EFFICACY OF USE OF APPENDIX AS MITROFANOFF CONDUIT IN URINARY DIVERSION

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ABSTRACT

OBJECTIVE: To study the efficacy and safety of using appendix as catheterizable conduit based on Mitrofanoff procedure in urinary diversion.

METHODOLOGY: This prospective observational study was conducted at department of surgery, Hayatabad medical complex and Khyber teaching hospital from 1st January 2005 till 31st December 2011. Total number of 56 patients (38 males and 18 females) from 5-60 years of age were included in the study. Mitrofanoff principle was used to achieve clean intermittent catheterization and urinary continence. Patients were followed for two years with, initially 3 months and then 6 months intervals. All the data was collected on structured proforma and was analyzed on SPSS.

RESULTS: Out of 56 total patient, primary diagnosis was transitional cell carcinoma in 23 (41%) case, exstrophy-epispadias in 10(17.9%), urethral injury in 7(12.5%) cases and miscellaneous in 16 (28.5%) cases. Augmentation cystoplasty was performed in 9 (16%) and 33(58.9%) patients had neobladder formation in conjunction with Mitrofanoff procedure. Urinary continence was achieved in 51(91%) patients. Mortality rate was 3.5% (n=2/56) and 3(5.3%) patients were lost to follow up. Complications were observed in 18 (35.2%) cases. Stomal stenosis was most common complication in 7(12.5%) patients, followed by incisional hernia, wound infection, suprapubic fistula and intestinal obstruction in 2 (3.9%) patients each. Only 7 (13.7%) needed surgical management, rest of 11(21.5%) were treated conservatively.

CONCLUSION: Mitrofanoff procedure provides immense advantage to patients needing urinary diversion, as it is associated with far less complications, higher continence rate and greatly improved level of independence in bladder management.

KEY WORDS: Radical cystectomy, Urinary diversion, Mitrofanoff principle.

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INTRODUCTION

The management of bladder dysfunction can be complex and in the pursuit of continence, patients can face numerous challenges and problems.[1] Long-term urethral catheterization is associated with significant widely recognized complications such as catheter blockage, urethral fistula/strictures, pericather, and colonization by bacterial organisms causing UTI.

The continent urinary stoma may provide improved access for catheterization whenever the urethra is either difficult to catheterize or inaccessible.[2] In 1980 Mitrofanoff described a principle to achieve urinary diversion.[3] In the original procedure, appendix or ureter was tunneled submucosally into bladder wall and the other end was brought out as catherizable stoma. This allowed the bladder to be emptied by a route other than the urethra. This was a further revolutionary step in the management of urinary incontinence, following clean intermittent self-catheterization introduced earlier by Lapides. There are two major requirements for catheterizable conduit, to provide channel for easy clean intermittent- catheterization and to achieve adequate continence. In absence of appendix other alternatives available are the ureters, the fallopian tube, the ileal tube, the vas deference and gastric tube.[4,5]

However before the advent of Mitrofanoff procedure, it was ileal conduit which was the only widely practiced urinary diversion.[1] This was easy to learn procedure with far less complications. The indications for Mitrofanoff procedure include refractory neurogenic bladder, refractory idiopathic bladder dysfunction, congenital malformation like bladder exstrophy-epispadias complex, post urethral valve, and acquired conditions like neoplasia,chronic inflammatory condition like tuberculosis or schistosomiasis, absent or abnormal urethra. For this purpose large volume, low pressure reservoir combined with easily catheterizable conduit is essential.[6]

In Mitrofanoff principle whereby the appendix or an alternative conduit is implanted in the urinary reservoir in a non- refluxing flap value technique, which

is instrumental in the success of the conduits[7]. Currently appendix remains the conduit of choice, due to higher stoma complications associated with conduits made out of ureter ,bowel segments and fallopian tube.[8,9]

As Mitrofanoff principle as urinary diversion is a relatively new procedure being practiced in Khyber Pakhtunkhwa and to the best of our knowledge no study has been done in this regard before; this study was conducted to observe the efficacy and safety of using appendix as catheterizable conduit based on Mitrofanoff procedure in urinary diversion.

METHODOLOGY

It is a prospective observational study, conducted in Department of general surgery Hayatabad Medical Complex and Khyber Teaching Hospital, Peshawar from 1st January 2005 to 31st December 2011. Total numbers of 56 patients of both genders from 5-60 years of age, needing urinary diversion with or without cystectomy with no co-morbid conditions were included in the study. We excluded high risk patients of uncontrolled diabetes, hypertension and learning disabilities. Mitrofanoff procedure was performed by same consultant surgeon.

During surgery patient is placed in supine position with table tilted 20 degree head down. Abdomen is approached via long lower midline incision. According to the need either appendix alone or right colon is mobilized up to mid transverse colon.

If appendix alone is used then first the mesoappendix is mobilized. Distal tip of appendix is divided and the lumen is progressively dilated to take 14Fr Nelaton catheter. Appendix is then attached to bladder by making submucosal tunnel in order to make an anti-reflux mechanism and distal end brought out in right iliac fossa.

Similarly if bladder augmentation or neo-bladder formation is needed then after Rt-hemicolectomy the large bowel is detubularized up to ceacum. Appendix buried submucosally in anterior taenia for 3cm and distal end brought out as catheterizable stoma. Both the ureters are attached to the reservoir. The reservoir is drained via 14Fr suprapubic silicon catheter and 14Fr Nelaton catheter via stoma. Both ureters are drained by 6Fr infant feeding tube for 1 week. Post-operative from 2nd day onwards the reservoir is washed with normal saline solution three times a day to drain excess mucus accumulation. Various steps of Mitrofanoff procedure are shown in figures 1-4.

Patient is usually discharged on 5th post-operative day, when bowel motion starts and the peritoneal drain is removed. Patient is called back after 3 weeks and taught about self-catheterization through Mitrofanoff channel.

Patients were followed with estimation of serum biochemistry, renal function tests, and urinalysis and urine culture at postoperative 3 weeks and by 3-month intervals thereafter. Additionally, pouchography and abdominal ultrasonography was performed every 6 months.

All pre-operative, per-operative and post-operative data was collected on structured pro forma and was analyzed on SPSS.

RESULTS

Out of 56 patients, 23(41%) patients underwent Mitrofanoff procedure for transitional cell carcinoma of bladder, 10(17.8%) patients for Extrophy-epispadias and 7(12.5%) patients were operated for urethral injury (Table 1).

Appendicular Mitrofanoff alone was performed in 14(25%) cases and in rest of cases had concomitant surgeries with Mitrofanoff (Table II).

Out of 56 appendicular Mitrofanoffs, 18 cases (35.2%) presented with complications (Table III). Eleven patients (21.5%) were having only minor problems which were dealt conservatively and 7 patients (13.7%) having major complications, who were operated under general anesthesia.

The most common complication was stenosis of the stoma, noted in 7(13.7%) of the patients. Two patients needed revision of the stoma and 5 were treated

TABLE 1: INDICATIONS FOR MITROFANOFF PROCEDURE

Indications	Frequency (n=56)
Transitional cell carcinoma of bladder	23(41%)
Extrophy-epispadias	10(17.8%)
Urethral injury	7(12.5%)
Post urethral valve	6(10.7%)
Neurogenic bladder	5(8.9%)
Post-pelvic radiation	3(5.3%)
Vesico-viginal fistula	1(1.7%)
Contracted bladder due to T.B	1(1.7%)

TABLE II: SHOWS CONCOMITANT SURGERIES WITH MITROFANOFF

Procedure	Male (n=37)	Female (n=19)	Total (n=56)
Appendicular Mitrofanoff alone	10	4	14(25%)
Mitrofanoff+bladder augmentation	4	5	9(16%)
Mitrofanoff+neobladder	23	10	33(58.9%)

TABLE III: COMPLICATIONS AFTER MITROFANOFF PROCEDURE. (N=51)

Complications	Total	Conservative	Operative management
Stomal stenosis	7 (13.7%)	5(9.8%)	2(3.9%)
Incisional hernia	2 (3.9%)	—	2 (3.9%)
Wound infection	2 (3.9%)	2(3.9%)	—
Suprapubic urinary fistula	2 (3.9%)	1(1.9%)	1 (1.9%)
Intestinal obstruction	2 (3.9%)	1(1.9%)	1 (1.9%)
Retrograde hydronephrosis / Pyelonephrosis	1 (1.9%)	1 (1.9%)	—
Bladder stone	1 (1.9%)	—	1 (1.9%)
Intraperitoneal urine leak	1 (1.9%)	1 (1.9%)	—
Total	18 (35.2%)	11 (21.5%)	7 (13.7%)

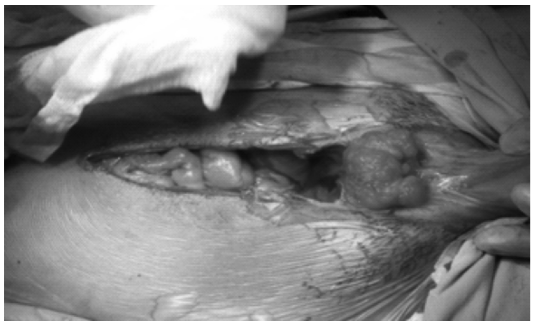

Figure 1: Abdomen opened with lower midline incision, exstrophy-epispadias bladder complex also visible.

Figure 2: Mobilization of appendix over mesoappendix to be used as a conduit

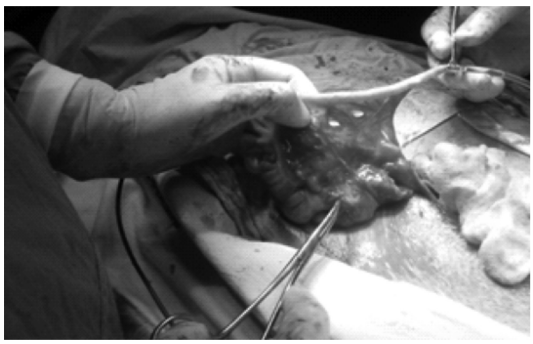

Figure 3: Catheter inserted in appendix to check its patency

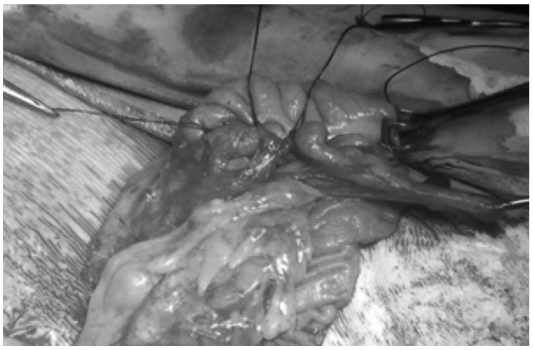

Figure 4: Neo bladder construction with appendicular Mitrofanoff

conservatively with dilatation and catheterization. Other problems major problems encountered were, urinary fistula at the site of supra pubic drain in 2 patients (3.9%), one was treated conservatively and another needed revision under G.A. Two patients (3.9%) had sub acute intestinal obstruction, one needed laprotomy to re-do ileo-colic anastomosis and second one was treated conservatively. Two patients (3.9%) developed incision hernia which was treated later on with mesh repair. One patient (1.9%) developed bladder stone ,for which litholopaxy was done.

Two patients (3.5%) died and three (5.3%) were lost to follow. However continence was achieved in rest of 51 (91%) patients.

DISCUSSION

During the past three decades, tremendous improvement has been made in the field of urology for the treatment of incontinence. Following demonstration by Lapides that clean intermittent self catheterization (CISC) is safe and effective method for bladder emptying, the combination of CISC and bladder augmentation/neobladder has become a common method in achieving continence in patients with neurogenic bladder, trauma and transitional cell carcinoma bladder.[10] However due to severe congenital or orthopedic anomalies, leg braces, wheel chair dependence and obesity some patients are unable to independently catheterize per urethrally.[11] To overcome this problem, Mitrofanoff procedure was innovated. Mitrofanoff operation is absolutely necessary and useful adjunct to many reconstructive procedures

in urology. It provides a safe, effective and painless abdominal route for intermittent catheterization or night drainage.[12] That's why there is strong argument against incidental appendicectomies as it may be needed for this purpose.[13]

The strength of our study is that it has a large sample size, with a longer follow up time of 2 years as compared to other national studies. It is probably the first study conducted in Khyber Pakhtunkhawa on safety and effectiveness of appendicular Mitrofanoff.

The weakness of our study is that, it is not a randomized control trail, using only appendix as a catheterizable channel, we have not compared it to its alternatives conduits of ureters, fallopian tube or gastro-intestinal segment. However in the presence of appendix, use of any alternative conduit is otherwise not needed.

Our overall success rate as continent catheterizable conduit is 91%. National and international studies show varying results, ranging from 79-100%.[2] Liard et al. reported a continence rate of 79% in 23 patients[14]. Having one of the longest average follow-up time of 20 years. While Rajendra and Mallikarjun reported a 100% continence rate in 6 patients after a mean follow-up of 33 months[12]. In the earlier study the sample size was much smaller and follow up time much longer than ours. Neuropathic bladder was the only indication for Mitrofanoff in their study, besides the procedure was performed in period when the concept of low pressure reservoir was not yet established and bladder augmentations were not routinely performed. Rajendra included in his study only the pediatric population, had a smaller sample size, shorter follow up period of 33 months and Mitrofanoff procedure was performed laproscopically. As indications for Mitrofanoff procedure are numerous, transitional cell carcinoma (TCC) bladder and exstrophy-epispadias complex were the leading indications in our study (Table 1). Other studies done internationally shows neurogenic bladder as their only indication[15] probably because TCC bladder is diagnosed in earlier stages in developed countries needing only transurethral resection of bladder tumour, while we usually receive cases in advanced stages leading to radical cystectomy. In the same way, extrophy-episadias complex is treated in early childhood with primary repair in developed countries, while here most of our patients presenting with extrophy-episadias complex were adults with or without failed attempts of primary repair in early childhood before the epithelial metaplasia develops.

Most common complication was difficulty in catheterization of the conduit. Initial attempt with dilatation failed in 2 out of 9 patients. The etiology of stricture is most probably infection, ischemia, recurrent trauma, improper catheterization technique and the V-flap skin technique[6] that we use for appendicular stoma formation. Another technique V-Q-Z has been devised to prevent this complication.[16,17]

Andreou et al reported increased appendicular fibrosis, decreased appendicular lymphoid tissue and decreased appendicular luminal diameter with increasing age of the patient[18]. But in spite of above, our stomal stenosis percentage i-e 13.7%, is lower than reported in other international studies where it ranged from 0-100% of the procedures[19,20]. Mitrofanoff revision was not required in any case except for 2(3.9%) patient who had stomal site stenosis. In literature overall revision rates have ranged from 8.7% to 32%.[20,21]

Our study is implicated on general surgeons, urologists, pediatric urologists and urogyneacologists, who are involved in management and treatment of bladder dysfunction and incontinence.

Having experienced the stomal site stenosis, recently we have started V-Q-Z technique for stomal formation. Its success rate is yet to be known.

CONCLUSION

We conclude that use of appendix as catheterizable conduit based on Mitrofanoff procedure provides immense advantage to patients needing urinary diversion, as it is associated with far less complications, higher continence rate and greatly improved level of independence in bladder management.

REFERENCES

1. Rowland RG, Mitchell ME, Bihrle R. Urinary diversion via a continent ileal reservoir. J Urol 1975;113:1136-9.
2. Veeratterapillay R, Morton H, Thorpe AC, Harding C. Reconstructing the lower urinary tract: The Mitrofanoff principle. Indian J Urol 2013;29:316-21
3. Mitrofanoff P. Cystotomie continente transappendiculaire dans le traitement des vessies neurologiques. Chir Pediatr 1980;21:297-305.
4. Basavaraj D, Vineet A, Simon C. The continent, catheterizable abdominal conduit in adult urological practice. BUJI 2008;102:1688-92
5. Marcelo F, Antonia A, Adauto J. Continent urinary diversion with short appendices in obese patients: the initial results of a surgical option. J Surg 2013; 1(2): 22-7.
6. Heij HA, Ekkelkamp S, Moorman-Voestermans GC, Vos A. Application of Mitrofanoff principle in children with severe impairment of bladder function. Pediatr Surg Int 1997;12:286-8.
7. Suzer O, Vates TS, Freedman AL, Smith CA, Gonzalez R. Results of the Mitrofanoff procedure in urinary tract reconstruction in children. Br J Urol 1997;79(2): 279-82.
8. Mor Y, Kajbafzadeh AM, German K, Mouriquand PD, Duffy PG, Ransley PG. The role of ureter in the creation of Mitrofanoff channels in children. J Urol 1997;157:635-7.
9. Van Savage JG, Khoury AE, McLorie GA, Churchill BM. Outcome analysis of Mitrofanoff principle applications using appendix and ureter to umbilical and lower quadrant stomal sites. J Urol 1996;156:1794-7.
10. Lapides J, Dionko AC, Gould ER, Lowe BS. Further observations on self catheterization. J Urol 1976;116;169-71.
11. Sylora JA, Gonzalez R, Reinberg Y. Self intermittent catheterization by quadriplegics via Mitrofanoff catheterizable channel. J Urol 1997;157:48-50.
12. Rajendra Bi, Mallikarjun, Shishir D. Laparoscopic mitrofanoff appendicovesicostomy Indian J Urol 2012; 28(1): 28–31.

13. Wheeler R, Malone P. Use of the appendix in reconstructive surgery: A case against incidental appendicectomy.BJS 1991;78:1283-85.

14. Liard A, Séguier-Lipszyc E, Mathiot A, Mitrofanoff P. The Mitrofanoff procedure: 20 years later. J Urol 2001;165:2394–8.

15. Merenda LA, Duffy T, Betz RR, Mulcahey MJ, Dean G, Pontari M. Outcomes of Urinary Diversion in Children With Spinal Cord Injuries Lisa A.J spinal cord med 2007;30:41-7.

16. Murthi GV, Kelly JH. V-V plasty, A new technique for providing a resilient skin-lined opening for the Mitrofanoff stoma. J Urol 2006;68(3):661-2.

17. Sultan S, Hussain I, Ahmed B, Aba Umer S, Saulat S, Naqvi SA, et al. Clean intermittent catheterization in children through a continent catheterizable channel: A developing country experience. J Urol 2008;180:1852–5.

18. Andreou P, Blain S, Boulay CEH Du. A histopathological study of the appendix at autopsy and after surgical resection. Histopathology 1990; 17: 427–31.

19. Farrugia MK, Malone PS. Educational article: The Mitrofanoff procedure. J Pediatr Urol 2010;6:330

20. Sahadevan K, Pickard RS, Neal DE, Hasan TS. Is continent diversion using the Mitrofanoff principle a viable long-term option for adults requiring bladder replacement? BJU Int 2008;102:236-40.

21. Spahn M, Kocot A, Loeser A, Kneitz B, Riedmiller H. Last resort in devastated bladder outlet: Bladder neck closure and continent vesicostomy- Long-term results and comparison of different techniques. Urol 2010;75:1185-92.

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

MK: Concept, acquisition of data, drafting the manuscript, critical revision, final approval of the version to be published

AI: Study design, Acquisition and analysis of data, drafting the manuscript, final approval of the version to be published

NA, SA, FA & SM: Acquisition of data, drafting the manuscript, final approval of the version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declare no conflict of interest

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