ORIGINAL ARTICLE

Pediatric suprapubic urinary diversion in acute urinary retention. An easy, fast and feverish technique

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Abstract

Objective: Suprapubic urinary diversion in children is a provoking assignment for pediatric emergency department. Here we describe a simple and reproducible way to tackle this problem, that is safe, less traumatic, and durable that can be perform without ultrasound guidance.
Study design: Descriptive case series
Place and duration of study: It's a single center study that was conducted from June 2012 to May 2014, at Abbasi Shaheed Hospital, Karachi Medical and Dental College.
Patients and methods: Children presented with acute urinary retention, and had failed attempt of urethral catheterization were enrolled. Patients were divided into two groups based on clinical findings. The primary end point was complication free suprapubic diversion and secondary end point was comparing of procedure outcome in two groups. Complications were assessed with Modified Clavien classification. Differences in adverse events among two groups were tested with Fisher's exact test.
Results: A total of 40 patients were managed by modified method. Beside two failures, there were no intra-operative complications. Follow up pain scale was very low, hematuria, port bleeding, urinary extravasation were nil. The incidence of pain, fever, port infection and extended hospital stay was based on patient's presentation and high in group B.
Conclusion: Supra pubic urinary diversion by using this modified method is a safe procedure. It is easy to perform, quick and durable with fewer chances of blockage and displacement. It has considerably low morbidity and can be performed without supervision.

Keywords: Acute urinary retention, urethral catheter, suprapubic catheter, suprapubic kit, suprapubic urinary diversion and urethral trauma.

Introduction:
Till the end of the 19th century, surgeons generally opted to use open surgical methods for supra-pubic urinary diversion.[1,2] Easy availability of disposable suprapubic catheter kit made it possible to shift from open methods, and now most urologists prefer percutaneous approach for urinary diversion.[3] Both Seldinger[4] and sharp trochar techniques are in common practice.[5] Irrespective of the techniques we follow, percutaneous supra-pubic catheter placement needs surgical skills and has significant incidence of complications with 3 percent morbidity and 1.6 percent mortality.[6]

Management of pediatrics acute urinary retention (AUR) is more challenging. Intra-abdominal position of low volume bladder in young children makes this clinical scenario more complicated. After an unsuccessful attempt of urethral catheterization, the common practice is to perform supra-pubic needle aspiration. For relieving acute retention this method is notorious to be repeated again and again even within few hours, as needle displaced very frequently, and child needs multiple taps till he or she undergoes definite treatment.[7] Unlike adults, Suprapubic catheter kits for small children are not commonly available. On availability its place-

ment requires surgical expertise. It is more traumatic, more painful and has additional chances of complications.[8]

In this paper, we report our experience of using modified method for supra-pubic urinary diversion. Our technique is only for short term transitory relief of retention for few days. We prepare a pediatric supra-pubic diversion kit: 4/14 kit. It composed of 4FR feeding tube, 14G cannula, pyodine sachet, sprit swabs and lidocaine ampoule for local anesthesia. The lumen of 14G cannula is 2mm, while 18G cannula that is commonly used for bladder aspiration or evacuation has lumen size 1.3mm. The diameter of 4FR feeding tube is 1.33mm. It can easily pass through a 2 mm lumen cannula. By placing tube through cannula it works like a size 4 suprapubic percutaneous catheter. Its small lumen results in slow evacuation of urine, yet because of long tube inside the bladder it is less likely to be displaced.

This modification does not need extra skills or supervision, as generally supra-pubic bladder tap is a bed site procedure that is usually performed by different specialties. Here there is no use of scalpel, sharp trocar, guide wire or any dilators, moreover, in consequences it has minimal operative trauma, less pain and very cost effective.

Material and Methods:

This was a two years experimental single center study conducted at Abbasi Shaheed Hospital from June 2012 to May 2014. Convenience sample technique was used and prospectively collected departmental data base was exercised to determine the outcome in 40 consecutive children with acute urinary retention, managed by modified supra-pubic urinary diversion. Children from 3 to 14 years of age, who had failed attempt of urethral catheterization for acute urinary retention (AUR) were included. Those in whom bladder was not palpable due to excessive obesity or had history of lower abdominal surgery were excluded. All those who needed diversion for longer duration due to chronic illnesses were also excluded. Before procedure every patient was completely examined, especially for distended bladder, abdominal scar and urethral bleeding. In cases of suspected urethral trauma after urethral instrumentation more cautious pelvic examination was done for any sign of extravasation, scrotal fullness, rectal or vaginal bleeding. The suspected trauma patients were also included in the study. Urine routine and culture sensitivity, complete blood count, renal functions and plain X-ray KUB were mandatory for all patients. Second generation oral Cephalosporin or Amoxicillin was started in all cases. Intravenous antibiotic was used only in cases of suspected complications. Syrup Acetaminophen was used as analgesic agent.

After taking informed consent from legal guardian, in supine position the lower abdomen was prepared with pyodine solution. 1ml of 1% lidocaine was used for skin infiltration at midline two fingers above symphysis pubis. The cannula insertion approach is slightly different in children. In pediatrics we insert slightly cephalad, 10-200 off perpendicular. A 14G cannula was inserted towards bladder while aspirating until urine appears within the syringe. Once urine starts coming, the metallic stellate of the cannula is removed and instead of passing guide wire and perform tract dilatation as per mentioned in Seldinger technique, we pass a pre-tested, size 4 feeding tube through cannula into the bladder. Dry dressing with adhesive tape applied to fix tube along with cannula on lower abdomen.

Variables diversity necessitates patients division into two groups. Group-A comprises of patients who had simple attempt of urethral catheterization without instrumentation, therefore no suspected trauma, no urethral bleeding or any sign of urine extravasation. In Group-B we include those who had suspected urethral trauma secondary to catheter attempt, hematuria, suprapubic cannula in situ, fever, tenderness, suspected extravasation and positive urine culture at initial presentation.

Procedure failure, multiple attempts, tube displacement or tube block was recorded. Post procedure pains scale and uses of analgesics were re-

Table-1: Comparison of patient's outcome in two groups

	Total no of cases		Group A (non-traumatic)		Group B (traumatic)		p
Variables	**n=40**	**%**	**n=31**	**77.5 %**	**n=09**	**22.5%**	**value**
Procedure Failure	02	5%	01	3.2 %	01	11%	0.06
Tube Block	04	10%	01	3.2 %	03	33%	0.04
Tube Displacement	01	2.5%	01	3.2 %	00	00	
Pain Scale							
0-I	33	82.5%	29	93.5 %	04	44.4%	<0.05
II	07	17.5%	02	6.5%	05	55 %	0.03
III	00	00	00	00	00	00	
Fever	07	17.5%	02	6.4%	05	55%	0.04
Macroscopic Hematuria	00	00	00	00	00	00	
Port Infection	03	7.5%	00	00	03	33%	0.04
Positive Urine Culture	05	12.5%	01	3.2%	04	44%	<0.05
Diversion Duration							
1-2 days	35	87.5%	30	96%	05	55%	
3-4 days	02	05%	01	3.2%	01	11%	
> 4 days	03	7.5%	00	00	03	33%	
Parents Dis-satisfaction	05	12.5 %	02	6.4 %	03	33 %	0.06

Table-2: Possible contributing factors and its breakup for parent's dissatisfaction

	Total no of cases		Satisfied		Dissatisfied		p
	n=40	**%**	**n=35**	**87.5 %**	**n=05**	**12.5%**	**value**
Group A	n=31	77.5 %	29	93.5 %	02	6.5 %	
Group B	n=09	22.5 %	06	66.6 %	03	33.3 %	
Procedure Failure	n=02	05 %	01	50 %	01	50 %	
Tube Block	n=04	10 %	01	25 %	03	75 %	<0.05
Tube Displaced	n=01	2.5 %	01	100 %	00	00	
Port Infection	n=03	7.5 %	00	00 %	03	100 %	0.04
Post Procedure Fever	n=07	17.5 %	02	28 %	05	72 %	<0.05
Positive Urine Culture	n=05	12.5 %	01	20 %	04	80 %	<0.05
Diversion Duration							
1-2days	n=35	87.5 %	34	97 %	01	2.8 %	
3-4 days	n=02	05 %	01	50 %	01	50 %	0.04
> 4 days	n=03	7.5 %	01	33 %	02	66 %	
Operator skills							
> 5 years	n=07	17.5%	06	85 %	01	15 %	
2-5 years	n=10	25%	08	80%	02	20%	
< 2 years	n=23	57.5%	20	86%	03	14%	
Total Hospital Stay							
1-2days	n=33	82.5%	33	100%	00	00	
3-4 days	n=03	7.5%	02	67%	01	33%	<0.05
> 4 days	n=04	10%	00	00	04	100%	

viewed from nursing notes. FLACC behavioral pain scale[9] was used for patients younger than seven years and Wong-Baker (W-B) FACES pain rating scale10 was used in children aged more than 7years. For statistical convenience FLACC score 1-3 and W-B FACES pain rating 0-2 labeled as scale-I (mild), FLACC score 4-6 and W-B FACES pain rating 4-6 labeled as scale-II (moderate) and FLACC score 7-8 and W-B FACES pain rating 8-10 labeled as scale-III (severe)

Parent's impressions marked as "satisfied or not satisfied" were recorded twice, first within 24 hours and then at the time of discharging patients. The satisfaction calculation in this study is a subjective assessment of parents. It was not quantified by any pre-designed patient factors or questioners. In cases of parent's dis-satisfaction note, cases further scrutinized for child condition at first presentation, operator experience and 4/14 kit disposable issues. Duration of indwelling tube along with complications like, fever, macro-scopic hematuria and accidental removal of tube were also documented.

SPSS version 22 was used for statistical analysis. Data was summarized using mean + SD and percentages. Fischer's exact test was used because of small sample size. Adverse events between two groups were tested. The differences in qualitative values between two groups were considered significant when p-value was less than 0.05. Modified Clavien classification was used for complication assessment.

Results:

40 consecutive cases were managed in 2 years' duration. 32 were male patients. Age range was from 2 to 14 years; mean age was 6 years + 2 SD. Our 28 children (70%) had impacted urethral stones while 4 (10 %) had meatal stenosis. In 8 children (20%) we performed primary supra-pubic diversion as their past history was suggestive of impacted stone and they had failed attempts of urethral catheterization before.

31 patients (77%) were included in group-A. In this group 97% had successful urinary diversion with supra-pubic placement of tube into the bladder. Procedure duration was 11 to 17

minutes + 5 SD. There was 1 failure to pass tube through cannula on first attempt, one tube displaced, and 1 had tube blocked within 36 hours (3.2 % each). Two children (6%) had low fever (100 of or less) after tube placement. Pain scale was I (mild) in twenty nine patients (93 %), in two children scale was II (moderate). There was no incidence of post procedure macroscopic hematuria and port infection in this group. Average hospital stay was 2 days + 1 SD. 93% percent parents were satisfied with the initial management of retention. In 2 cases parents' dis-satisfied note was due to fever. table-1

In group B we had 9 patients (23% of study sample). Reason of keeping them in this group were bleeding after urethral catheter attempts in 4 patients, meatal tear in one, multiple supra-pubic tap in 2 cases and 2 children were febrile with positive urine culture. SPD procedure duration was 12 to 19 minutes + 4 SD. We had 1 failure to place tube in this group. 3 patients had tube block after 48 hours (33%). 5 patients developed fever; 4 of them had positive urine culture (55%). Pain scale was also high in this group. 5 children (55%) had pain scale II. Average hospital stay was 4 days + SD 2. One third parents of this group were dissatisfied. Their main concern was fever, port infection and extended hospital stays. (table-1&2)

In both groups complications like severe or persistent pain, hematuria and port bleeding was nil. Sign of intra-abdominal irritation or extravasation was also nil. Average duration of diversion was 2 days with range of 1 to 6 days. Extended duration was seen in patients where definite treatment was deferred due to urinary infection or other medical conditions of the patient.

We found post-procedure pain scale a reliable indicator of procedure safety and parent's satisfaction. It was very low and used of analgesia on first day was in only six cases (15%). Interestingly difference in operator experience did not have any major impact on the overall outcome of the study.

Discussion:

Supra-pubic urinary diversion is an extensively used tool practiced widely by a variety of specialties and usually stated as safe and simple procedure.[11,12] However there is very little published confirmation on the safety of this procedure particularly in pediatric age group. History of urinary retention is as old as of mankind. From plant leaves to metallic tubes, and animal/fish bone to rubber tubes, there is a long list of materials used for relieving urinary retention.[13-17] Straightaway there is another list of procedure related complications. Simple urethral discomfort to urethral trauma, urinary extravasation to fistulas, recurrent urinary infection, sepsis and gangrene were reported in literature.[18,19] In addition bladder trauma, bowel trauma, bowel perforation, peritonitis and even death were reported in association with suprapubic urinary catheter placement[20-22] (figure-1). In 1998 Sheriff[23] published his experience of supra-pubic catheterization and documented 2.7 percent incidence of bowel perforations. Similarly Ahluwalia mentioned 2.5% incidence of bowel perforation with 1.8 % mortality in 20066 patients. Here it is important to note that this significant bowel perforation incidence and high mortality within 30 days are in the study where suprapubic catheterization was performed under cystoscopy guidance.

In children, not only because of their small size but also due to the anatomically abdominal position of small capacity urinary bladder there is a potential risk of complications while passing supra-pubic catheter. In order to avoid complications, common practice is to perform supra-pubic bladder tap with syringe or to place a small caliber cannula into the bladder. This is simple but a temporary measure as it is notorious to displace and the child needs multiple taps.[24] In our modified method for supra-pubic urinary diversion we precede with the standard method of needle placement into the bladder as in Seldinger techniques. However, instead of passing guide wire, we pass 4 French feeding tubes through the lumen of 14G cannula into the bladder. The extended tube length within bladder makes it durable with almost negligible chance of displacement in empty bladder.

In the early phase of study we had 2 technical failures, where we were unable to pass the tube through the cannula lumen. The disposable's size variation between different manufacturers gives us an idea to make a pre-tested, size compatible tube and cannula kit with accessories so that patient will not suffer in the future.

Our modification makes this procedure secure and none except one case where tube was displaced. Nonetheless the extended length of narrow tube has three potential concerns: It drains slowly so patient does not get immediately relief as by 10 or 12 size supra-pubic catheter. Yes it drains slowly but the risk of bullas formation, mucosal catch or bleeding is less with slow drainage as mentioned by Glahn and others.[25,26] Another potential risk is blockage of tube. Total 4 patients (10%) had tube blockage in this study. Three of them had blockage after 48 hours of placement. All of them were febrile and three had urinary tract infection at the time of presentation. Blockage of catheter is a known phenomenon. Duration of indwelling catheter and associated infection are considered as main contributing factors. In 2010 Stickler[27] discussed this issue and compared it with the duration of indwelling bladder catheter. He observed more catheter block when patient had prolonged duration. In our study, though we used narrow caliber tube, even than the incidence of blockage is most in those who have extended duration. Similarly the impact of pre-existing infection, catheter material and role of crystalline biofilms on catheter block were published in 2014 by Stickler.[28] Our results are in correlation with them as all blocked cases had urinary infections. Our last concern is a very rare phenomenon of tube knotting.[29] Fortunately we did not have this unpredictable complication of extended tube inside the bladder. Best possible way to avoid these things is to keep tube for shorter duration and offer the definite treatment as soon as possible.

In this study incidence of fever, port infection and pain is considerably high in group-B patients. Our data suggested that this all is not directly related with SPD rather than to pre-existing urinary infection.[30,31] Our 70% cases had acute urinary retention secondary to impacted stones. Our geographical location on stone belt, superadded with malnutrition and poor dietary habits made us a population of having high stone prevalence. Literature review clearly shows that all these factors contribute in recurrent urinary infection. Also in a child who had urinary stasis with multiple urethral catheter or bladder tap attempts, the chances of infection is significantly high. We under-stand the risk of emerging resistant organism by excessive use of antibiotics,[32-34] without knowing the culture report, but as a protocol we always start antibiotics in all our cases. A short 3 days course of narrow spectrum antibiotics in a patient with urinary retention, has stone disease, having foreign body into the bladder and suppose to underwent cystolitholepaxy in next 12-24 hours is justifiable.

Our modification is very simple with huge benefit of almost no re-taping incidence. We felt that if we have a long length cannula than we may not need to exclude the obese children. With better length cannula this technique can be applied in adult population. After this simple, quick and relatively less painful diversion more than ninety percent parents were satisfied on initial management. Fever, port infection and extended hospital stay were main concerns in non-gratified parents. Most of such events were in group-B patients. Best way to avoid all these is to treat children with more humble approach. Force free urethral catheter attempt with appropriate size catheter, without using metallic guide or bogie is crucial to avoid urethral trauma.

Conclusion:
In children suprapubic urinary diversion related complications are questionable. Use of cannula for supra-pubic urine tap in pediatrics is common but it is notorious for early blockage and frequently displaced. Our method is easy, safe, cost effective and durable with less chance of blockage and displacement.

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Role and contribution of authors:

Dr Syed Saeed Abidi, study designing, methodology and data collection. Discussion and conclusion writing

Dr Denis Vyskubov, statistical analysis and reference collection

Dr Mohd Yousuf, data collection and literature review

Dr Owais Khawar, methodology and result extraction

Dr Irfan Feroz, writing discussion and conclusion

Dr Mohd Aslam, study designing, references and conclusion.

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