

Complete Traumatic Rupture of Female Urethra

— Report of Four Cases —

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Four cases of complete traumatic rupture of female urethra were reviewed. Herein the incidence, etiology and treatment modalities of complete rupture of female urethra are discussed to propose guidelines for the proper management of these unusual injuries. I recommend the following: Through the retropubic approach in children, a primary realignment with either surgery or an interlocking Foley catheterization should be performed as in the delayed retropubic urethroplasty when primary realignment was not accomplished. Transvaginal repair is considered choice approach for the urethro-vaginal laceration due to other than pelvic fracture in adults.

Key Words: Traumatic rupture of female urethra, guidelines for the proper management, primary realignment with surgery or interlocking catheterization, delayed retropubic urethroplasty.

Female urethral injuries are associated most commonly with instrumentation, vaginal operations and obstetrical complications (Hamm and Waterhouse 1963; Persky and Hoch 1972).

Female urethral rupture sustained with fracture of the pelvis has rarely been reported (Simpson-Smith 1936; Bolger *et al.* 1977; Buxton 1978; Casselman and Schillinger 1977). Urethrovaginal lacerations may also occur from sexual activities (Mitchell 1984).

As in the management of male posterior urethral injuries, controversy exists as to whether a female cystostomy as the initial procedure followed by a delayed urethroplasty.

No definite guidelines for the management of female urethral rupture either in adults or children have been established.

I have reviewed 268 consecutive cases of urethral injuries from records at YUMC and two affiliated hospitals, Chon Ju Presbyterian Medical Center and Wonju College of Medicine, in an effort to propose guidelines for proper management of these unusual female injuries (Table 1).

The sex ratio of male to female urethral injuries in general was revealed approximately 28:1 (259:9) (Table 1).

Table 1. Sources of materials and sex distribution

Sources of Materials	Sex		Female		Total No. %
	No.	%	No.	%	
YUMC	142	(53.0)	6	(2.2)	148 (55.2)
PMC	64	(23.9)	1	(0.4)	65 (24.3)
WMC	53	(19.7)	2	(0.8)	55 (20.5)
Total	259	(96.6)	9	(3.4)	268 (100%)

YUMC = Yonsei University College of Medicine

PMC = Presbyterian Medical Center, Chonju

WMC = Wonju College of Medicine

Table 2. Age distribution of 9 females among 268 urethral injuries

Age	YUMC	PMC	WMC	Total
0- 9	1	—	1*	2
10-19	—	1*	—	1
20-29	2(1*)	—	1*	3
30-39	1	—	—	1
40-49	2	—	—	2
50-	—	—	—	0
Total	6(2.2)	1(0.4)	2(0.8)	9(3.4)

() = Percentage * = Case selected

YUMC = Yonsei University College of Medicine

PMC = Presbyterian Medical Center, Chonju

WMC = Wonju College of Medicine

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Nine female urethral injuries were found. Four had a ruptured urethra combined with anterior vaginal laceration. Five patients had contusions. Patients with contusions were excluded from the study (Table 2).

The age distribution of females among the 268 urethral injuries is revealed as follows: Six out of 9 were adult females between 20 and 49 years old and 3 children were below 10 years of age (Table 2).

The clinical course of four female patients with complete traumatic rupture of the urethra was presented in relation to the treatment modalities.

CASE REPORTS

Case I. K H J F/20

This 20-year-old female was referred to the emergency room on May 7, 1984 because of pain in the pubic area with gross hematuria due to a car accident. She was pushed against a wall by a bus.

The X-ray of the pelvis, excretory urography (IVP), and cystogram revealed a Malgaigne fracture, high riding distended bladder, and leakage of irregularly margined contrast media in the pelvis (Fig. 1, Fig. 2).

Surgical intervention was immediately undertaken.

The patient was placed in the lithotomy position and the bladder was approached through a low midline incision. A massive pelvic hematoma was encountered. The urethra was found to be transected at the posterior bladder neck and the urethrovaginal wall disrupted. A vaginal laceration was repaired with interrupted 3-0 chromic catgut sutures. The transected urethra was approximated and maintained by a primary realignment with interlocking indwelling 20F Foley catheter. A suprapubic cystostomy with a 22F Foley catheter was placed in the bladder. Concomitantly, intraperitoneal exploration was done revealing no laceration or injuries of other intraperitoneal organs.

The postoperative course was uneventful. On the 37th postoperative day, the urethral Foley catheter was removed. Four days later a urethrogram was taken revealing no evidence of urinary leakage (Fig. 3). The patient was then transferred to the Orthopedic Department for physiotherapy and crutch walking. She was discharged on July 24, 1984 (78 hospital days) with good continence of self voiding.

A follow up voiding cystourethrogram was taken 1 year postoperatively revealing good continuity and no stricture (Fig. 4).



Fig. 1. Preoperative excretory urogram shows high riding distended bladder in the pelvis.



Fig. 2. Preoperative retrograde cystogram shows leakage of irregularly margined contrast media in the Lt. side of pelvis.

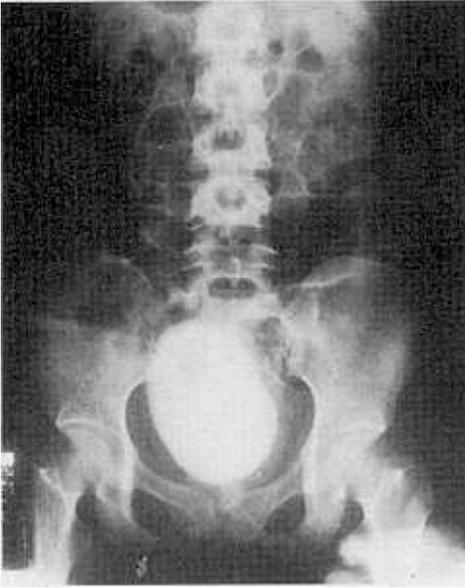


Fig. 3. Voiding cystourethrogram after removal of the urethral Foley catheter shows no evidence of urinary leakage.

Case II. J E J F/9

On May 5, 1984, a 9-year-old girl was involved in a motor vehicle accident. She sustained multiple pelvic fractures including bilateral pubic rami fractures.

On physical examination, severe vaginal and urethral meatal bleeding with abdominal distention were manifested. Pelvic X-ray with excretory urography revealed bilateral pubic rami fracture with a high riding bladder (Fig. 5).

Because of her rapidly decreasing blood pressure and restlessness, surgical intervention was immediately attempted. A laparotomy through a low midline incision showed a deep laceration of the anterior vaginal wall. Complete transection of the urethra at the level of the bladder neck was also found. Primary realignment with an interlocking 12F Foley catheter and 20F Foley suprapubic cystostomy was performed.

On the 23rd postoperative day, anastomotic strictures developed but have responded to periodic urethral dilation.

The 16 month postoperative follow up revealed the patient remains continent and voids without difficulty.



Fig. 4. One year follow up. Voiding cystourethrogram shows good continuity and no stricture.

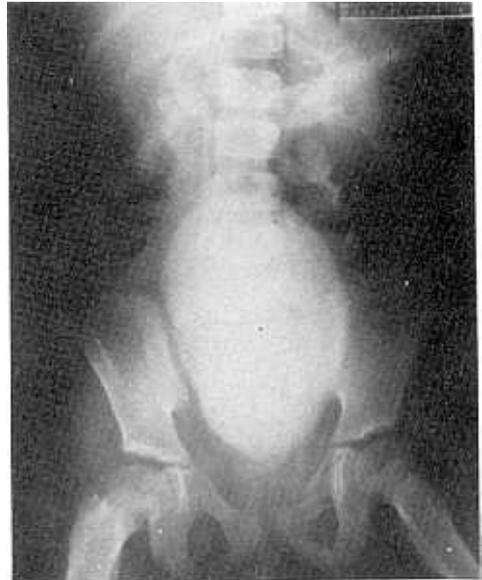


Fig. 5. Preoperative excretory urography shows high riding distended bladder in the pelvis.

Case III. L S H F/10

A 10-year-old girl was involved in a car accident in August, 1983 sustaining multiple injuries including complete transection of the membranous urethra and a superficial anterior vaginal laceration due to diastasis of the pubic symphysis. She was hypotensive due to severe hemorrhage.

The right thigh showed painful swelling due to an intramuscular hematoma and a limited range of motion. In addition, she had a right clavicular fracture. The lower abdomen was tender and distended. Pelvic examination revealed gross bleeding from the external urethral meatus and a superficial anterior vaginal laceration. On rectal examination, a volume mass in the pelvis was noted. An excretory urography demonstrated an intact upper urinary tract and a high-riding distended bladder (Fig. 6). A retrograde urethrogram of contrast media extraperitoneally beneath the bladder.

The patient was explored through a low midline incision. A massive retroperitoneal intrapelvic hematoma was encountered. No intraperitoneal injuries were found. A suprapubic cystostomy was accomplished.

One year following the suprapubic cystostomy, the patient was evaluated for an ensuing urethral stricture (Fig. 7). Endoscopy revealed an intact vesical neck



Fig. 7. Second stage preoperative combined cystogram and retrograde urethrogram (AP view). AP view shows bilateral vesicoureteral reflux and obliterated segment of membranous urethra.

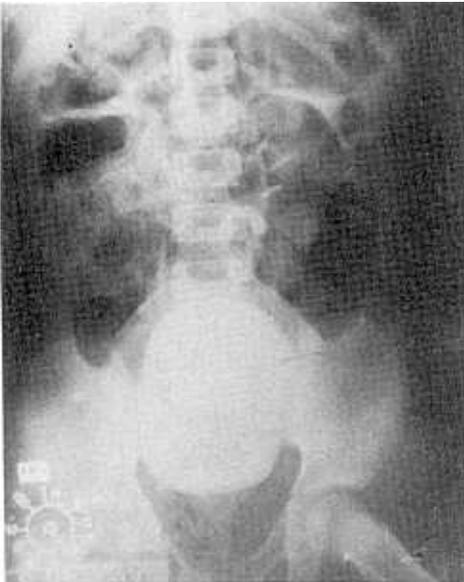


Fig. 6. First stage preoperative IVP: IVP shows normal upper urinary tract and high riding distended bladder in the pelvis.



Fig. 8. Postoperative voiding cystourethrogram (AP view) shows good continuity and patency without evidence of leakage.



Fig. 9. Postoperative voiding cystourethrogram (Lateral view) shows good continuity and patency without evidence of leakage.

with .1 cm of urethra completely stenotic. The distal urethra measured 2.5 cm in length. The proximal urethra was noted to be posteriorly displaced (Fig. 7). A cystogram indicated bilateral vesicoureteral reflux (Fig. 7).

The patient underwent a definitive urethral repair or so called delayed retropubic urethroplasty on June 3, 1985. The patient's urine was left diverted with a 16F silicone urethral catheter and a 20F silicone suprapubic cystostomy catheter for 3 and 4 weeks respectively. After the urethral catheter was removed postoperatively 3 weeks later, the patient was continent, voiding with good stream and had no residual urine. A voiding cystourethrogram taken 4 weeks after the operation revealed good continuity and patency without evidence of extravasation of contrast medium (Fig. 8, Fig. 9). After the suprapubic cystostomy was removed, the patient was discharged 4 weeks later from the hospital in a satisfactory condition.

The 6 months second postoperative follow up revealed the patient remains continent and voids without difficulty. In addition, bilateral vesicoureteral reflux appeared to be much improved

Case IV. L H J F/20

This 20-year-old woman was brought to an emergency room on May 19, 1982 because of severe

vaginal bleeding due to vigorous sexual activities with her partner.

She was transfused with a total of 10 pints of blood.

On physical examination she presented hypotension, anemic conjunctiva, cold and moist skin. A pelvic examination revealed a vertically lacerated entire urethra extending from the external urethral meatus to the vesical neck. A deep lacerated anterior vaginal wall and massive hematoma with brisk vaginal bleeding was seen (Fig. 10).

Through the transvaginal approach in lithotomy position, the urethra was closed with a primary interrupted 4-0 chromic catgut. A 20F silicone Foley catheter was placed in the bladder. Vaginal packing

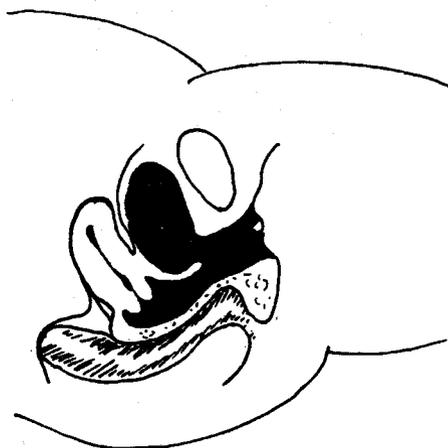


Fig. 10. Preoperative finding of traumatic urethrovaginal laceration. Vertically ruptured entire urethra extending from the urethral meatus to the bladder neck is revealed.

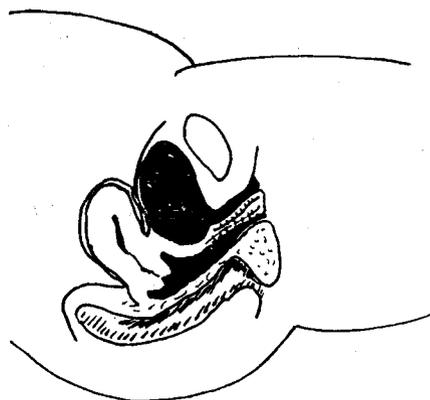


Fig. 11. Postoperative finding of urethrovaginal laceration. Through the transvaginal approach both urethra and anterior vaginal wall are repaired.

was also applied. On the 5th postoperative day a wound infection and separation developed in the previously sutured vagina and urethra. Two weeks later, through the transvaginal approach in lithotomy position, a secondary closure was performed to the urethral and vaginal wall with 4-0 and 3-0 chromic catgut respectively (Fig. 11).

The postoperative course was uneventful. She was discharged voiding with good continence on the 30th hospital day.

DISCUSSION

Traumatic female urethral injuries can be associated with pelvic fractures, penetrating injuries, obstructed labor, foreign bodies, iatrogenic injuries and ritual trauma (Mitchell 1984). Of all the possible causes, obstetrical complications, instrumentation and vaginal operations are most commonly involved (Hamm and Waterhouse 1963; Persky and Hoch 1972; Buxton 1978). Self-inflicted damage may also occur from objects inserted into the vagina for sexual amusement. Warrell (1984) reported an empty baked bean tin found in the vagina. The sharp edge had cut the anterior vaginal wall and penetrated the urethra, resulting in a urethrovaginal fistula.

Of the 4 cases of female urethral rupture with vaginal laceration I presented, Case I, II, and III were due to pelvic fractures, and Case IV was allegedly secondary to preliminary vigorous sexual petting followed by sexual intercourse. As for Case IV, even though personal assault very rarely gives rise to any urinary tract injury beyond bruising or laceration of the vulva, it must be an extraordinarily unusual example of female urethral rupture which has not yet been reported.

Rupture of the posterior urethra in a male is a well recognized complication of pelvic fracture, but a comparable female urethral rupture has rarely been reported (Turner-Warwick 1973; Bolger *et al.* 1977; Buxton 1978; Casselman and Schillinger 1977).

Although no complete rupture of a female urethra was reported, 7 incomplete tears among a series of 381 cases of traumatic rupture were reported. Recently, sporadic cases of urethral rupture in female patients with pelvic fracture have been reported (Casselman and Schillinger 1977; Bredeal *et al.* 1979; Guerriero and Devine JR. 1984).

Mitchell (1968) reported 2 urethral ruptures in review of 60 cases of lower urinary tract in women, one of whom was a child under 15 years of age who also had a pelvic fracture. Williams (1975) has had experience of 9 cases of rupture of the female urethra

in childhood, 8 of which accompanied fracture of the pelvis. Pokorny *et al.* (1979) found one female urethral rupture of 11 major urological injuries in 10 patients among the 100 patients with pelvic fractures. In my series of 268 urethral injuries, male to female sex ratio revealed 28:1.

Female urethra is not vulnerable to rupture as it is well protected because of its short length, relative lack of exposure and greater mobility (Patil *et al.* 1982).

Mechanisms explaining urethral ruptures include (1) diametric fracture (by which Case I can be explained to have occurred), (2) bilateral fracture of the pubic rami with guillotine like action at the membranous urethra, (3) diastasis of the pubic symphysis with rupture of pubo-prostatic ligament in male and posterior pubourethral ligaments in female, and (4) direct injury owing to a bony spicule (Pokorny *et al.* 1979; Patil *et al.* 1982).

In Case II, type 2 and 4 mechanisms appeared to have produced her injuries. In Case III type 3 mechanism was considered to be related. As in the management of male posterior urethral injuries in childhood, controversy exists as to whether females should have primary realignment or hands off suprapubic cystostomy (DeWeerd 1959; Malek *et al.* 1977; Waterhouse *et al.* 1980; Patil *et al.* 1982).

Guerriero and Devine (1984) insist that initial cystostomy alone is not an ideal treatment for this injury in females and that some attempt to repair the injury or at least to leave the catheter indwelling is necessary.

There has been some discussion about the advantages or disadvantages of preliminary cystostomy. DeWeerd (1977) insisted that the use of the cystostomies did permit a leisurely, deliberate approach to the primary lesion and contributed to a satisfactory final outcome.

Mitchell (1984) stressed that the problem of delayed repair is dissection of the fibrous tissue that forms around the urethra and anterior vaginal wall binding both structures to the posterior aspect of the symphysis pubis. Extensive dissection and mobilization are required to bring the two ends of urethra together and close the communication with the vagina.

In a younger patient the future problems of child birth will have to be considered and almost certainly will be by caesarian section. As in Case III, the cut end of the proximal urethra was posteriorly displaced and adhered to the outer layer of the anterior vaginal wall and vaginal perforation developed during dissection and mobilization of the two ends of urethra. End to

end anastomosis of two ends of urethra and closure of the vagina with 4-0 polyglycolic acid suture was done with good result.

However, the acute urethral injury was managed by initial suprapubic drainage of the bladder with delayed repair both in male and female (Waterhouse et al. 1980; Patil et al. 1982). Bredael et al. (1979) suggest suprapubic cystostomy and delayed repair when the patient's general condition is unstable. It is also indicated when the proximal two-thirds of the urethra was crushed completely in such a way as primary urethral anastomosis was not possible.

In Case I and II, through the retropubic approach, primary realignment with interlocking Foley catheterization and suprapubic cystostomy drainage was done with good results. In Case II, postoperative anastomotic stricture developed but has responded to periodic urethral dilation. In Case III a complete membranous urethral rupture in a female who was in very poor and unstable general condition was treated initially with hands-off suprapubic cystostomy with later retropubic urethroplasty has given us a rewarding experience.

In Case IV, through the vaginal approach, urethrovaginal disruption was repaired in a second reconstructive surgery with good result having voiding with continence.

CONCLUSION

There were 9 female urethral injuries found. Four of them had urethral rupture and anterior vaginal laceration. I presented each of them and conclude as follows:

1. Female urethral rupture is extremely rare in contrast to male injuries. The sex ratio of male to female in urethral ruptures revealed 28:1 (259:9).
2. The age distribution of 9 females in 268 urethral injuries revealed 6 were between the age of 20 and 49 years old and 3 were children below the age of 10 years old.
3. 3 of 4 selected cases of urethral rupture and anterior vaginal wall laceration occurred due to vehicular accidents (Case I, 20 years old; Case II, 9 years old; Case III, 10 years old) and 1 due to vigorous sexual behavior (Case IV, 20-years-old).
4. I recommend the following as the treatment modalities for the female urethral rupture combined with anterior vaginal laceration in children and adults. 1) Primary realignment with surgery or interlocking Foley catheterization is performed through the retropubic approach as long as patient's condition is stable. 2) Delayed retropubic urethroplasty is an ex-

cellent alternative to primary realignment when primary repair was not accomplished especially in children. 3) Transvaginal repair is considered choice approach for the urethro-vaginal laceration due to other than pelvic fracture in adults.

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