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Repair of recto-urethral fistula with urethral augmentation by buccal mucosal graft and gracilis muscle flap interposition – our experience

[Autor's unedited version]

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Introduction Recto-urethral fistula (RUF) is a relatively rare surgical condition, the treatment of which is quite challenging. There are many causes of RUF but 60% of them are iatrogenic following open prostatectomies, radiotherapy, brachytherapy, urethral instrumentation etc. We present a series of six cases treated at our institution.

Material and methods A retrospective study of all six patients of recto-urethral fistula treated at our centre 'between' 2011 to 2016 was done. The study included charting of information like age, etiology, clinical presentation, diagnostic modalities, treatment protocols, complications and recurrence. All the patients had simple direct fistulas with no previous history of repair. One had history of pelvic fracture following road traffic accident, one had a penetrating perineal injury following road traffic accident; two patients had history of Freyer's prostatectomy for Benign prostatic hypertrophy; two patients had history of open radical prostatectomy performed at other centers. All patients were treated with an initial double diversion (suprapubic cystostomy and colostomy) followed by definitive surgical repair three months later. The surgical technique used was by fistula excision, urethral augmentation by buccal mucosal graft, primary rectal defect repair and gracilis muscle flap interposition between rectum and urethra.

Results The patients were followed up ranging from 6 to 48 months with a mean follow-up period of 27 months. There were minimal complications like main wound site infections, seroma at the harvested site of gracilis muscle flap, urethral stricture. There was no report of recurrence.

Conclusions From our experience we conclude that this method of repair is a very efficient one without any recurrence and with minimal complications. The results were on par with all the other successful methods of recto-urethral fistula repair described in literature.

INTRODUCTION

RUF is a relatively uncommon surgical condition which requires complex and meticulous surgery. RUFs are classified according to etiology by culp and calhoon [1] as follows a) Congenital due to malformation of anus and urinary tract. b) Iatrogenic following surgeries like open prostatectomy, radiotherapy, brachytherapy, urethral instrumentation. c) Traumatic d) Neoplastic e) Inflammatory. Of these 60% of RUFs are iatrogenic [2] and majority are caused by radical prostatectomy [3, 4, 5].

RUFs are also reported after prostate cryosurgery, radiotherapy, chemotherapy, high intensity focused ultrasound therapy and transrectal hyperthermia [6–9]. Common presentation of RUF are watery stools, fecaluria, pneumaturia [10, 11]. RUFs can be diagnosed clinically with symptoms like fecaluria, pneumaturia, urine leak from rectum. Digital rectal examination, proctoscopy and cystoscopy are some of the suggested modalities for diagnosis. MCU (micturating cysto-urethrogram) is suggested for all cases of suspected RUFs and passage of dye into rectum confirms the diagnosis [12, 13, 14]. CT Cystogram is an additional and important diagnostic modality which is very useful during emergencies like traumatic cases. To assess the outcome of this surgical technique on a long term basis this study was undertaken.

MATERIAL AND METHODS

A retrospective study of all six patients of recto-urethral fistula treated at our centre 'between' 2011 to 2016 was done. The study included charting of information like age, etiology, clinical presentation, diagnostic modalities, treatment protocols, complications and recurrence. A total of six patients presented to our hospital with clinical features suggestive of RUF. Diagnosis was confirmed by symptoms, per rectal examination, MCU and Cystoscopy. Two of the patients visited the emergency room with history of road traffic accident (RTA).

Case 1. This patient had history of pelvic fracture with inability to pass per urethral catheter for which supra pubic cystostomy was done. Patient presented with fecaluria and passing urine per rectum after 1 week. Digital .rectal examination revealed a communication between rectum and urethra. CT Cystogram was done by pushing dye through the supra pubic cystostomy into bladder and there was passage of dye into rectum. A diversion colostomy was done and patient reviewed after 3 months. The pelvis was stabilized before taking him up for the definitive surgery.

Case 2. Second patient had h/o RTA with a penetrating injury in the perineum resulting in injury to urethra and rectum. Supra pubic cystostomy and colostomy were done. Prophylactic tetanus immunoglobulin was given. Thorough wound cleaning was done and it was made sure there was no infection before taking for the definitive procedure. Patient was reviewed after 3 months.

Case 3 and 4. Two patients had history of Freyer's prostatectomy done for BPH in some other centre. Patients were referred to our hospital with complaints of watery diarrhea and fecaluria. Digital rectal examination and MCU confirmed the diagnosis. Supra pubic cystostomy and a diversion colostomy was done and reviewed after 3 months for definitive surgery.

Case 5 and 6. Two patients had history of radical prostatectomy for CA Prostate at other centre. Both patients had undergone supra pubic cystostomy and a diversion colostomy. Spontaneous closure was not seen after 3months and were referred to our hospital.

In all six patients excision of fistula, urethral augmentation by buccal mucosal graft, closure of rectal defect in multiple layers and transposition of gracilis muscle flap between urethra and rectum was done.

Pre-operative instructions: All patients were advised to take good colostomy and SPC care.

Surgical technique

All surgeries were performed by the same urologist. Patient is placed in lithotomy position. Cystoscopy was done and the fistulous connection was visualized (Figure 1). All the fistulas were direct and simple fistulas, approximately measuring around 1cm in size and were admitting the beak of a 22 Fr cystoscope. 0.35 guide wire was passed into the bladder through the cystoscope (Figure 2). Foley's catheter was guided over it.

An inverted 'Y' shaped incision made over the perineum. Incision was deepened and all the layers including colle's fascia was incised. The perineal body was dissected and cut to create space between rectum and urethra. Rectum was dissected while sparing the external sphincter. The urethra was mobilized anteriorly. Index finger was inserted into the rectum and the fistulous opening was felt. The fistulous opening was incised around the finger and the edges were freshened and sutured in two layers using 3-0 vicryl sutures. Simultaneously the buccal mucosal graft was harvested from inner cheek sparing the stenson's duct. Buccal mucosal graft was placed over the urethral defect and sutured using 3-0 vicryl (Figures 3A & B).

Harvesting the gracilis muscle flap: A line was drawn on the inner thigh starting from pubic tubercle to medial condyle of tibia. An incision was made 10 cm away and 3 cm below the pubic tubercle to conserve the main neurovascular bundle supplying the gracilis muscle. Three more incision were made in between the first incision and the medial condyle, at equal distance from each other (Figure 4). The tendinous insertion was divided and the muscle separated from its insertion. The gracilis muscle was carefully dissected by dividing the small vessels supplying the muscle and it was delivered out from the proximal incision (Figure 5). The viability of muscle was tested by eliciting twitching's after it was touched with a bipolar cautery. The muscle was rotated by 180 degree and tunneled beneath the subcutaneous tissue and interposed between rectum and urethra and sutured to the pararectal tissues using 2-0 vicryl sutures (Figure 6).

A drain was kept at the harvested site and incisions sutured. Suprapubic catheter was removed after three days. Drain was removed after the wound was dry. Colostomy closure was done after 2 months. Per urethral catheter was removed after 6 weeks.

Post operative instructions: All patients were advised to maintain perineal hygiene and report immediately if they experienced any symptoms like poor stream of urine, pnemauturia, fecaluria.

The average operating time was 227 minutes and average hospital stay was 11.16 days (Table 1).

RESULTS

The patients were followed up ranging from 6 to 48 months with a mean follow-up period of 27 months. There were minor complications like main wound infection or seroma at the harvested site of gracilis in 4 patients and were managed conservatively. One patient

presented with poor stream after 4 months of the repair and diagnosed to have stricture. Four patients developed erectile dysfunction soon after the inciting factors causing the RUF (2 traumatic, 1 radical prostatectomy, 1 Freyer's prostatectomy). There was no improvement after the repair. We have to take into account that erectile dysfunction was caused by the primary inciting factor and not the corrective surgery. There was no case of anal stricture or urinary incontinence. There was no recurrence of the fistula noted in any of our patients (Tables 2 & 3).

DISCUSSION

Spontaneous closure of small RUF have been reported following long term per urethral catheterization [15]. Spontaneous closure following double diversion have also been reported in war wounds [14] and post radical prostatectomies [16]. However widely accepted protocol worldwide now is double diversion followed by definitive surgical repair [10, 17]. More than 40 surgical techniques have been described in literature [18, 19, 20] which include transperineal, transanal, posterior para-rectal, transabdominal and transvesical, transsphincteric and combined [21]. In 1969 a posterior parasacrococcygeal trans-sphincteric approach was described which involved division of the sphincter (The YORK MASON procedure) [23]. The patient is placed in prone jackknife position. After incision and dividing the sphincter, the mucocutaneous junction and both internal and external anal sphincter are marked by color-coded sutures to provide a proper alignment and reconstruction at closure. The fistula is excised exposing the catheter in the prostatic urethra and the rectal wall is separated from the urinary tract by sharp dissection to allow a sufficient mobilization. After closing the urethra, the rectum is sutured paying attention that the suture lines do not overlap each other with a 'vest over pants' technique. Parks et al. [40] described a fistula's repair by means of a full thickness flap of the anterior rectal wall through a transanal approach, with the aim to avoid any division of the sphincter mechanism. The rectal mucosa is excised laterally and distally to the rectal opening of the track, and the circular muscular layer of the rectum is denuded. Then a flap of about four centimeters in length is harvested. The defect in the urethra was closed using interrupted absorbable sutures over the urethral catheter to prevent stenosis. The rectal flap was advanced over the fistula and sutured to the rectal wall with interrupted absorbable sutures. Pera et al. [28] reported 100% cure rates in 5 patients with York mason procedure. Since it involves division of sphincters, rectal incontinence has been reported. 5 to 7% of patients treated by this procedure also developed recto-cutaneous fistula [29]. Posterior sagittal approach was also described by Kraske without division of sphincters, however this technique is not very popular.

Perineal approach was first described by Young in 1917 where he dissected the rectum away from sphincters, divided the fistula, closed the urethra, and mobilized the rectum further cephalad in such a way as to pull the affected rectum caudad out of the anus where it was then transected and discarded, suturing the proximal rectum to the anal skin. and a large series of RUF repair was reported by Goodwin in 1958 by this method [22].

There have been reports of commercial fibrin sealant (quixil) with anterior mucosal flap with no recurrence [25] and fibrin sealant injection with 70 % cure rates [26, 27]. In 1979 Ryan et al described the technique of gracilis muscle interposition(24). The other interponents that have been used are omentum, scrotal flap, levator ani muscles, gluteus muscle, fibrin glue etc. we preferred gracilis muscle because of the ease of dissection with intact blood supply and relatively lesser muscle thickness, gracilis muscle flap is ideal in this smaller operative field.

CONCLUSIONS

RUF being a rare condition does not have a well established protocol for diagnosis and treatment. However, there have been many reports by surgeons who have used different methods of repairs with varying degrees of success. In the present study we propose this method of repair as a very efficient method with a defined protocol of double diversion followed by definitive repair. As urologists are well versed with the perineal anatomy, this method is easier to perform than other methods described in literature. Though our study shows a 100% success rate with this method, use of this method on a larger number of RUF patients needs to be analyzed.

Limitations of our study

Our study was done on six patients. This method of repair should be applied to a larger group of patients with recto-urethral fistulas.

Present study did not include patients with post radiation recto-urethral fistulas.

Further use of autologous cells cultivated by tissue engineering would be the ideal treatment in future.

Conflicts of interest

The authors declare no conflicts of interest.

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Table 1. The duration of surgery, hospital stay and blood loss

<u>Case</u>	<u>Duration of surgery</u>	<u>Blood loss</u>	<u>Duration of hospital stay</u>
<u>Case 1</u>	<u>248 min</u>	<u><500 ml</u>	<u>14 days</u>
<u>Case 2</u>	<u>210 min</u>	<u><500 ml</u>	<u>14 days</u>
<u>Case 3</u>	<u>189 min</u>	<u><500 ml</u>	<u>8 days</u>
<u>Case 4</u>	<u>245 min</u>	<u><500 ml</u>	<u>12 days</u>
<u>Case 5</u>	<u>196 min</u>	<u><500 ml</u>	<u>9 days</u>
<u>Case 6</u>	<u>278 min</u>	<u><500 ml</u>	<u>10 days</u>
<u>Mean</u>	<u>227 min</u>	<u>Mean</u>	<u>11.16 days</u>

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Table 2. Retrospective chart of patient’s profile

Sl. No.	Age	Etiology	Complications	Follow up	Recurrence
1.	29	Pelvic fracture	Main wound infection and stricture urethra and erectile dysfunction	48 months	Nil
2.	36	Penetrating injury	Wound infection and erectile dysfunction	36 months	Nil
3.	66	Freyer’s prostatectomy	Seroma at gracilis muscle flap harvested site	36 months	Nil
4.	68	Freyer’s prostatectomy	Wound infection and seroma at gracilis flap harvested site and erectile dysfunction	24 months	Nil
5.	62	Radical prostatectomy	Erectile dysfunction	12 months	Nil
6.	64	Radical prostatectomy	Wound infection	6 months	Nil

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Table 3. Complications and their management

Complications	Number	Management	Outcome
Main wound infection	2 (case 1 and 6)	Cleaning and dressing	Improved
Seroma at site of harvest of Gracilis flap	1 (case 3)	Cleaning and dressing	Improved
Main wound infection and seroma at harvest site of gracilis	1 (case 4)	Cleaning and dressing	Improved
Stricture urethra	1 (case 1)	Cystoscopic dilatation done and advised clean intermittent catheterization once a day	Improved
Erectile dysfunction	4 (case 1, 2, 4, 5)	PDE5 inhibitors	Not improved

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Table 4. Meta analysis of various techniques described by surgeons and their success rates

Surgeon	No. of patients	Approach	Interponent	Closure technique	Success rate
Pera et al. [28]	5	York mason	Nil	Layer to layer	100%
Crippa et al. [2]	5	York mason	Nil	Layer to layer	100%
Dafnis et al. [30]	1	York mason	Nil	Layer to layer	100%
Kasraeian et al. [31]	12	Modified York mason procedure	Nil	Layer to layer	100%
Spahn et al. [32]	4	Transperineal	Buccal mucosa	Mucosal patch	75%
Zmora et al. [33]	2	Transperineal	Gracilis muscle	Layer to layer	100%
Ghoniem et al. [34]	10	Transperineal	Gracilis muscle flap	Rectal flap	100%
Culkin and Ramsey [35]	3	Transperineal	Deepithelised scrotal flap	Y-V plasty	100%
Quazza et al. [36]	2	transperineal	Omental flap mobilized laparoscopically	Layer to layer	100%
Youseffet al. [37]	2	transperineal	Dartospedicled Flap	Layer to layer	100%
Wilbert et al. [38]	2	transperineal	Fibrin glue	Layer to layer	100%
Abdalla [39]	1	Posterior sagittal pararectal with rectal mobilization	Gluteus muscle flap	Layer to layer	100%
Present study	6	Transperineal	Gracilis muscle flap	Layer to layer	100%

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Table 5. Pros and cons of single vs double diversion vs gracilis interposition in small fistulas

Technique	Pros	Cons
Single diversion (ileal/colonic)	Less morbidity	High chances of failure if per urethral catheter is blocked in the post operative period.
Double diversion	Good option for surgically unfit patients, contaminated penetrating wounds.	High morbidity.
Gracilis interposition	High success rates	Challenging procedure

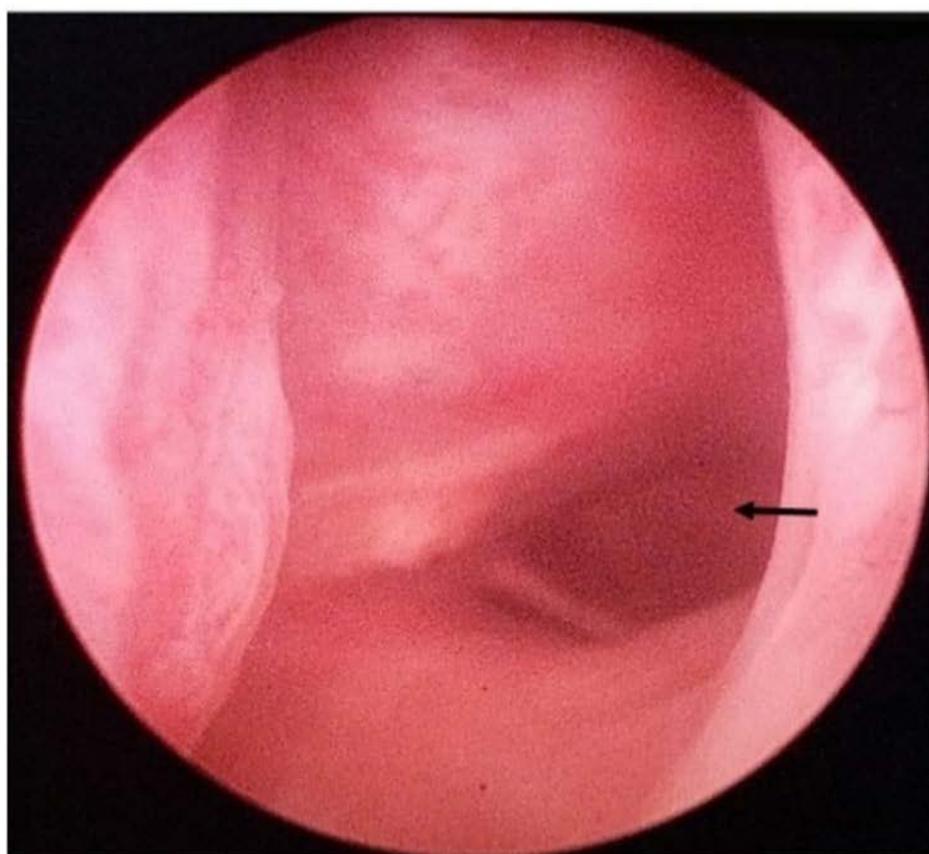


Figure 1. Fistulous connection visualized through cystoscope.

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Figure 2. Guide-wire passed into patient's bladder.

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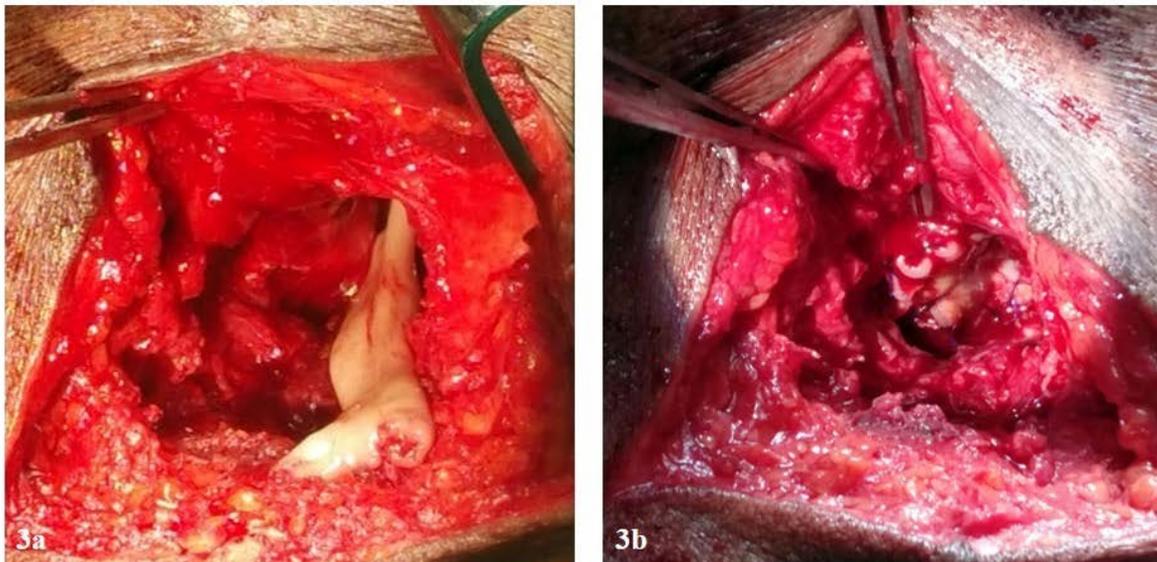


Figure 3a. Buccal mucosal graft was placed on urethral defect.
3b. Shows the graft sutured to the urethral defect.

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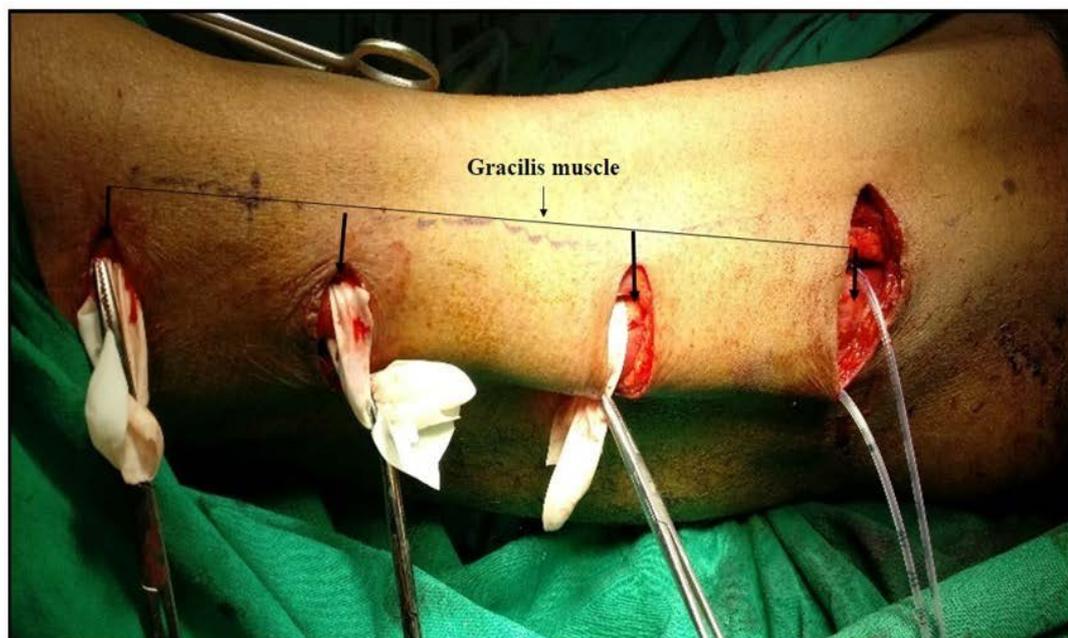


Figure 4. Gracilis muscle was dissected by dividing the small vessels supplying the muscle through multiple incisions while preserving the neurovascular bundle.

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Figure 5. Gracilis muscle flap after division of tendon and delivered through proximal incision.

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Figure 6. Gracilis muscle flap interposition between rectum and urethra by fixing it to para-rectal tissues.

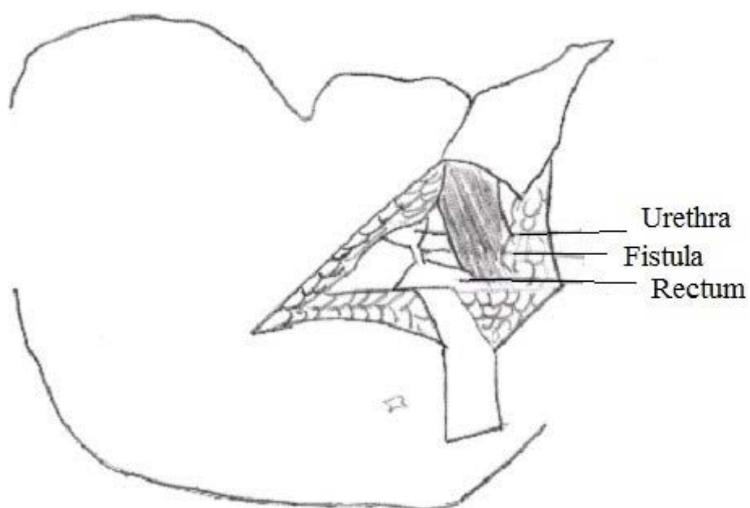


Figure 7. Shows the urethra and rectum and the fistulous connection.

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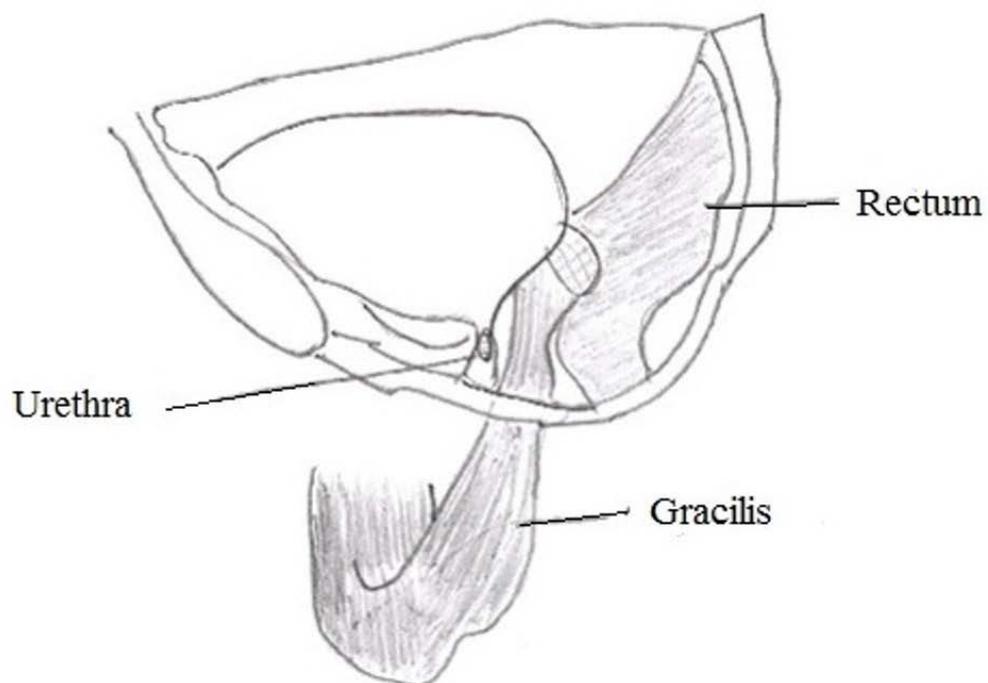


Figure 8. Shows interposition of gracilis muscle flap between rectum and urethra.