

Partial Inferior Pubectomy in the Delayed Repair of Pelvic Fracture Urethral Injury: Adopting a Bone-nibbling Technique

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Received: 08 April 2020; Revised: 10 June 2020; Accepted: 19 June 2020; Available online: 7 July 2020

Abstract

Background: The use of wedge inferior pubectomy can be challenging to many urethral surgeons. Our objective was to introduce a bone-nibbling technique to accomplish a partial inferior pubectomy (PIP) in a resource-poor setting, and to report the medium- to long-term outcome of using the technique. **Methods:** Five patients were recruited (mean age: 38.8 years) who presented, over a 30-month period, with posterior urethral fibrosis from a pelvic fracture urethral injury (PFUI). One had failed a previous attempt at posterior urethral reconstruction elsewhere. The length of urethral defect was from 2 to 4 cm. We describe a bone-nibbling technique used to carry out PIP for the delayed repair of PFUI in these patients. The outcomes in the medium to long term of surgical procedures done with this technique are presented. **Results:** Immediate postoperative complications in all were essentially a Clavien–Dindo grade I. Peak flow rate

assessed 12 weeks' post operation was between 20 mL/s and 23 mL/s (mean: 21 mL/s). The longest duration of follow-up was 34 months, and all patients were voiding satisfactorily. **Conclusions:** A satisfactory and durable outcome can be obtained from nibbling at the bone from the inferior margin of the pubic bone to achieve PIP. This is of interest to lower urinary tract reconstructive surgeons who have concerns with chiseling-out wedge of the inferior pubis.

Keywords: Bone nibbling, Partial inferior pubectomy, PFUI, Posterior urethra, Urethral anastomosis
Ann Afr Surg. 2021; 18(2): 69-74
DOI: <http://dx.doi.org/10.4314/aas.v18i2.2>

Conflicts of Interest: None

Funding: None

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Introduction

Generally, the management of pelvic fracture urethral injury (PFUI) continues to evolve but has remained a challenge. Short-term and long-term outcomes of its management have much improved in the last 2 decades (1). While some surgeons practice early realignment, others prefer delayed reconstruction of the stricture that develops with the healing of the injury (2).

Both groups report acceptable outcomes (3). Repairing the stricture after the PFUI has healed can be challenging

(4), and in the hands of a less experienced surgeon the outcome of such repair may be disappointing. Among the factors contributing to the poor outcome of repair is poor access to the site of surgery due to the rigid configuration of the bony pelvis (5). The unyielding bony pelvis limits access to the proximal healthy urethral segment, increases the chances of incomplete excision of the fibrotic urethral segment, which compromises the integrity of urethral anastomosis, and impairs a successful tension-free anastomosis (6).

Over the years, various maneuvers have been incorporated into the operative procedure with the primary objectives of improving access to the surgical site and shortening the gap to be breached after the complete excision of the fibrotic segment in a single-stage procedure (7). These maneuvers include splitting the corpora cavernosa in the midline, partially resecting the inferior aspect of the body of the pubic bone (partial inferior pubectomy, PIP), and supracrural rerouting of the urethra (7,8). Use of any or some of these maneuvers has been reported to improve significantly the outcome of such repairs (8,9). Therefore, when indicated, one or more of these maneuvers are frequently used by experienced surgeons (10,11).

A technique for PIP in the delayed repair of PFUI is described (12,13). Many surgeons, irrespective of how long they have been practicing, may have never used this maneuver because of the fear of uncontrollable hemorrhage and concerns about inadvertent injury to other surrounding structures. Nibbling at the pubic bone from the inferior margin may offer the same surgical value as chiseling out a mass of bone. The controlled use of the bone nibbler may increase a surgeon's confidence in their ability to use the technique without collateral damage.

The study aims to describe the bone-nibbling technique of accomplishing a PIP and to give the outcome of its use in our center so far.

Methods

Medical records were retrieved of five male patients who underwent delayed repair of the PFUI between March 2017 and December 2019 using the bone-nibbling technique to accomplish PIP. These records were used to audit the outcome. Four of these procedures were primary repairs while one was a repeat repair. The mean age of these men was 38.8 ± 7.0 years, and the length of the urethral defect was from 2 to 5 cm. From the records, we reviewed the operating time, need for intraoperation blood transfusion, immediate post operation complications, need for re-establishing a urinary catheter, and urine peak flow rate 3 months post operation.

In addition, institutional records from April 2008 to January 2016 of delayed repair of a PFUI in men were retrieved. All 20 cases identified were undertaken without using PIP. The men were between 20 and 70 years of age with a mean age of 33.8 ± 12.2 years. The median length of a urethral defect was 2.5 cm (range 1.5–5.0 cm). From these records, we determined the outcome of repair in terms of the need to re-establish a suprapubic cystostomy or to perform a repeated urethral dilatation and compared it with the test cohort. The mean age of the patients, mean length of urethral defect, and mean units of blood transfused were compared for the two groups using analysis of variance (ANOVA). Crosstab analysis was used to compare outcomes. The Statistical Package for Social Sciences (SPSS Statistics ver. 21.0; IBM, Armonk, NY, USA) was used for analysis.

Figure 1 highlights the bone-nibbling technique of carrying out a PIP: a combined retrograde urethrogram and a voiding cystogram image of a PFUI requiring repair. Briefly, with this repair technique, patient positioning, skin incision and mobilizing the urethra are as described in other references (5,12,13). The lambda (inverted Y) perineal skin incision gives a better exposure with soft tissue retraction. The urethra is transected just distal to the fibrotic segment, and the distal segment is protected from harm. At this stage, the fibrotic segment is left attached to the proximal stump of the urethra to aide retraction while dissecting the proximal urethral segment. The proximal corporal bodies are carefully parted in the midline and the dorsal vein coursing inferior to the symphysis pubis is ligated and transected (5) (Fig. 1).

With the inferior aspect of the pubic body and adjoining rami visualized, the periosteum is incised and striped using a periosteal elevator. Then the inferior pubis is nibbled using a bone nibbler (Fig. 2) until adequate room is created for maneuvering the needle holder, and the necessary tissue forceps and suction nozzle during anastomosis. The proximal urethral stump is further dissected with the help of an antegrade



Figure 1. A combined retrograde urethrogram and voiding cystogram image of a PFUI requiring repair

urethral bougie to free enough healthy proximal urethra for anastomosis. Bone wax is applied on the cancellous bone surface for hemostasis. The fibrotic urethral segment is completely excised to expose healthy proximal urethral mucosa (Fig. 3), and a robust end-to-end urethral anastomosis is accomplished with relative ease over an appropriately sized urethral catheter. The rest of the procedure is as described elsewhere (12,13). A corrugated wound drain is always left in place for about 48 h, and a firm dressing is placed on the perineum after wound closure. A peri catheter urethrography is done 3 weeks post-surgery and the urethral catheter stent removed thereafter. The post repair peak flowrate was assessed 12 weeks post-surgery using uroflowmetry (Figs. 2 and 3).



Figure 2. Nibbling at the inferior pubis using a bone nibbler

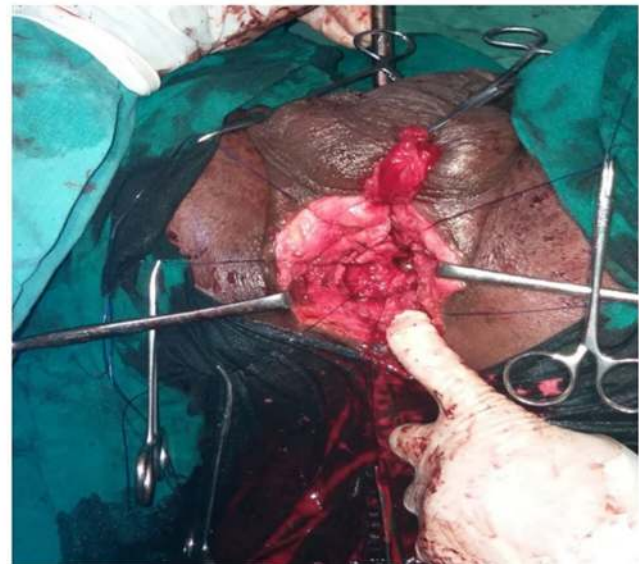


Figure 3. Excision of the fibrotic urethral segment to expose healthy proximal urethral mucosa

Results

For the PIP cohort, the mean intraoperative blood transfusion rate was 1.4 ± 0.5 units per procedure. There was no case of hematoma, deep wound infection, or any complication beyond a Clavien–Dindo grade I (14)

Table 1. Summary of PFUI repairs using bone-nibbling technique of PIP

Case	Age (years)	LUD (cm)	Blood transfusion	Operating Time (min)	PFR- 3 months (mL/s)	Follow-up period (months)
1	29	3	1	190	23	38
2	48	4	2	175	21	34
3	39	4	1	150	20	25
4	36	2	2	165	20	19
5	42	5	1	170	21	18
Mean	38.8±7.0	3.6±1.1	1.4 ± 0.5	170±14.6	21±1.2	

LUD: Length of urethral defect; PIP: partial inferior pubectomy; PFR: peak flow rate.

in the postoperative period. The post repair peak flowrate had a range of 20–23 mL/s with a mean of 21 mL/s. The longest follow-up period was 34 months and all five patients have maintained satisfactory urine flow to date.

For the non-PIP group, a mean of 1.6±0.6 units of whole blood were transfused per surgical procedure. In about 60% of repairs, there was compelling need to re-establish the use of a suprapubic catheter for micturition or to perform repeated urethral dilatations within 6 months post operation. There was little or no evidence of any significant variations in the age of the patients ($p=0.39$), length of urethral defect repaired ($p=0.05$), and in blood transfusion per procedure ($p=0.50$) between the two groups. However, there was evidence showing outcome is better in the PIP cohort ($p=0.02$) (Table 1).

Discussion

One of the limitations to ensuring a durable end-to-end anastomosis at the posterior urethra is poor access (5). To overcome this limitation, various specially designed instruments, suture needles, and retractors have been introduced for use during this procedure (15). The struggle to complete this anastomosis in the difficult conditions of poor access increases the risk of poor

tissue handling and of performing anastomosis of doubtful integrity, resulting in poor outcome with its attendant burden on the patient, the surgeon, and the health system (6,16). Recurrence of posterior urethral fibrosis requiring further procedures or repeat reconstructions is common (17). With the recognition that the first attempt at repair provides the best chance for a successful outcome, recurrence is worrisome (17,18). Beyond the space constraint, the urethral length constraint (Fig. 1) presents another limitation in accomplishing tension-free, robust end-to-end anastomosis after excising the fibrotic urethral segment (7). The extent of the urethral length challenge understandably depends on the length of the excised urethral segment.

PIP is a maneuver recommended to reasonably overcome both space and urethral length constraints (8). However, many surgeons are not enthusiastic about this maneuver for fear of encountering uncontrollable bleeding or causing damage to other structures by adopting a wedge pubectomy technique using rongeurs (2,9). In a recent yet to be published survey of urologists in Nigeria (19), of the respondents who have witnessed

wedge PIP in the delayed repair of PFUI, 70.6% are yet to use this technique due to concerns of primary hemorrhage and 64.7% are concerned about damage to other structures.

PFUI appears to be a generally uncommon limiting experience with its management beyond the initial diversion of urine (20,21). Reports from our local and regional settings show that the outcome of surgery for PFUI repair is generally not as good as the outcome of repair of an anterior urethral stricture (22). This may be because these PFUI repairs are done without performing PIP, thereby undertaking urethral anastomosis in the very challenging circumstances of the surgical field and urethral length constraints. Undertaking such urethral anastomosis in the context of space and length constraints will generally lead to suboptimal repair outcome.

The bone-nibbling technique described here (Fig. 2) offers an alternative to achieving the same goals of improving on surgical access and urethral length constraints. At the same time, it may reduce the concern of inadvertent damage to tissue. The controlled engagement and cutting using the bone nibbler repeatedly from the inferior margin of the pubis may be easier to appreciate and incorporate into surgical practice than the conventional wedge pubectomy. Nibbling at the pubic bone does not appear to increase primary hemorrhage. This study reveals that the blood transfusion rate is not increased as a result of using this technique to perform PIP. To the benefit of both surgeon and patient, adequate surgical space is created for robust primary urethral anastomosis (Fig. 3) with improved chances of a good and durable outcome (Table 1).

Unarguably, use of the PIP maneuver in surgeries for PFUI repair generally increases the chances of good surgical outcomes (10,23,24). Urethral reconstructive surgeons who may have concerns about chiseling out a mass of pubic bone to carry out a wedge inferior partial pubectomy could nibble at the bone from the inferior margin instead of undertaking the urethral anastomosis, without PIP, in less-than-optimal conditions with the attendant poor repair outcome.

Conclusion

We recommend the use of PIP to repair PFUI-related urethral fibrosis in order to overcome constraints in surgical access and healthy urethral length during urethral anastomosis. To accomplish PIP, the pubic bone can be nibbled at from the inferior margin where wedge inferior pubectomy cannot be conveniently put to use. Medium- and long-term outcomes show that nibbling at the inferior margin of pubic bone does not further increase the risk of PIP, and offers durable repair outcome.

Acknowledgment

The authors acknowledge the assistance of Nweze Ekwuribe in the production of this manuscript.

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