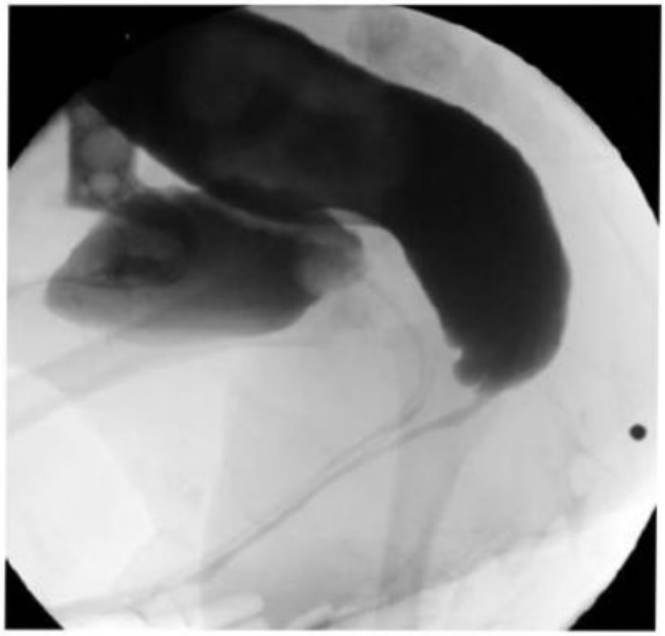

Fig. 9.3 Distal colostogram showing a fistula located at the penile urethra

Spinal abnormalities, mainly hemivertebra and butterfly vertebra, have been seen in approximately 7 % of the cases with a rectourethral bulbar fistula.

Esophageal atresia occurs in 4 % of these patients; duodenal atresia in 1 %.

Patent ductus arteriosus occurs in 8 % of the cases, but only one third of them required some

sort of therapeutic intervention due to hemodynamic problems. Atrial septum defects occurred in 7 % of the cases, but only one third of them required intervention. Ventricular septum defect occurred in 5 % of the cases, and ¼ of the cases required therapeutic intervention. Tetralogy of Fallot occurred in 1 % of these cases.

There is a small group of male patients born with an anorectal malformation that had communication between the rectum and the urethra in a location more anterior to the bulbar site, meaning somewhere in the spongiosum portion of the penile urethra. In those cases, the rectum follows a narrow fistula tract that runs parallel to the penile urethra and opens at different levels of the urethra (Fig. 9.3).

Those cases are not considered in the classification presented in this book, due to the fact that they are very unusual, but must be kept in mind by the surgeons.

There are also many cases of rectourethral bulbar fistula that, when seen during the newborn period, the rectal pouch seems to be bulging down and located very close to the perineal skin (Fig. 9.4). Using the traditional, old parameters to study the newborn babies, some of those cases were erroneously considered "low" malformations and consequently approached through the perineum. The surgeons found the rectal pouch, pulled it down successfully, and left the patient with a persistent, untouched rectourethral fistula. Soon enough, these patients passed urine through the rectum and stool through the urethra [7]. That is another reason why we do not favor the classification of these malformations into the traditional, old categories of "high," "intermediate," and "low."

During the neonatal period, these babies are, in general, healthy, due to the fact that the incidence of associated defects is rather low. The perineum in these patients is usually "good looking" (Fig. 9.5), meaning that they have good midline groove and a well-defined anal dimple. Yet, there is no evidence of any kind of perineal fistula or any meconium present in the perineum. During the first 20 h of life, usually they do not pass meconium through the urine, in spite of the presence of the fistula, and we interpret that as a manifestation of a very narrow fistula tract that requires a very significant intraluminal bowel

Fig. 9.4 Distal colostogram showing the rectal pouch located lower than the fistula

Fig. 9.5 Perineum of a patient with a rectourethral bulbar fistula. There is a prominent midline groove and a clear anal dimple

pressure in order to force the meconium through the fistula into the urethra. Therefore, one should not expect meconium in the urine in the first 20 h of life (see Chap. 4 of this book).

If the baby is born in an institution where the surgeons have a demonstrated interest and experience in the surgical management of neonatal patients, it is conceivable that these patients could be treated posterior sagittally during the newborn period without a colostomy. The fundamental requirement to perform that kind of treatment is that the surgeon could see the image of the rectum located well below the coccyx as delineated by the presence of gas. By seeing that image in a cross-table lateral film, one can be sure that by opening posterior sagittally, the rectum will be found, and therefore, one can avoid damage to the urinary tract.

Most of the patients operated on by us come to our institution with a colostomy already opened at another hospital.

If the surgeon has no experience in the management of neonates with anorectal malformations, it is much safer to open a colostomy (Chap. 5).

A laparoscopic approach is justified and convenient in cases of anorectal malformations that would require a laparotomy; yet, it has been done in these kinds of cases [8–20]. We are definitely opposed to that approach in this particular malformation. A posterior sagittal approach done in these patients is an operation that takes approximately 2 h. The rectum is minimally dissected, just enough to reach the perineum, which is very close. The abdomen is not entered; the results are very good. The patient has mild pain, can eat the same day of the operation, and can be discharged the following day. We do not understand the rationale of attempting the repair of these defects through the abdomen. A consequence of laparoscopic attempts to repair bulbar fistulas is the posterior urethral diverticula (pieces of rectum left attached to the urethra), due to the fact that the surgeon was unable to reach the end of the bowel (which resides well below the peritoneal reflection) through the abdomen, laparoscopically [21] (Animation 9.1). Also, a much more extensive circumferential dissection is done laparoscopically which is unnecessary.

9.3 Posterior Sagittal Anorectoplasty

We perform this operation as early in life as possible, since we try to avoid unpleasant memories related to the operations and rectal dilations in the patient. When the patients are born at our institution, they receive a colostomy at birth, and 2–4 weeks after that operation, assuming that the baby has recovered well, is growing, and developing normally, the baby is ready to undergo this operation. Many times, the patients are referred to us later in life, and that is why not all of our patients have been operated early in life.

9.4 Surgical Technique

Under good general anesthesia and endotracheal intubation, the patient is placed first in lithotomy position. We use a baby cystoscope routinely in all of our cases to confirm the diagnosis of rectourethral bulbar fistula. We take advantage of this procedure to learn more about the anatomy of the posterior urethra. We have been learning important anatomic facts from the cystoscopies in male patients with anorectal malformations, including abnormalities in the verumontanum, abnormal locations of the prostatic utricle, and ectopic ureteral openings in the bladder neck and posterior urethra. We also look at the bladder neck as well as the ureteral orifices and the bladder in general. At the end of this procedure, we pass a Foley catheter into the bladder. Sometimes the rectourethral bulbar fistula is a large one, and due to its location, the catheter tends to go into the rectum. This happens in approximately 20 % of the cases. If this happens, we can try to introduce a special catheter with a curved tip, called "coude catheter." We must try to direct the curve of the catheter anteriorly and cephalad in order to avoid the catheter going into the rectum. This may or may not work. If it does not work, then we can take a regular Foley catheter and introduce a lacrimal probe in its tip (Fig. 9.6) (photograph). By doing that, we can direct the tip of the catheter conve-

niently into the posterior urethra. If this maneuver does not work, we can pass a wire through a cystoscope, followed by the catheter. Most of the time, we are successful in placing the catheter in the bladder using one of the two described maneuvers. Occasionally, it is impossible to do this and we have to leave the catheter in the rectum. During the operation, when we open the rectum, we have the opportunity to redirect the catheter toward the bladder under direct vision.

With the Foley catheter in place, the patient is placed in prone position with the pelvis elevated. The positioning of the patient is the responsibility of the surgeon. One must be absolutely sure that all of the pressure areas are well cushioned to avoid any potential injuries. The chest should be slightly elevated from the table, with rubber foam (Fig. 9.7) to be sure that the shoulders fall forward to avoid stretching of the brachial plexus. The tips of the toes should not rest on the table. The penis should be free from the rubber foam that is placed in the groin to elevate the pelvis.

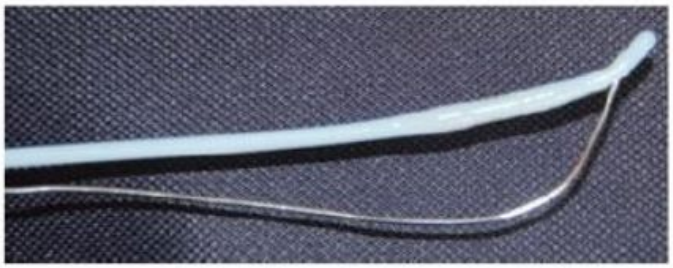

Fig. 9.6 Lacrimal probe introduced in the tip of a Foley catheter in order to direct it into the bladder and avoid getting through the fistula into the rectum

The perineum and perineal area are washed, prepped, and draped in the usual manner. The sterile towels are sutured to the skin to avoid their displacement during the operation (Fig. 9.8). Because of the position of the patient, the towels that surround the operative field tend to fall away, even if taped, and therefore, we have learned to stitch them to the skin.

Animations 9.2 and 9.3 illustrate the basic principles and technical maneuvers required to repair this malformation.

An electrical stimulator is used to determine the limits of the sphincter and also as a guide to be sure that we make the incision dividing the sphincter exactly in the midline, leaving equal amounts of muscle on both sides. A special very fine needle-tip cautery is used to avoid excessive tissue burning. A very sharp needle allows the surgeon to decrease the intensity of the electric

Fig. 9.7 Prone position with adequate cushioning

Fig. 9.8 Sterile towels sutured to the skin to avoid contamination

current used during the operation by concentrating the energy in the tip of the needle. Not being familiar with the use of this specific type of needle may provoke serious tissue burning. The needle must be used with quick movements touching the tissues only with the very tip of the needle and not with the lateral parts. The field should always be dry, as wetness will diffuse the energy, making the needle ineffective, which may induce the surgeon to increase the intensity, producing tissue burning.

The skin is opened with an incision running from the inferior portion of the sacrum to the anal dimple. When we open the skin, we continue opening the subcutaneous tissue and we usually find a group of fibers that run parallel to the skin and on each side of the midline; therefore, we call them parasagittal fibers (Fig. 9.9). These fibers are divided exactly in the midline. We try to separate rather than to cut them. A Weitlaner retractor is used, trying to place the retractor as superficially as possible to not injure the muscle fibers. Below the parasagittal fibers, we find a fatty tissue that we call ischiorectal fossa (Fig. 9.10). There, it is rather difficult to maintain the midline plane. There is a very thin fascia that can be identified by careful observation of the tissues; that thin fascia allows us to separate one side of the ischiorectal fossa from the other and to avoid the inconvenient herniation of fat into the operative field that may interfere with the exposure. Below the ischiorectal fossa, we find the levator muscle (Fig. 9.11). The levator muscle is divided in the exact midline with needle-tip cautery (Fig. 9.12).

In the area of the anal dimple, we find another group of fibers that run perpendicular to the parasagittal fibers, from the skin toward the urethra.

Fig. 9.9 Parasagittal muscle fibers on both sides of the wound

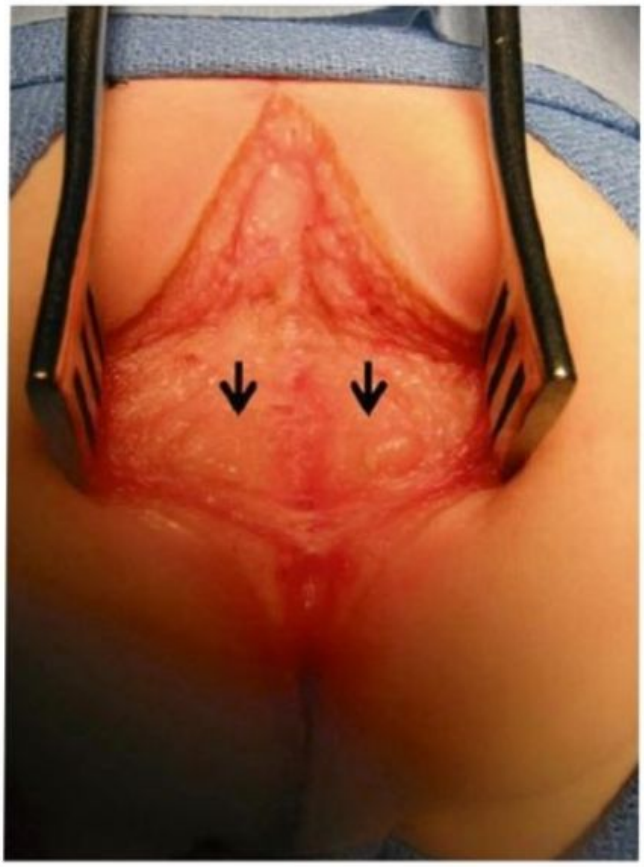

Fig. 9.10 Ischiorectal fossa located deeper than the parasagittal fibers. *Arrows* – ischiorectal fossa

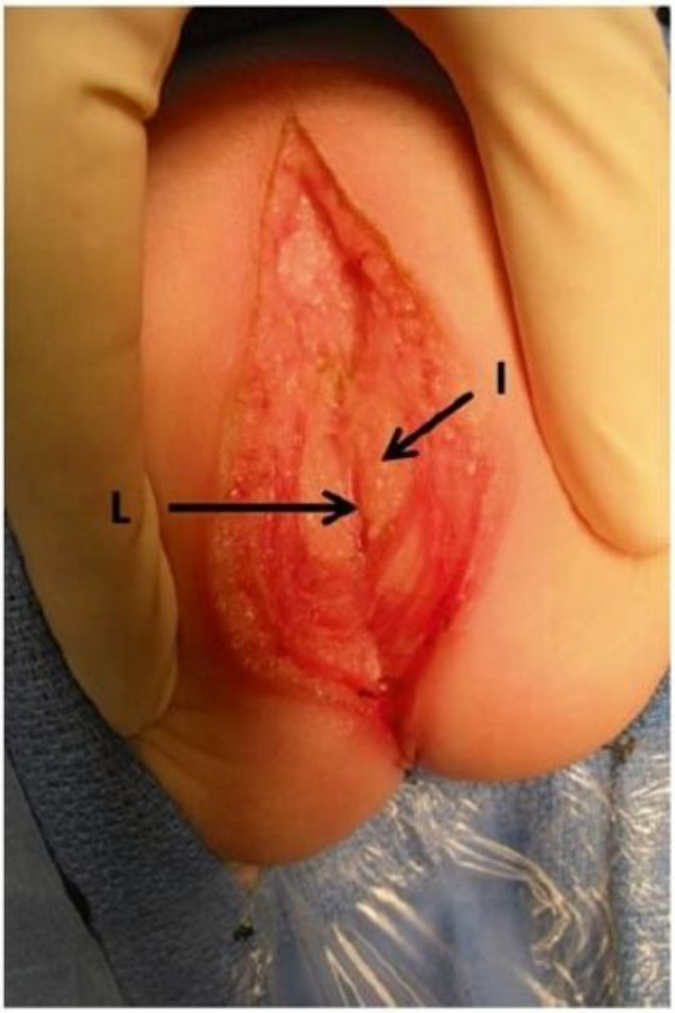

Fig. 9.11 Levator muscles, found deeper than the ischiorectal fossa. *L* levator, *I* ischiorectal fossa

Fig. 9.12 The levator muscle is divided in the midline

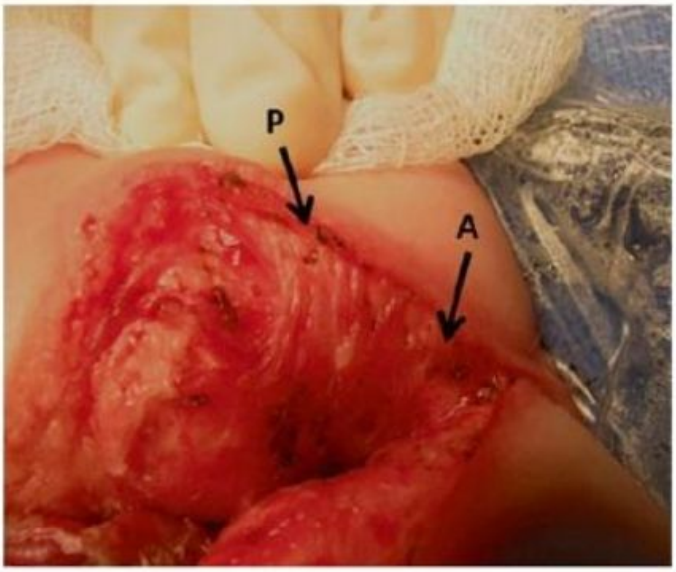

Fig. 9.13 Muscle complex. (**a**) Anterior limit of the sphincter. (**b**) Posterior limit of the sphincter

These we call the muscle complex (Fig. 9.13). The muscle complex joins in continuity with the levator muscle, forming an angle usually of about 90° (Fig. 9.14). The muscle complex fibers must also be divided exactly in the midline. After we divide the entire sphincter mechanism, deeper, we identify a characteristic white fascia that covers the rectum posteriorly (Fig. 9.15). The white fascia is divided to create a plane of dissection as close as possible to the rectal wall. The dissection of the rectum must be performed by staying in intimate contact with the rectal wall itself.

These patients should never be approached without a good, preoperative distal colostogram (Fig. 9.16 and Animation 9.4). This study performed prior to this operation shows that the rectum is located below the coccyx and opens in the lowest part of the posterior urethra; therefore, when we approach these patients posterior sagittally, there is no way to miss the rectum or to injure the urinary tract since the rectum is the first structure that we identify because it actually bulges when we open the white fascia.

Two 5-0 silk stitches are placed taking the posterior rectal wall, one on each side of the midline (Fig. 9.17). The needle-tip cautery is used again to divide the posterior rectal wall in

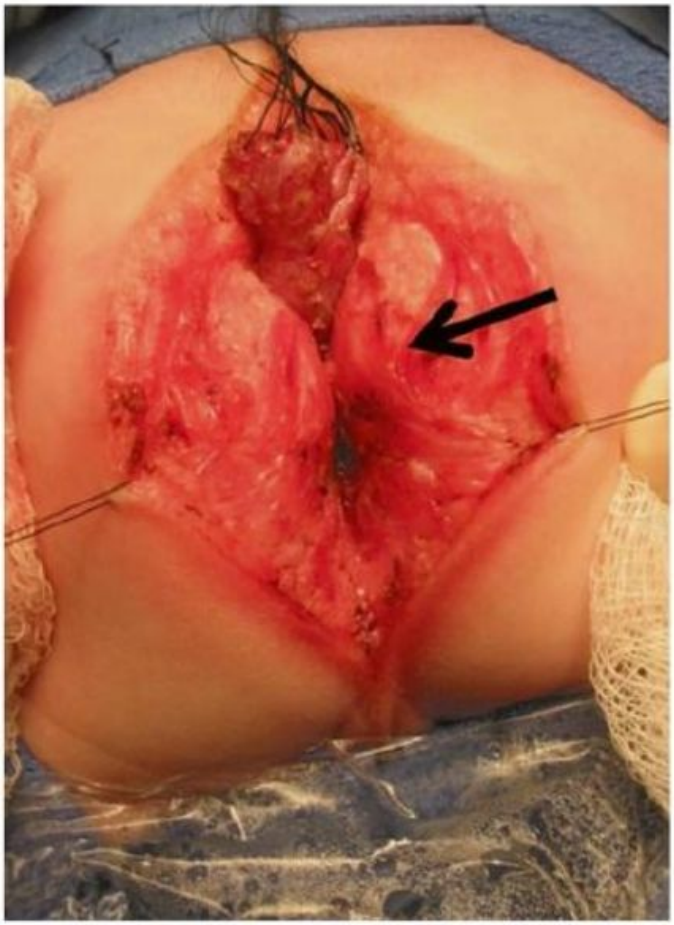

Fig. 9.14 Junction of levator and muscle complex (the rectum in this case was already separated from the urethra). *Arrow* shows the point of junction

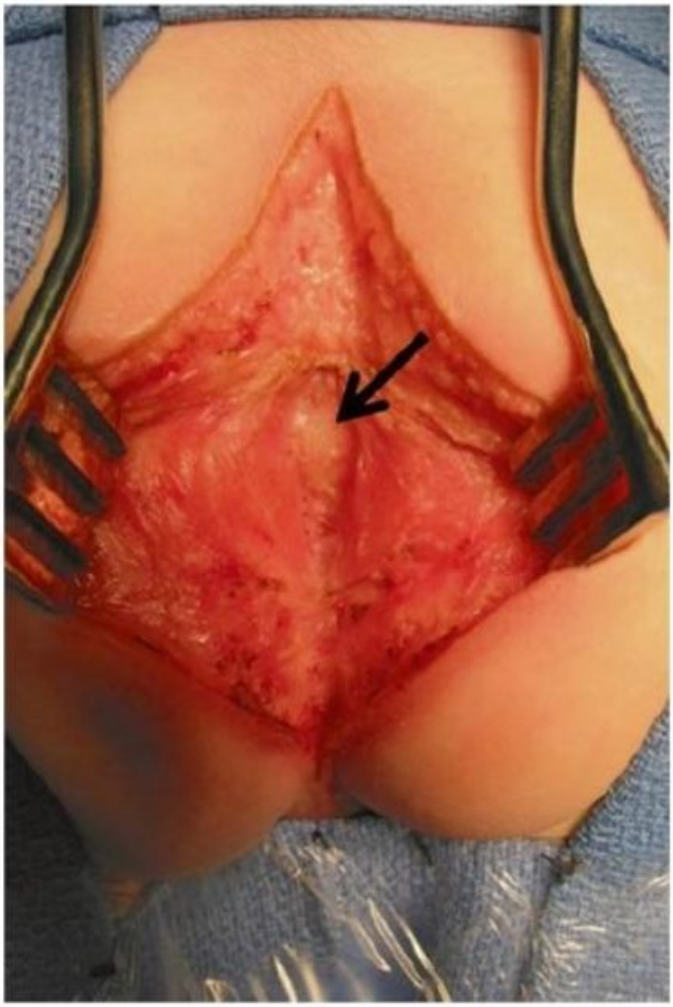

Fig. 9.15 Deeper than the levator, a characteristic white fascia is found, which covers the rectum from behind. The *arrow* shows the white fascia

between these two silk stitches. As we identify the lumen of the rectum, we place 5-0 silk sutures, taking the edges of the rectum in each side of the incision (Fig. 9.18).

The incision then is extended distally, yet remaining exactly in the midline. As we open with the needle-tip cautery gradually, we keep placing 5-0 silk stitches, taking the edges of the rectal wall. The use of retractors placed on the rectal mucosa must be avoided, because it traumatizes the tissues, producing edema and bleeding that may interfere with the visualization of the fistula. The fistula will become evident just by continuing the incision in the midline. A last 5-0 silk stitch is placed, taking the most distal part of our incision, including the edge of the fistula site (Figs. 9.19 and 9.20). At this point, we are just about to start the most delicate part of the operation, which is the separation of the rectum from the urinary tract.

Most of the catastrophic events that have occurred in cases that were referred to us from other institutions occurred at this particular stage: trying to separate the rectum from the urinary tract without following the basic principles. The first principle is to have a distal colostogram good enough to know that what we are dealing with is indeed the rectum, and we are not blindly exploring the pelvis of a baby. The most common source of mistakes in these cases is the lack of a distal colostogram. The surgeons entered looking for a rectum that was not there; they actually did not know the location of the rectum and suffered terrible misadventures in looking for it. In the process of searching for the rectum, they rather found the urethra, prostate, seminal vesicles, vas deferens, and nerves that must be preserved to avoid neurogenic bladder and impotence. Trying to pass a big right-angle clamp around the rectum is a dreadful old, traditional maneuver that must

Fig. 9.16 Distal colostogram showing a rectourethral bulbar fistula

Fig. 9.17 Two silk stitches are placed, taking the posterior rectal wall, one on each side of the midline

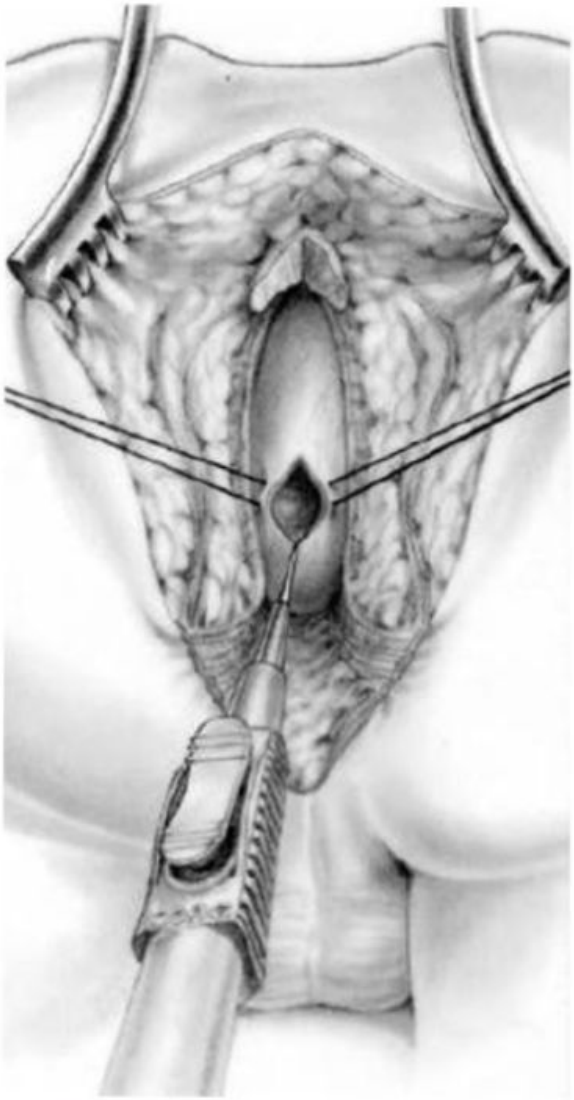

Fig. 9.18 Diagram showing stitches in both rectal edges

be avoided. Old, simplistic diagrams showing the rectal fistula connected to the urethra in a "T" fashion (Fig. 9.21) may explain why some surgeons think that they can go around the rectum with a right-angle clamp and simply "ligate" the fistula. This is also one of our concerns related to the laparoscopic approach of this malformation.

One must keep in mind that the lower the malformation, the longer the common wall between the rectum and the urinary tract. In other words, patients that have a recto-bladder neck fistula basically have no common wall between the anterior rectal wall and the posterior wall of the urinary tract. Therefore, those cases are ideal to be treated laparoscopically. Trying to make two walls out of one in a rectourethral bulbar fistula deep down in the pelvis with laparoscopic instruments is a risky business that frequently produces serious injuries (Animation 9.1).

The next step is to separate the rectum from the urinary tract, being sure that we do not injure any of the important elements of the urinary tract in that area. In order to do that, we place multiple 6-0 silk stitches taking the rectal mucosa about 2 or 3 mm above the fistula site, forming a hemicircumference cephalad to the fistula orifice. The rectal mucosa of the anterior rectal wall in this area has many folds that probably represent the original pectinate line. Those multiple folds make the separation of the rectum from the urethra more difficult. The multiple silk stitches allow us to have control of all of those folds and separate the rectum from the urethra, maintaining both structures intact (Fig. 9.22). Once those stitches have been placed, we then use the needle-tip cautery to make an incision in the rectal mucosa distal to the 6-0 silk sutures and cephalad to the fistula site. The incision is only 1 mm deep (Fig. 9.23). At this point, we specifically recommend not to continue trying to work between the rectum and the urethra, but rather to work on the lateral walls of the rectum. The remaining white fascia, fat, and extrinsic blood supply are removed from the rectal wall and cauterized, establishing a very clean lateral plane of dissection that will make the separation of the rectum from the urinary tract easier (Fig. 9.24). The lateral plane shows the path toward the anterior plane. A submucosal plane of dissection is then created between the rectum and the urinary tract. We are not supposed to see the vas deferens or the

Fig. 9.19 Operative view of the open rectum

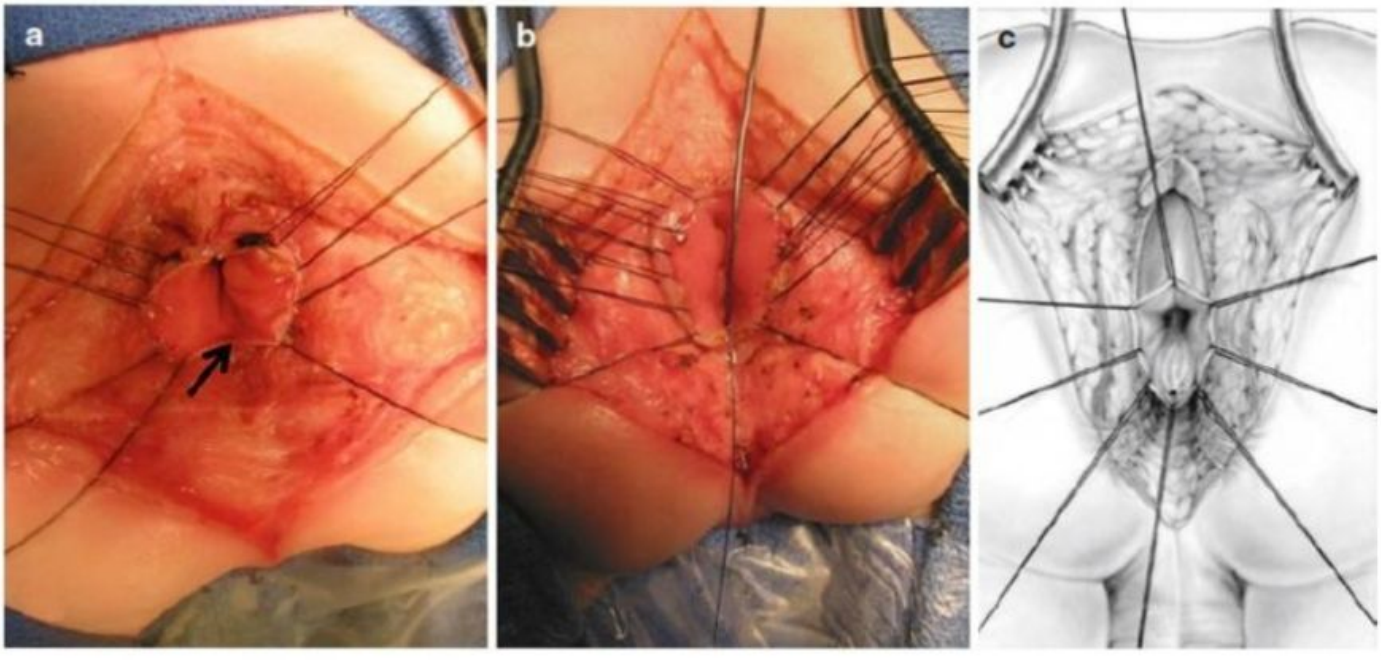

Fig. 9.20 The fistula is found always in the midline at the most distal part of the rectal opening. (**a**) *Arrow* showing the fistula. (**b**) Last stitch is placed in the midline, taking the lower edge of the fistula, lacrimal probe introduced in the fistula. (**c**) Diagram

Fig. 9.21 Old simplistic misguiding diagram showing the fistula connecting the rectum to the urinary tract in a "T" fashion

Fig. 9.22 Multiple fine silk sutures are placed in a hemicircumference, cephalad to the fistula

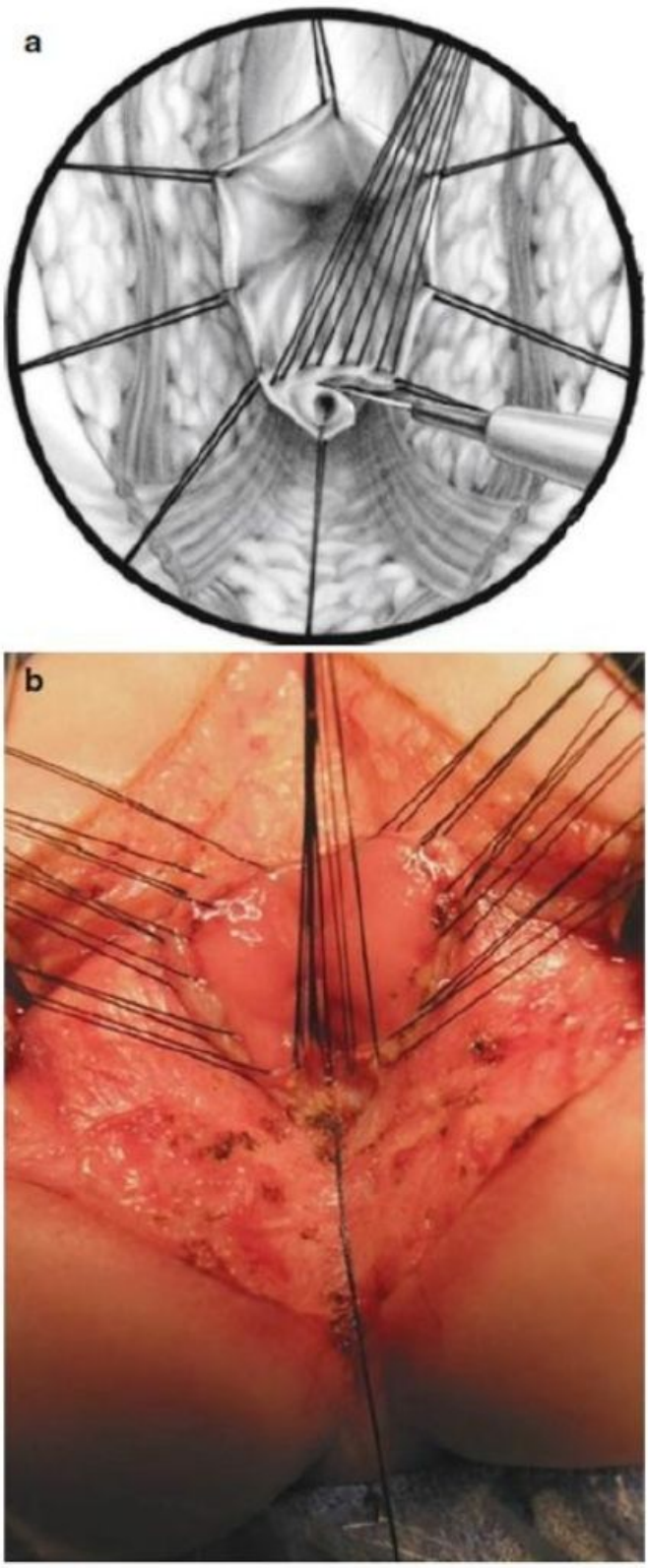

Fig. 9.23 Incision on the rectal mucosa, one millimeter deep, immediately cephalad to the fistula and distal to the silk sutures. (**a**) Diagram. (**b**) Operative

seminal vesicles. When we see those elements, it means that we are too deep in our dissection. Staying in the submucosal plane for about 5 mm and then going to full thickness is what allows us to respect all the important urologic structures.

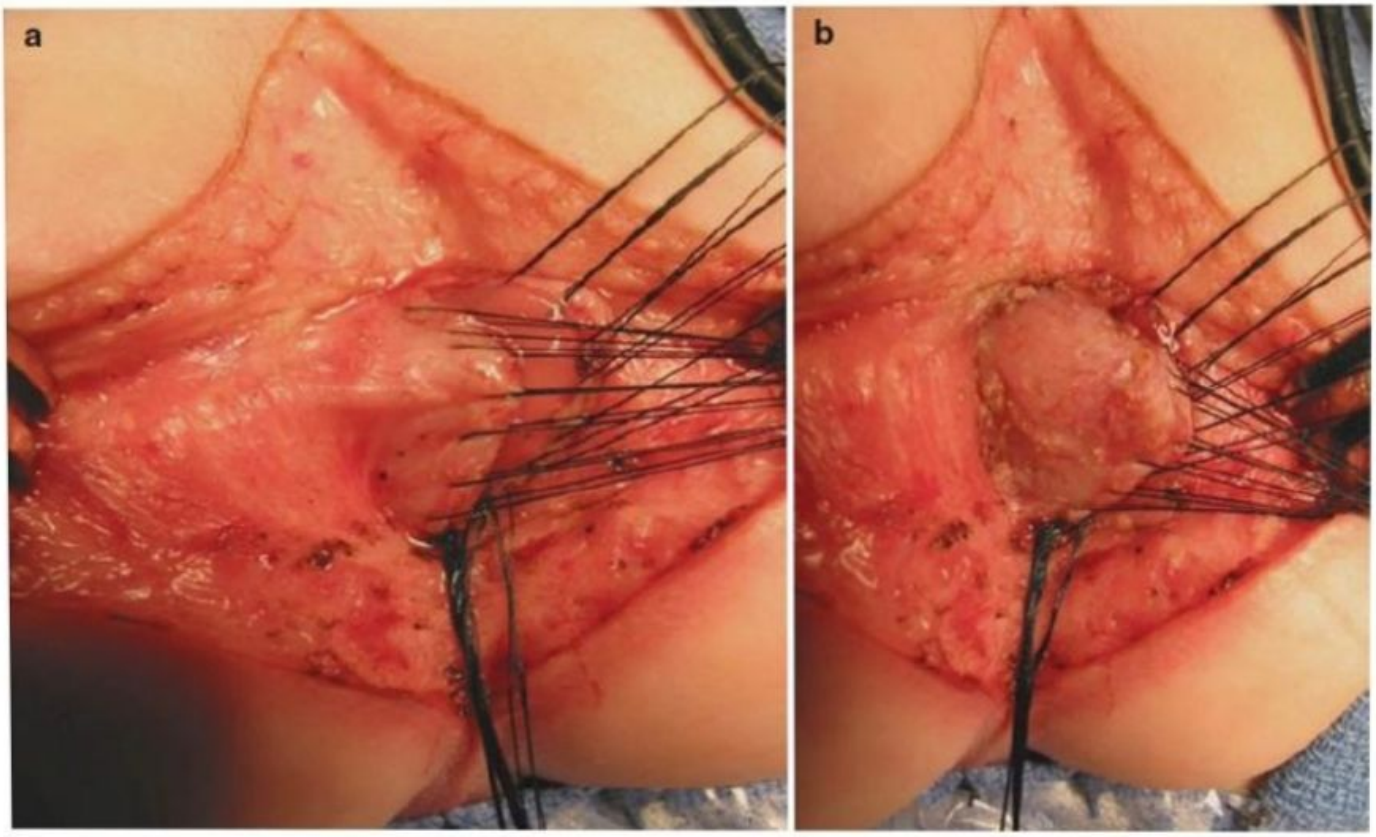

Fig. 9.24 Dissection of the lateral walls of the rectum, removing all the white fascia, fat tissue, and extrinsic vessels. (**a**) Before removing the white fascia. (**b**) After removing the white fascia

The dissection continues, intermittently switching from the lateral to the ventral dissection, until the rectum is completely separated from the urinary tract (Fig. 9.25). At that point, we estimate how much length is necessary in order to bring the rectum down to suture it to the skin with no tension. Rectourethral bulbar fistula cases require a minimal dissection on the rectum to reach the skin, due to the fact that the rectum is located rather low in the pelvis. This dissection is performed in a circumferential manner.

Uniform traction is applied on all the multiple silk stitches, including the 5-0 silk stitches that we placed originally when we opened the posterior rectal wall and the multiple 6-0 silk stitches. We like to say that "traction creates a plane," and by doing that, we can identify bands that represent the vessels and nerves that hold the rectum up in the pelvis (Animation 9.2). These tension bands are identified as grooves. The bands must be separated from the rectal wall, burned, and divided. These vessels must be burned carefully because they have a tendency to bleed when they retract into the pelvis (Fig. 9.26).

The perirectal dissection continues until we feel that we have gained enough length of rectum to bring it down to the perineum (Fig. 9.27). It is rather unusual to have to open the peritoneum when dealing with rectourethral bulbar fistulas. Opening the peritoneum is frequently necessary in cases of rectoprostatic fistulas but only rarely in this defect.

Once we gain enough rectal length, we then evaluate whether or not the patient needs tapering of the rectum. This is a maneuver that we have used very often in the past and we are using less and less now. We believe that this is a manifestation of the fact that now patients are receiving better colostomies (descending colon). An adequate colostomy decreases the frequency of megarectum that we frequently saw in patients that had transverse colostomies and were left many months without a repair. Those patients developed a megarectum that later translated into severe constipation. We believe that patients are now operated on earlier in life, and they have better colostomies (not transverse). Irrigating and cleaning the distal bowel during the opening of the colostomy result in a collapsed rectum (no

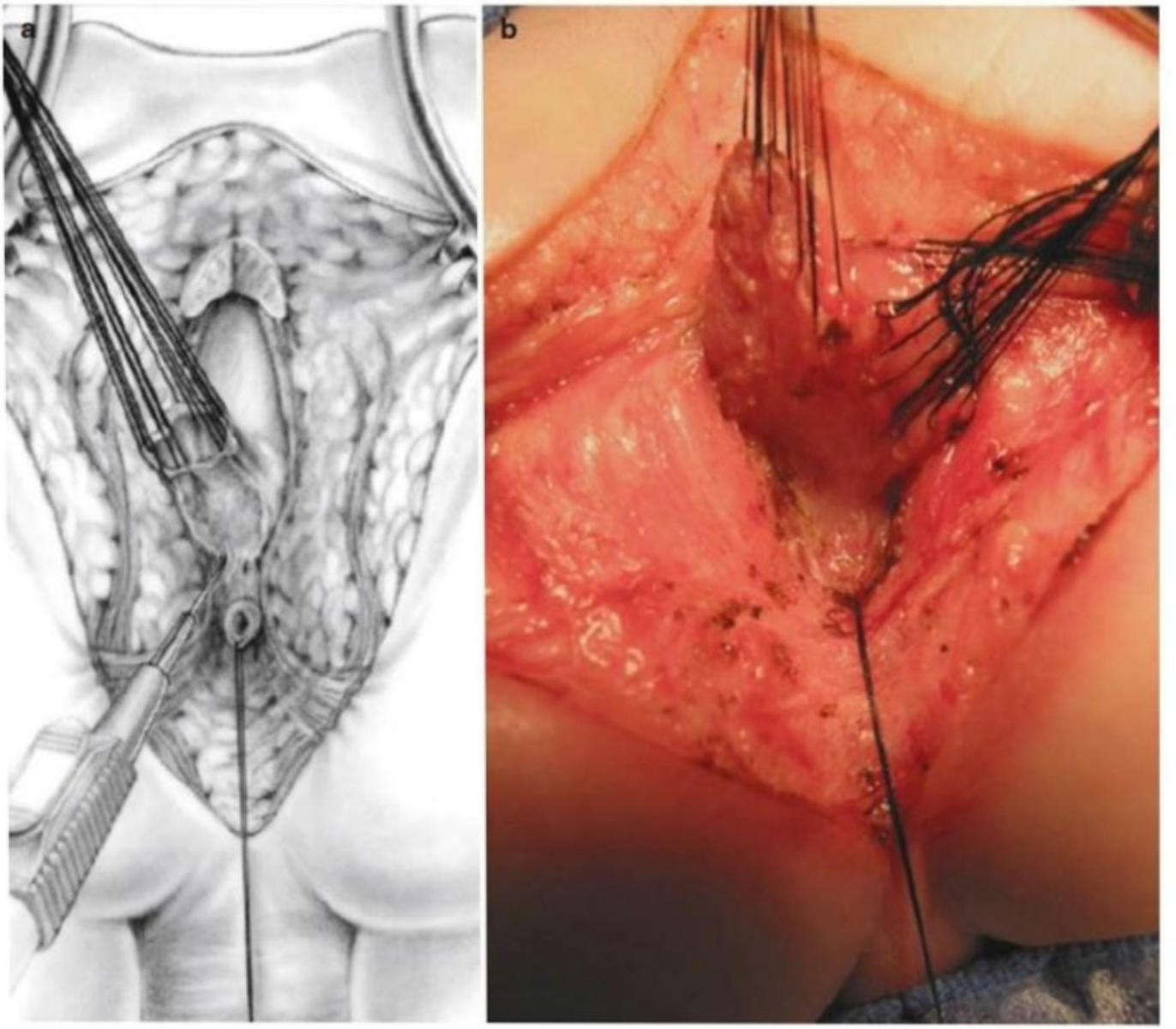

Fig. 9.25 Submucosal dissection of the anterior rectal wall to protect the urinary tract. (a) Diagram. (b) Operative

megarectum); therefore, it is rather unusual now to have to do tapering of these rectums. It is almost impossible to irrigate and clean a distal rectosigmoid through a transverse colostomy.

When a tapering is necessary, we should taper the rectum to the size of the available space, within the limits of the sphincter mechanism. The posterior aspect of the rectum is resected accordingly (Fig. 9.28). One should not taper the anterior rectal wall as this would leave a suture line located against the urethral fistula closure suture line, which is a predisposing factor for a fistula formation. The tapering may include 30–60 % of the rectal wall. The posterior rectal wall is repaired with two layers of interrupted 5-0 Vicryl sutures (Fig. 9.29).

The fistula is closed with three or four interrupted stitches of 6-0 Vicryl sutures. Those stitches take the white fascia that used to cover the rectum and urethra. No special effort is made to suture mucosa to mucosa at the fistula orifice (Fig. 9.30). In over thousand cases of male patients with anorectal malformations operated by us, we have never had a recurrence of a recto-urethral fistula.

The rectum is then placed within the limits of the sphincter. The levator muscle is sutured together behind the rectum in the midline with interrupted 5-0 Vicryl sutures. This can be done with the rectum located up and away from its future location to facilitate the visualization of the levator muscle (Fig. 9.31) or can be done with

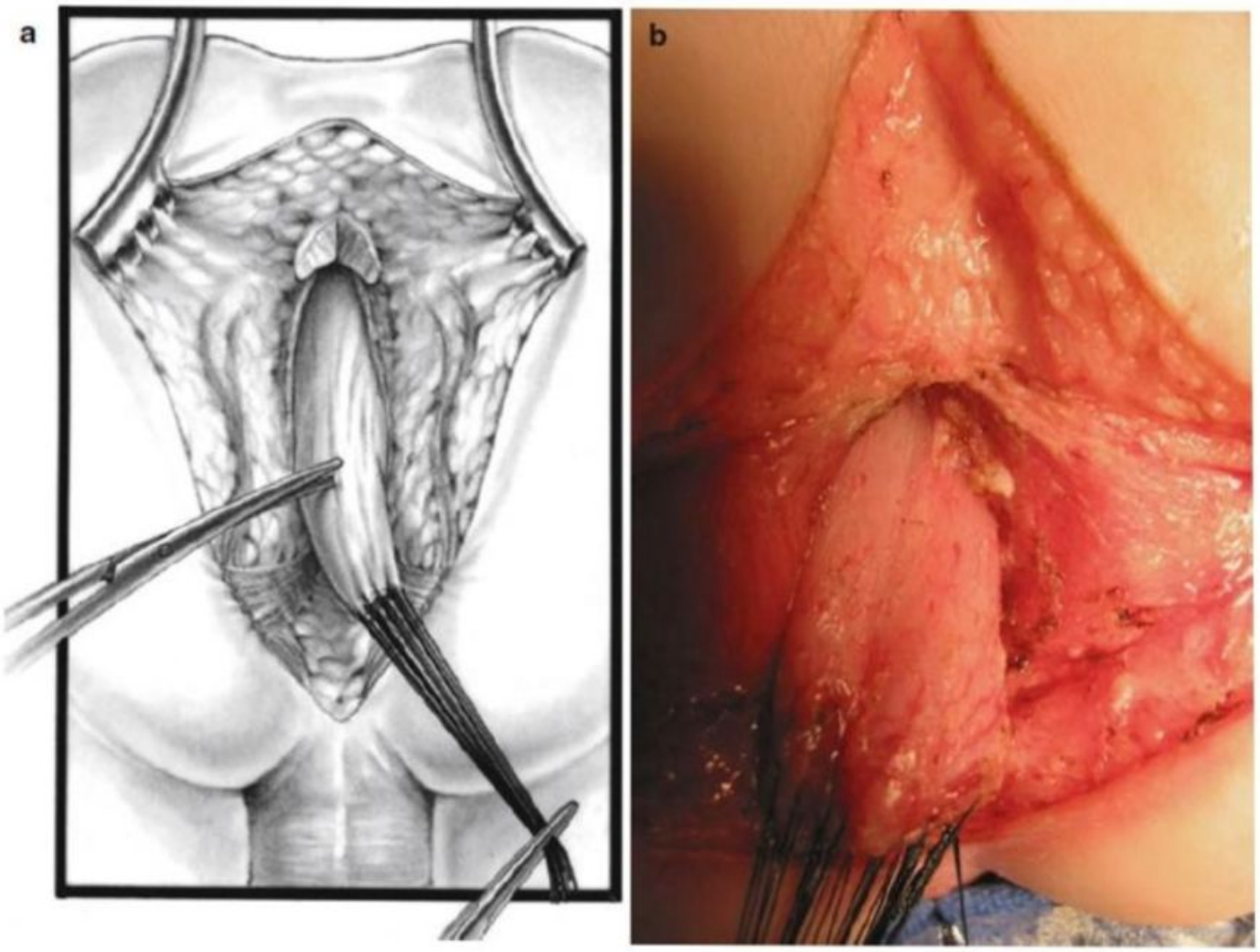

Fig. 9.26 Dividing and burning extrinsic vessels and bands of the rectum while applying traction, in order to pull it down. (**a**) Diagram. (**b**) Operative

the rectum already in place, particularly if the rectum is not very bulky. One can see the edge of the levator muscle, or one can use the electrical stimulator to be able to see it better.

We identify the junction between the levator and the muscle complex at the place where they create a 90° angle (Fig. 9.32). Actually, both structures (levator and muscle complex) are part of a continuum of muscle. This angle is less noticeable in cases with a poor sphincter mechanism.

Some patients with very poor sphincter mechanism (mainly rectoprostatic or recto-bladder neck fistula) simply have no available space between the levator and the urethra. There is no way to reconstruct the levator behind the rectum. Also, in patients with a very flat bottom, and therefore very poor sphincter mechanisms, it is very difficult to identify these sphincter structures. Fortunately, in cases of rectourethral bulbar fistula, this sphincter mechanism is easy to identify. The posterior edges of the muscle complex from each side are sutured together in the midline with interrupted 5-0 Vicryl sutures (Fig. 9.33). These stitches take a bite of the posterior rectal wall in order to anchor the rectum in a good position, and we think that that helps to prevent prolapse. The limits of the sphincters are electrically determined and marked with temporary 5-0 silk stitches (Fig. 9.34). The perineal body is reconstructed, bringing together the anterior limits of the muscle complex and the anterior limits of the sphincter in those cases in which our posterior sagittal incision was extended beyond the anterior limits of the sphincter (Fig. 9.35). The ischiorectal fossa is obliterated suturing the fat with

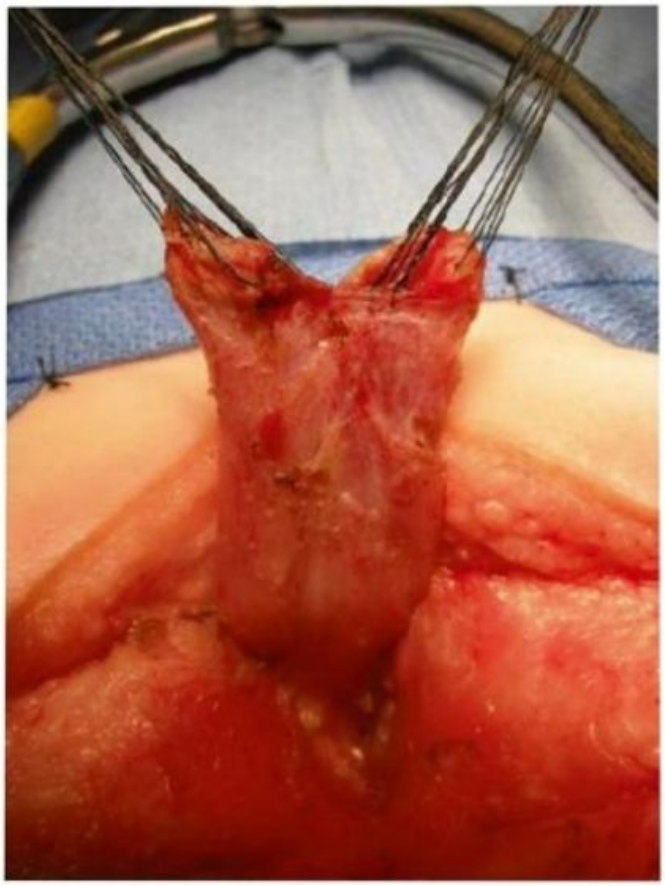

Fig. 9.27 Rectal dissection finished, the rectum reaches the perineum comfortably, without tension

interrupted 5-0 Vicryl sutures. The same suture material is used superficially to bring together the parasagittal fibers and subcutaneous tissue, putting a special emphasis in not taking the fibers of the parasagittal fibers themselves with our sutures, but rather bringing them together. U-type of stitches placed parallel to the muscle fibers facilitates the maneuver (Fig. 9.36). The anoplasty is performed with 16 circumferential stitches under slight tension.

The silk sutures used to pull the rectum are separated into two, right and left sutures. An incision is made in the anterior rectal wall in the midline; a first stitch of 6-0 Vicryl is placed, taking skin, bowel, and skin again as a U-type of suture. The same maneuver is done in the posterior corner of the anoplasty. The edges of the rectum are resected (Fig. 9.36), and stitches are placed in a radial (circumferential) fashion. The keys to avoid dehiscence of the anoplasty are to avoid excessive tension or devascularization and to be sure that all the stitches are placed under the same tension. Also, we want to be sure that the stitches

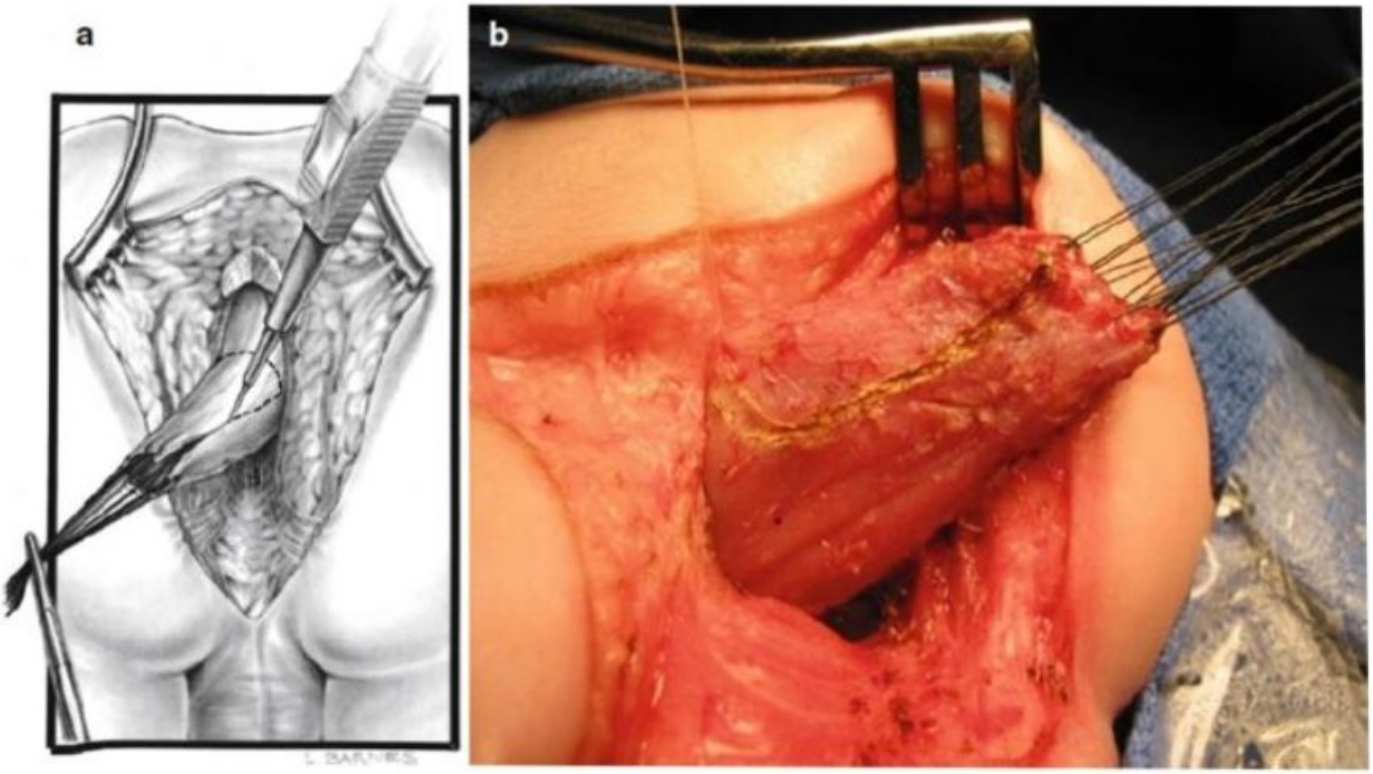

Fig. 9.28 Rectal tapering in a case of megarectum. Approximately 40 % of the posterior aspect of the rectum is resected. (a) Diagram. (b) Operative

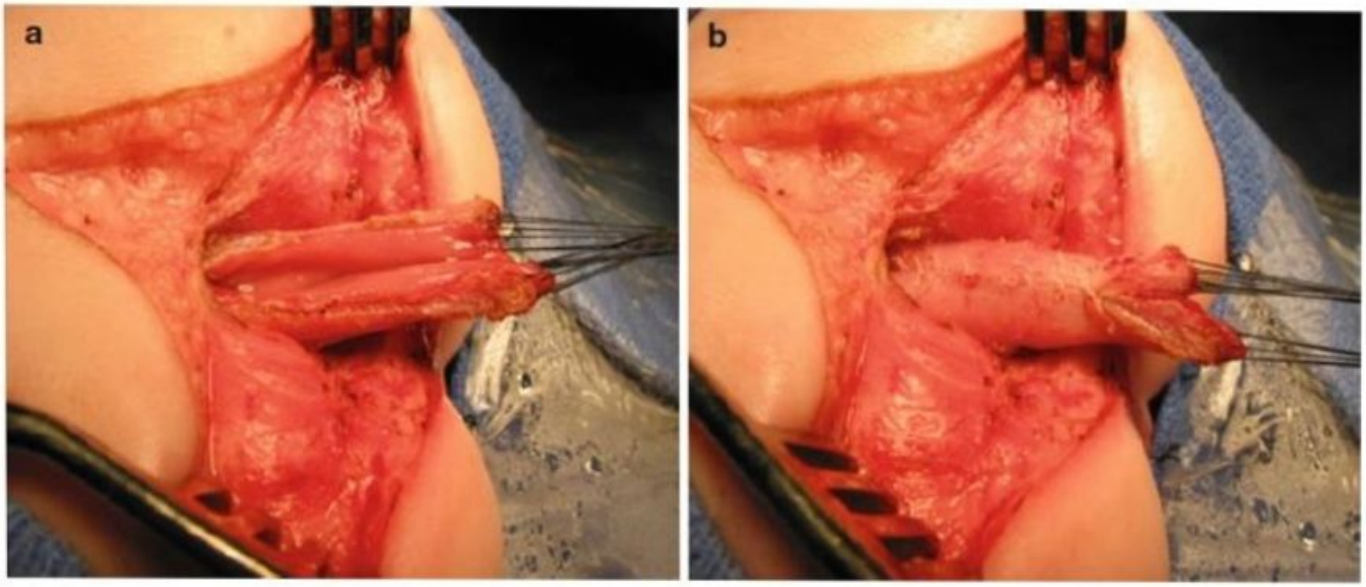

Fig. 9.29 The posterior rectal wall is repaired with two layers of interrupted sutures. (**a**) Before suturing. (**b**) After suturing

Fig. 9.30 Fine absorbable sutures are used to close the urethral side of the fistula. *Arrow* shows the fistula site

take full-thickness bowel, since sutures placed taking only the mucosa do not hold well to the skin. The sutures should be tied but not to the point of cutting the tissue with excessive force.

Through the years, we have learned that the blood supply of the rectum is well preserved provided the rectal wall integrity is respected and remains intact. An intact rectal wall guarantees a good intramural blood supply. Dissection of the rectum should be performed, staying as close as possible to the bowel wall, yet without injuring it. That is particularly crucial in patients with rectoprostatic fistulas or higher defects. In patients with rectourethral bulbar fistula, this usually does not represent a problem because these patients have a rectum that requires minimal circumferential dissection to reach the skin of the anal dimple.

The skin incision is usually closed with subcuticular 5-0 Monocryl (Fig. 9.37). We use an antibiotic ointment for the anoplasty and the posterior sagittal incision to be used for 5 days postoperatively. A Foley catheter is left in place for 1 week. A "double diaper" technique is used for the Foley catheter. The first diaper has an orifice through which the catheter is exteriorized; a second diaper is used to receive the urine. In this way, we avoid the use of a bulky Foley bag or "urinometer." In addition, the skin of the patient's perineum is better protected. We have never seen a case of an "ascending urinary tract infection" attributable to this technique.

We try to leave the catheter in place for one entire week. Sometimes, however, 3 or 5 days after

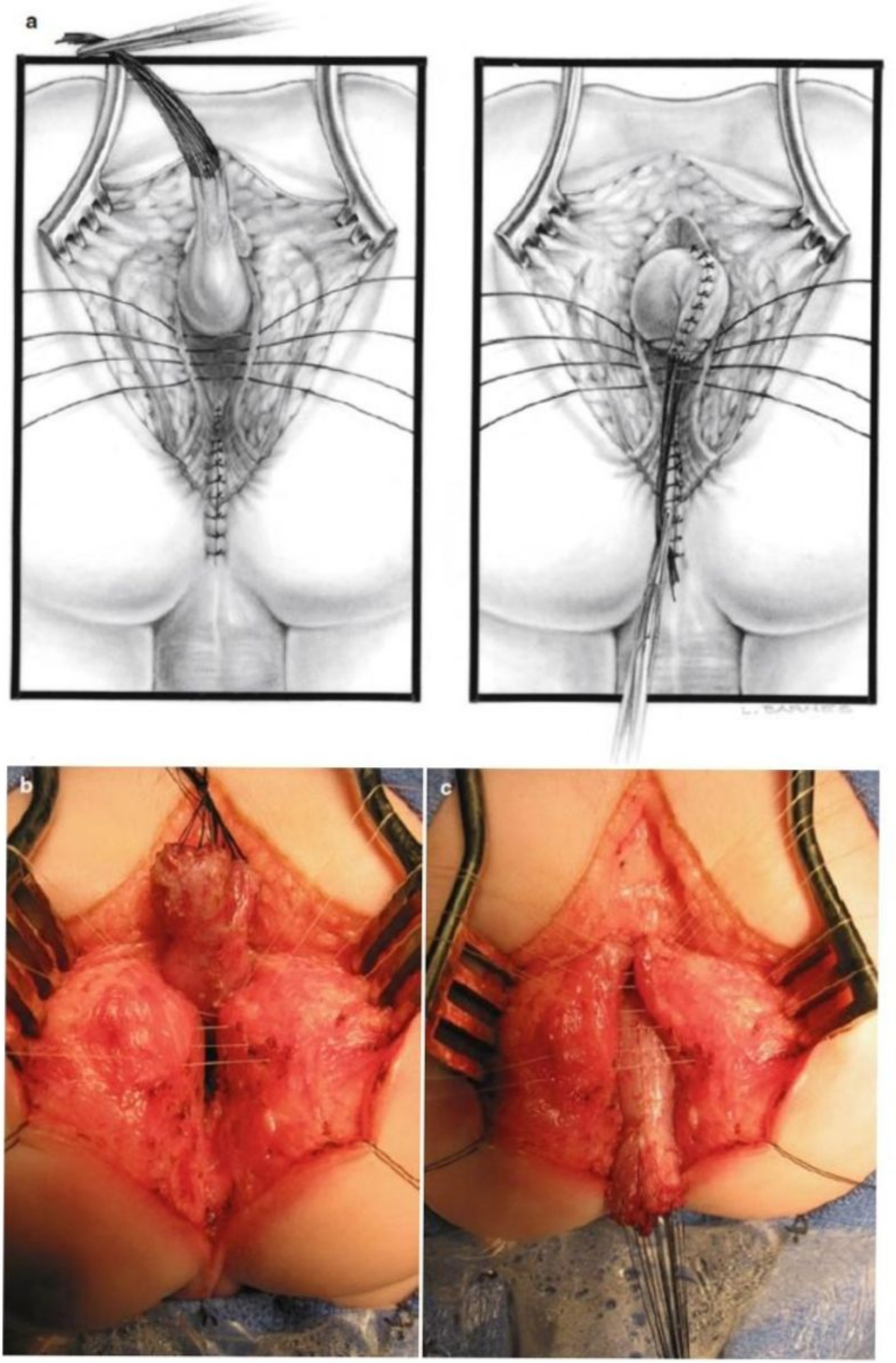

Fig. 9.31 Sutures are lying down taking both edges of the levator muscle. The rectum is pulled up in order to have a more clear view of the levator muscle. (**a**) Diagram. (**b**) Operative. (**c**) The rectum was pulled down deeper than the levator

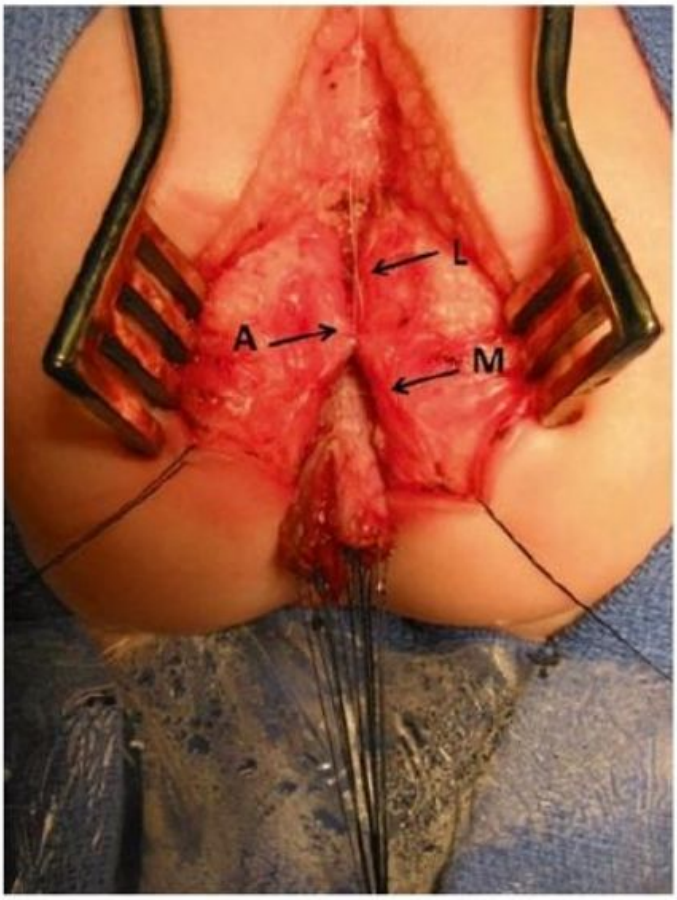

Fig. 9.32 The limits between the levator muscle and the muscle complex are arbitrarily determined at the place where both structures form an angle. *a* angle at the junction of levator muscle complex, *L* levator, *M* muscle complex

the operation, the parents describe that the babies suffer from severe cramps and simultaneously the parents can see urine coming out around the Foley catheter. That is a characteristic manifestation of bladder spasms. One can give them oxybutinin for the treatment of these spasms, but it usually does not work, and it is better to simply remove the Foley catheter; by doing that, even after only 48 h from the operation, we have never seen a problem. The fact that the baby is voiding around the catheter means that the catheter is no longer needed. Most patients, however, can tolerate the catheter for one entire week. A week after surgery, the baby comes to our clinic and we pull the catheter in the morning to be sure that the patient can urinate well.

Not being able to urinate for a baby with a good sacrum and a rectourethral bulbar fistula after the Foley is removed is a bad sign and usually is the result of a poor surgical technique. If the baby was urinary continent, had a normal urethra, and cannot void after a posterior sagittal operation, it means that there must have been an intraoperative nerve injury. This is prevented by following the basic principles of the operation, mainly staying exactly in the midline during the dissection of the rectum and being careful in the

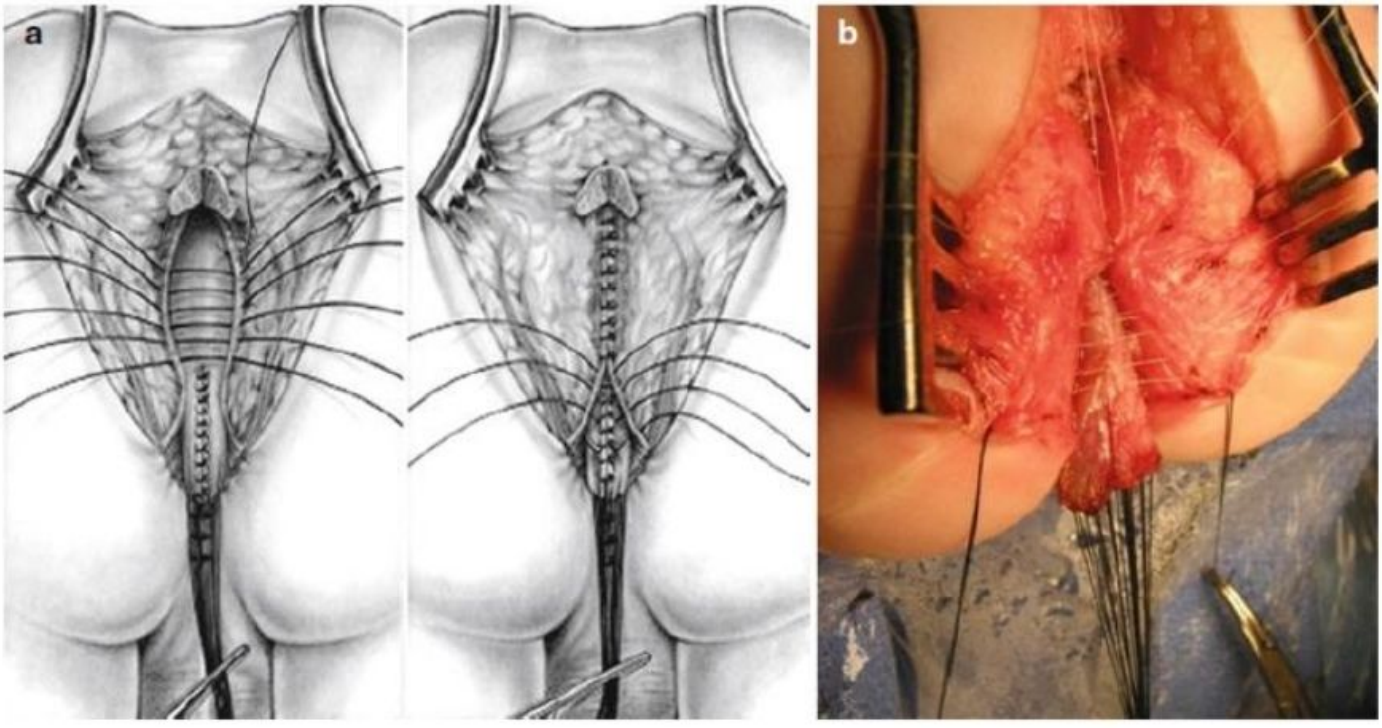

Fig. 9.33 The posterior edges of the muscle complex are sutured together, taking with the same suture a bite of the posterior rectal wall. (**a**) Diagram. (**b**) Operative

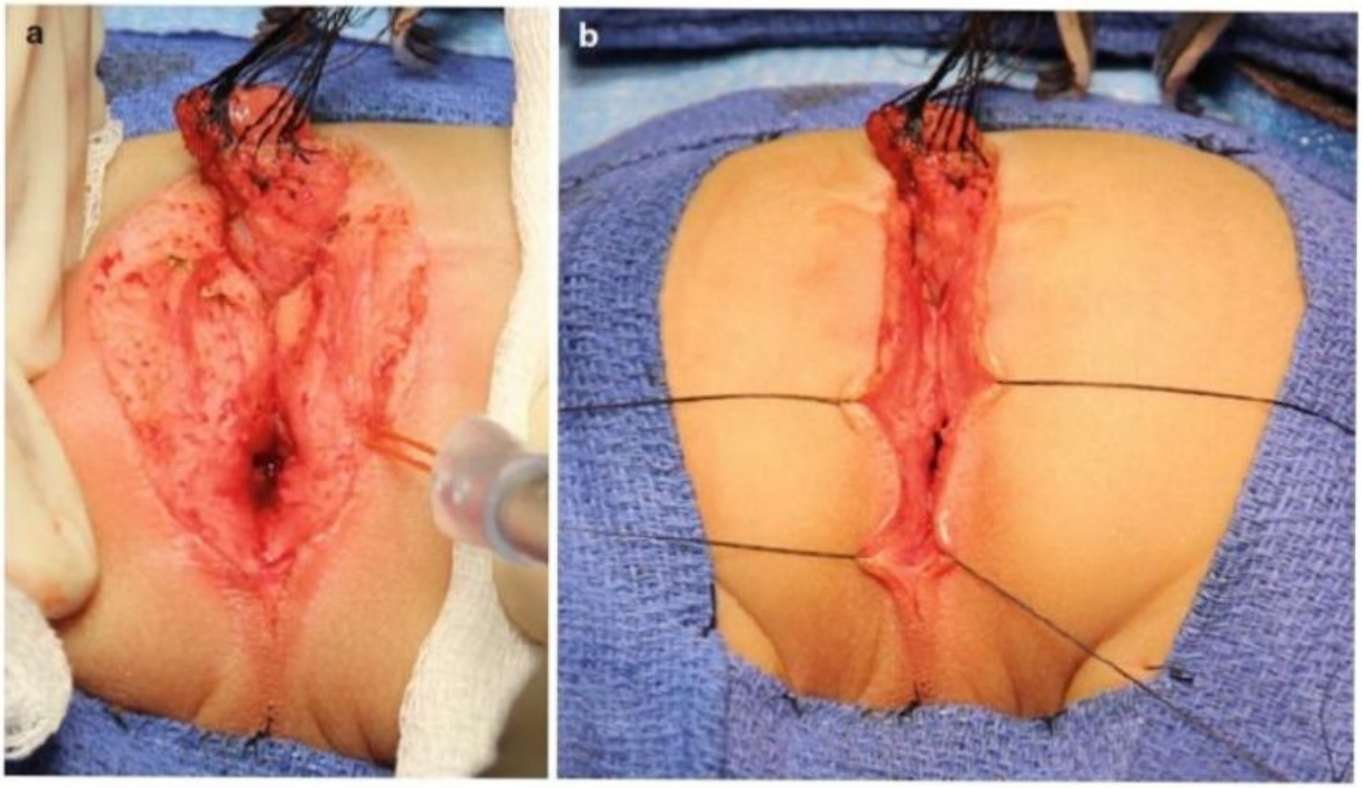

Fig. 9.34 The limits of the sphincter at the skin level have been electrically determined and marked with temporary silk stitches, prior to the levator reconstruction. (**a**) Electrical stimulation to determine the limits. (**b**) The limits of the sphincter marked with temporary silk stitches

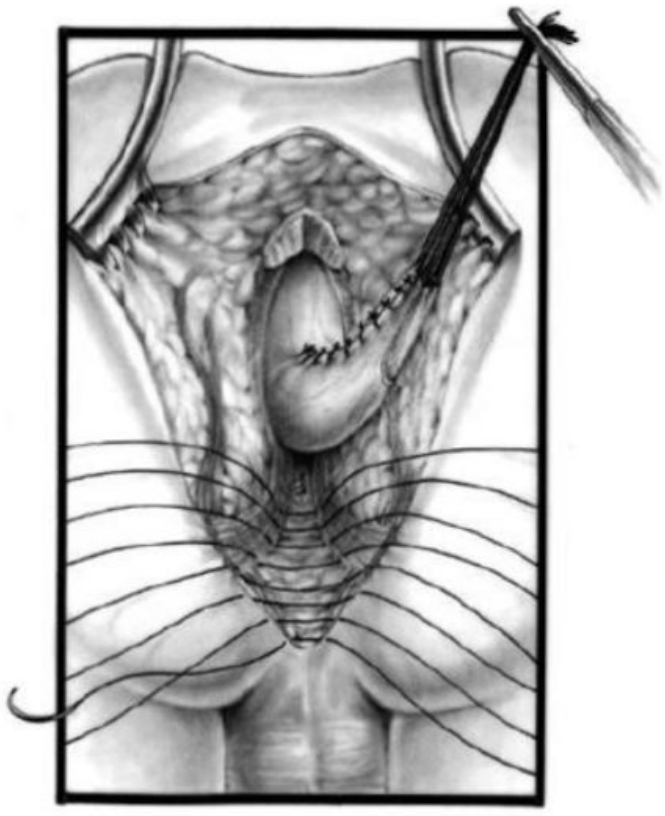

Fig. 9.35 The perineal body was reconstructed, bringing together the anterior limits of the sphincter. This was done prior to the pull-through of the rectum

Fig. 9.36 Anoplasty performed with 16 circumferential stitches

area of dissection anteriorly between the rectum and urinary tract. Also, a baby who had erections prior to the operation and the parents describe that they cannot see erections after the operation can be interpreted in the same way.

Fig. 9.37 Subcutaneous tissue, dermis, and skin are closed

Sometimes, those symptoms (urinary retention and absence of erections) are temporary and patients recover, but it is still a very worrisome sign. In patients with very abnormal sacra or myelomeningocele, one can expect those kinds of problems, but in patients with a normal sacrum, they are considered iatrogenic and therefore unacceptable.

Two weeks after surgery, the baby comes to the clinic, and we show the parents how to perform anal dilatations. We give them a copy of our protocol (See Chap. 5) that they are supposed to follow religiously. Dilatation should not be painful; they are uncomfortable but not painful if the operation was done correctly. Usually, about 2 months after these operations, the colostomy is closed.

9.5 Functional Results

Ninety-seven patients were older than 3 years and in contact with us, and 75 of them (78 %) had voluntary bowel movements. Half of them occasionally had marks (soiling) in the underwear. Ninety-two percent of patients are urinary continent. The soiling is usually a consequence of a problem with constipation that has not been treated well. The use of laxatives frequently takes care of this problem.

References

1. Kitchen PRB (1971) A study of the surgical anatomy of congenital rectobulbar fistula. Aust N Z J Surg 40(3):248–252
2. Gupta AK, Bhargava S, Rohtagi M (1986) Anal agenesis with recto-bulbar fistula. Pediatr Radiol 16: 222–224
3. Currarino G (1994) Imperforate anus associated with a recto-bulbar-cutaneous fistula. J Pediatr Surg 29(1):102–105
4. Currarino G (1996) The various types of anorectal fistula in male imperforate anus. Pediatr Radiol 26:512–522
5. Glasier CM, Seibert JJ, Golladay ES (1987) Intermediate imperforate anus: clinical and radiographic implications. J Pediatr Surg 22(4):351–352
6. Ohno K, Nakamurs T, Azuma T, Yoshida T, Yamada H, Hayashi H, Masahata K (2008) Anopenile urethral fistula. Pediatr Surg Int 24:487–489. doi:10.1007/s0038300720530
7. Shumyle A, Taiwo AL, Peña A, Sheldon C, Levitt MA (2011) Acquired posterior urethral diverticulum following surgery for anorectal malformations. J Pediatr Surg 46:1231–1235. doi:10.1016/j.jpedsurg.2011.03.061
8. Kubota A, Kawahara H, Okuyama H, Oue T, Tazuke Y, Tanaka N, Okada A (2005) Laparoscopically assisted anorectoplasty using perineal ultrasonographic guide a preliminary report. J Pediatr Surg 40:1535–1538. doi:10.1016/jpedsurg.2005.06.008
9. Lima M, Antonellini C, Ruggeri G, Libri M, Gargano T, Mondardini MC (2006) Laparoscopic surgical treatment of anorectal malformations. Pediatr Med Chir 28(4–6):79–82
10. Ichijo C, Kaneyama K, Hayashi Y, Koga H, Okazaki T, Lane GJ, Kurosaki Y, Yamataka A (2008) Midterm postoperative clinicoradiologic analysis of surgery for high/intermediate-type imperforate anus: prospective comparative study between laparoscopy-assisted and posterior sagittal anorectoplasty. J Pediatr Surg 43(1): 158–162. doi:10.1016/j.jpedsurg.2007.09.037
11. Rollins MD, Downey EC, Meyers RL, Scaife ER (2009) Division of the fistula in laparoscopic-assisted repair of anorectal malformations-are clips or ties necessary? J Pediatr Surg 44(1):298–301. doi:10.1016/j.jpedsurg.2008.10.032
12. Podevin G, Petit T, Mure PY, Gelas T, Demarche M, Allal H, Becmeur F, Varlet F, Philippe P, Weil D, Heloury Y (2009) Minimally invasive surgery for anorectal malformation in boys: a multicenter study. J Laparoendosc Adv Surg Tech 19(Suppl 1):S233–S235. doi:10.1089/lap.2008.0137
13. Yamataka A, Kato Y, Lee KD, Lane G, Kusafuka J, Okazaki T (2009) Endoscopy-assisted laparoscopic excision of rectourethral fistula in a male with imperforate anus. J Laparoendosc Adv Surg Tech 19(Suppl 1):S241–S243. doi:10.1089/lap.2008.0144
14. Koga H, Kato Y, Shimotakahara A, Miyano G, Lane GJ, Okazaki T, Yamataka A (2010) Intraoperative measurement of rectourethral fistula: prevention of