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Meckel’s Diverticulum: An Alternative Conduit for the Mitrofanoff Procedure
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Abstract:
The Mitrofanoff procedure is a versatile technique that is successfully used in achieving continent urinary diversion for a wide variety of urological conditions. Appendix and usable segment of ureter are commonly employed for this purpose and provide desirable results. This communication describes a teenage girl with lumbosacral agenesis and neurogenic bladder in whom Meckel’s diverticulum was successfully used for the Mitrofanoff procedure. (J Postgrad Med 2003;49:151-153)

Key Words: Continent diversion, Mitrofanoff, Meckel’s diverticulum

"Non-Urethral" continent catheterizable tubes represent simply a logical extension of the concept of intermittent urethral catheterization. When an appendix or usable segment of ureter is available, it forms an ideal tube for intermittent catheterization and the tunnel flap serves as a valve to ensure continence. When neither segment is available a small bowel segment can be used. Unfortunately such a segment tapers along the longitudinal axis and when reimplanted, is a comparatively poor alternative.1 No doubt the original principle of an appendicovesicostomy has been expanded upon and applied successfully to numerous urologic conditions utilizing a variety of surgical techniques. We present a case using Meckel’s diverticulum for the Mitrofanoff procedure.

Case History
A young teenage girl had a neurogenic bladder as a consequence of lumbosacral agenesis beginning at the third lumbar vertebra. Initially, she had a small capacity high-pressure bladder, requiring regular clean intermittent catheterisation (CIC). She underwent bladder augmentation (Gastrocystoplasty) in early childhood. Urodynamic study carried out immediately after the augmentation cystoplasty showed marked improvement with a maximal cystometric capacity of 208 ml at 16cm water. Residual urine was 180ml. DMSA renal scan showed good renal function on both sides. Bladder capacity at six years past augmentation was 450 ml. She was continent and used to remain dry in between regular CIC. Ultrasound showed no evidence of dilatation of the ureters or pelvicalyceal system; there was no associated vesicoureteric reflux. She had paraplegia with progressively disabling contractures of the lower limbs. This made it difficult for her to do CIC effectively. Hence there was a need for developing an alternative continent catheterizable stoma, which the patient could catheterize herself. She seemed an ideal candidate for a Mitrofanoff procedure. The patient was counselled for an abdominal stoma and surgery was performed after obtaining an informed consent.

The bladder was filled and palpated pre-operatively. The patient underwent an abdominal ultrasound examination for outlining the bladder so that the approximate length of conduit required could be estimated. At surgery it was noted that the patient had undergone appendicectomy earlier. She was noted to have a long (length 4.5 cm) and tubular Meckel’s diverticulum (Figure 1) that showed no evidence of inflammation or thickening. Hence the Meckel’s diverticulum was used for the Mitrofanoff procedure, albeit with some surgical adjustments. The segment of small bowel along with the Meckel’s diverticulum was resected along with its mesentery (Figure 2). This was tapered along its longitudinal axis and was “re-tubularised”. A mucosal stripping (as is done for intestinal duplication) was performed on the mesenteric side of the bowel at the site of the blood vessels that supply the diverticulum. This ensured that the blood supply to the diverticulum was preserved. Full thickness excision was avoided. The remaining seromuscular wall later served as an excellent tissue for buttressing the conduit to the bladder and parietal wall. Devascularized mucosa was trimmed off during “re-tubularization”. The conduit was exteriorised at the umbilicus.

This has certain advantages. It is not only cosmetically satisfactory, but it also obviates the need for having a long conduit...
since the skin is fixed to the fascia at the umbilicus.

Once the proposed course for the conduit was constructed, it was placed into position (Figure 3). The anastomosis to the skin was carried out first with carefully placed sutures of polyglactin acid. The conduit was gently drawn into its position and its tip amputated. A submucosal tunnel within the gastric reservoir (patient had undergone Augmentation Gastrocystoplasty in early childhood) was fashioned from outside, as in the technique of a Lich-Gregoir ureteral reimplant.² The submucosal tunnel was generous to avoid constriction of the blood supply of the diverticulum. The conduit was kept on gentle traction as the distal end was anchored to the mucosa with polyglactin acid sutures. The conduit was kept straight for ease in subsequent catheterisation. It is very important to avoid angulations that can make catheterisation difficult. Ease of catheterisation was confirmed during the operation.

There was no need to surgically close the bladder neck, as the patient was continent. A patent urethra provides a simple access to the bladder, if the patient requires undergoing cystoscopy in future. It also provides a pressure pop-off mechanism, which is so very important in a Mitrofanoff procedure. Postoperatively an indwelling Foley’s per urethral catheter drained the bladder. The Foley’s catheter was kept in place till the stoma matured adequately and the patient was able to catheterize it with relative ease. A small polyethylene feeding tube was left intubating the conduit for three weeks until clean intermittent catheterisation was begun (Figure 4).

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Figure 1: Intact Meckel’s diverticulum with small bowel segment

Figure 2: Meckel’s tapered along its longitudinal axis and retubularised

Figure 3: Retubularised Meckel’s conduit anastomosed at umbilicus and placed into position for reimplantation into bladder reservoir (gastric)

Figure 4: Final results: An easily catheterisable Mitrofanoff stoma
Stoma remained healthy with no evidence of stenosis. The patient was started on Omeprazole. At follow up the patient was doing CIC up to four to six times daily.

Discussion

Lapides and coworkers\(^3\) popularised the concept of clean intermittent catheterisation. “Non-Urethral” continent catheterisable tubes represent simply a logical extension of the concept of intermittent urethral catheterisation. When an appendix or usable segment of ureter is available, it forms an ideal tube for intermittent catheterisation and tunnel flap valve is used for ensuring continence. No doubt the original principle of an appendicovesicostomy has been expanded upon and applied successfully to numerous urologic conditions utilizing a variety of surgical techniques. Woodhouse and Macneily\(^4\) in their paper described seven different types of catheterising conduits constructed in conjunction with six varieties of urinary reservoir. Leibovitch et al evaluated the implication for incorporation of the appendix in urinary tract reconstruction and found that a total of 31.1% patients had notable histopathological abnormalities of the appendix.\(^5\) Yet the appendix continues to be the conduit of choice. We did have our reservations about using a segment of small bowel such as the Meckel’s diverticulum with all its known complications; more so because it would be incorporated into a gastric reservoir. Hence the patient was started on a higher dose of omeprazole in the hope of minimising the adverse effects of gastric acid secretion on the small bowel mucosa. The use of the diverticulum has several obvious advantages over the small bowel segment. The segment of small bowel removed is extremely small. If an appropriately long Meckel’s diverticulum were present, then a wedge resection of bowel would suffice. The mesentery winds up in the middle of the tube, thus providing a good mesentery free tube for re-implantation and creation of a catheterisable stoma. The obvious disadvantage of course is that of uncertainty of the availability of a Meckel’s diverticulum in most patient population. Nevertheless, it is an option worth considering.

References


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**Announcement**

**New Series**

From September 2003 issue, the journal will be publishing two series of articles on the following topics:

- Medical Photography
- Open Access in Medical Journals

The series of articles on medical photography will have articles on Basics of Photography, Digital Photography, Surgical Photography and more.

The series on open access will highlight importance of free and open access of information with particular reference to medical journals and developing countries.