

CHARLESTON POUCH WITH IN-SITU APPENDIX AND CONCEALED UMBILICAL STOMA

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Objectives : To evaluate the functional outcome of the Charleston pouch procedure as a continent catheterizable urinary reservoir using an unaltered in-situ appendix with a triangular skin flap at its umbilical stoma with few modifications to the original technique.

Patients and Methods: Between February 1999 and October 2002, 34 patients (31 males and 3 females) were studied at the Urology Department, Assiut University Hospital, Assiut, Egypt. The indications for urinary diversion were radical cystectomy for invasive carcinoma of the bilharzial bladder in 27 males and three females, and incontinent epispadias in four male patients. The age of the patients ranged between 18 and 60 years (mean 48.1 ± 6.1 years). Mean follow up was 30 ± 4.2 months (range 11-40 months). The evaluation during the follow-up period included clinical, laboratory, im-

aging and urodynamic studies to evaluate the functional outcome.

Results: All patients are continent (day and night). No stomal stenosis was recorded. Laboratory investigations were within normal. The upper urinary tract remained unchanged in all patients. Pouchometry revealed that the Charleston pouch is a low-pressure ($4 - 21$ cm H₂O) reservoir with a good capacity (average 750 ml). Cancer recurrence was recorded in 3 patients at 12, 27 and 32 months.

Conclusions: The Charleston pouch with in-situ appendix is an efficient versatile technique for the creation of a catheterizable continent cutaneous urinary reservoir. The umbilical stoma with triangular skin flap provides excellent cosmetic results.

Key Words: urinary diversion, catheterizable pouch, appendix

INTRODUCTION

In 1980, Mitrofanoff¹ first described the use of the appendix as a catheterizable stoma that was isolated from the caecum and tunnelled submucosally into the bladder. Meanwhile, the appendix, as well as the distal ileum have been modified using a variety of techniques to create a continence mechanism.²⁻⁶ The tunnelled appendix was first utilized in a modification of the Mainz pouch.⁷ In 1989, Bissada used the in-situ unaltered or minimally altered appendix to create the continence mechanism in a low-pressure urinary reservoir. The urinary reservoir is formed from detubularized distal ileum, caecum and ascending colon. Bissada called the technique the Charleston pouch.^{6,8}

The current study evaluates the use of the Charleston pouch as a continent cutaneous urinary reservoir using the unaltered in-situ

appendix and a triangular skin flap at its umbilical stoma.

PATIENTS AND METHODS

Between February 1999 and October 2000, 34 patients (31 males and 3 females) with a continent cutaneous reservoir (Charleston pouch) were studied at the Urology Department, Assiut University Hospital, Assiut, Egypt. The age of the patients ranged from 18 to 60 years (mean age 48.1 ± 6.1 years) at the time of surgery. The indications for urinary diversion were radical cystectomy for invasive carcinoma of the bilharzial urinary bladder (T3bN0M0) in 30 patients (squamous cell carcinoma in 23, transitional cell carcinoma in six and adenocarcinoma in one patient) and incontinent epispadias in four male patients.

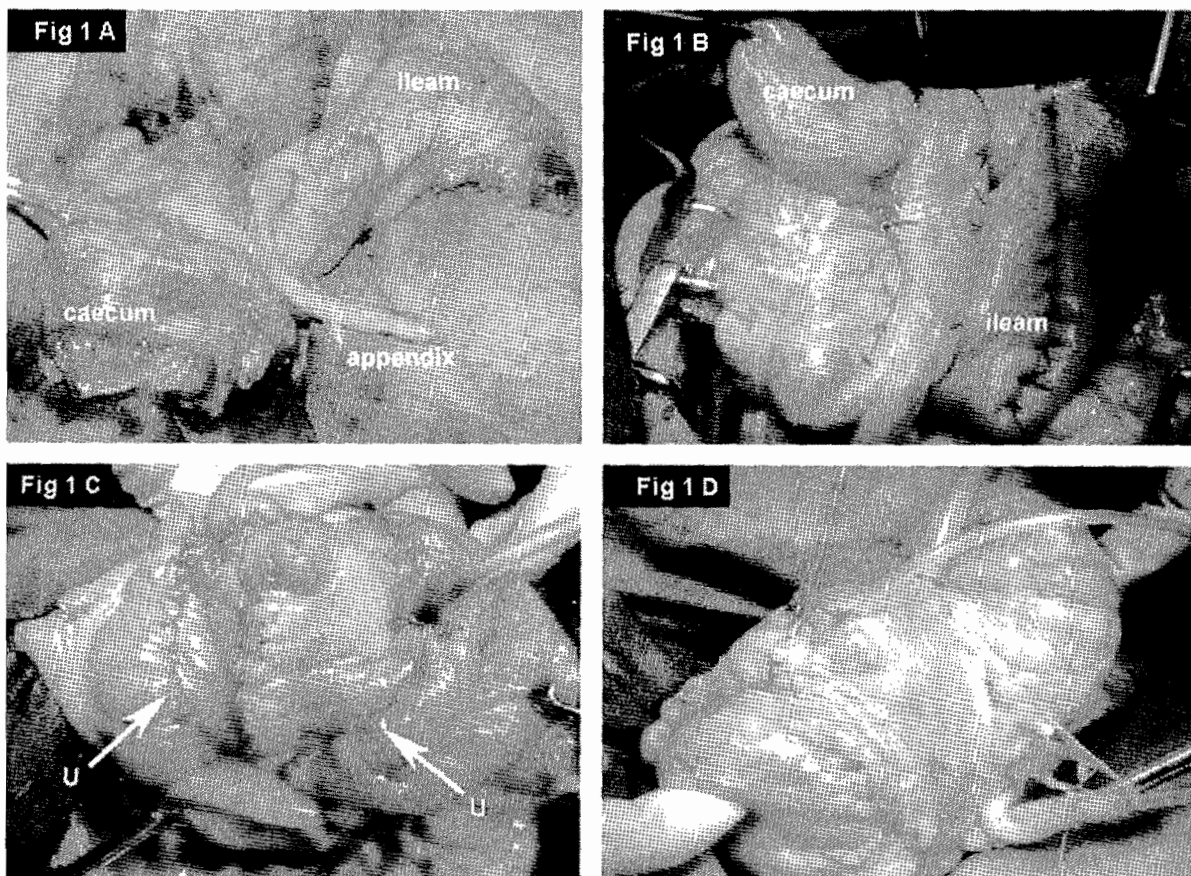


Fig. 1: Illustration of the operative technique. **A:** 30 cm of the terminal ileum and 10 cm of the ascending colon with the in-situ appendix. **B:** Reconfiguration in W-shape and detubularization of the intestinal loop with seromuscular side-to-side anastomosis of the adjacent limbs. **C:** Mucosal side to side anastomosis with subserous extramural anastomosis for uretero-pouch anastomosis (U). **D:** Charleston pouch after closure in two layers.

Operative Technique:

After completion of radical cystectomy (in cases of bladder carcinoma), the caecum and ascending colon were mobilized to the hepatic flexure. 40 cm from the ileum and ascending colon (10 cm from the caecum and ascending colon and 30 cm from the distal ileum) were isolated (Fig. 1A). The appendicular leak point pressure was measured using an arterial line set.⁹ The isolated loop was folded into a W-shaped configuration (4 equal limbs, 10 cm each), and side-to-side anastomosis of the serosa of the adjacent limbs was done using 3-0 silk sutures (Fig.1B). Detubularization at the antimesenteric border was done using a diathermy knife. Side-to-side mucosa-to-mucosa anastomosis of the adjacent limbs was performed with continuous 4-0 polyglyconate sutures. Uretero-pouch anastomosis was done

using a submucosal tunnel for 58/68 normal caliber ureters and a serous-lined extramural tunnel¹⁰ for 10/68 dilated ureters (Fig. 1C). The pouch was drained with a 24 Fr. Malecot tube and closed in two layers (Fig.1D). The in-situ appendix was stented with a 10-12 Fr. catheter. A concealed umbilical stoma with a triangular skin flap was created. The ureteral stents were kept in place for approximately 8 to 10 days and then removed over two consecutive days. The patients were discharged after removal of the caecostomy tube in the 3rd post-operative week. The stomal stent was removed in the 4th postoperative week.

The mean follow-up period was 30 months (range: 11-40 months). Evaluation included a clinical examination as well as laboratory, radiological and urodynamic investigations. The clinical follow up focused on the symptom

Table 1: Data of Biochemical Profile in our Patients after Charleston Pouch

Parameters (normal range)	Values \pm SD	Range
pH (7.34 – 7.44)	7.37 \pm 0.02	7.36 – 7.44
PO ₂ (75 – 100 mm Hg)	81.6 \pm 6.2	68.1 – 97.2
PCO ₂ (35 – 45 mm Hg)	39.1 \pm 3.1	30.6 – 43.4
Bicarbonate (22 – 26 mEq/L)	23.1 \pm 1.9	19.6 – 26.3)
Chloride (98 – 108 mEq/L)	104 \pm 3.8	99 – 109
Sodium (135 – 145 mEq/L)	141.3 \pm 2.9	135 – 146
Potassium (3.6 – 5.0 mEq/L)	4.3 \pm 0.5	3.6 – 5.1
Calcium (8.5 – 10.5 mg/dl)	9.3 \pm 0.8	8.5 – 10.4
Creatinine (0.8 – 1.4 mg/dl)	1.1 \pm 0.1	0.9 – 1.3

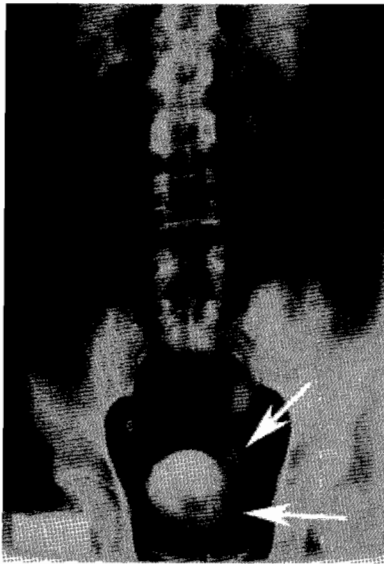


Fig 2 A

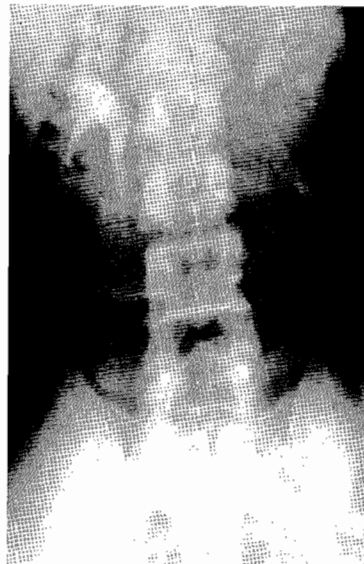


Fig 2 B

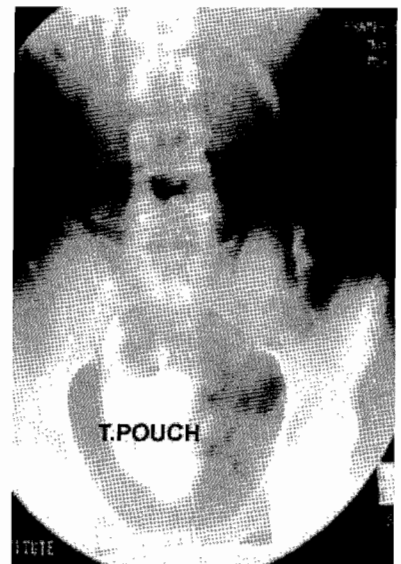


Fig 2 C

Fig. 2: A: Preoperative IVU with filling defect in the left lateral wall and the base of the urinary bladder with back pressure changes of the left upper urinary tract. B, C: Postoperative IVU of the same patient 12 months after the operation.

analysis for continence in addition to a clinical examination for the evidence of local recurrence or distant metastasis. Continence was defined as the absence of urinary leakage. Laboratory investigations included arterial blood gases (pH, partial pressure of oxygen [PO₂], partial pressure of carbon dioxide [PCO₂] and bicarbonate), serum creatinine, sodium, potassium, chloride and calcium, a haemogram and liver function tests. Radiological investigations included serial abdominal ultrasound, pouchography after 3 months, excretory urography (IVU) after 6 and 12 months and computed tomography (CT) of the

and computed tomography (CT) of the abdomen and pelvis after 12 months in selected cases. A urodynamic assessment including pouchometry was carried out for the evaluable patients in the 6th and 12th month after operation.

RESULTS

The average operative time for reconstruction of the pouch apart from radical cystectomy was 2.5 hours (range 2-3 hours). The appendix

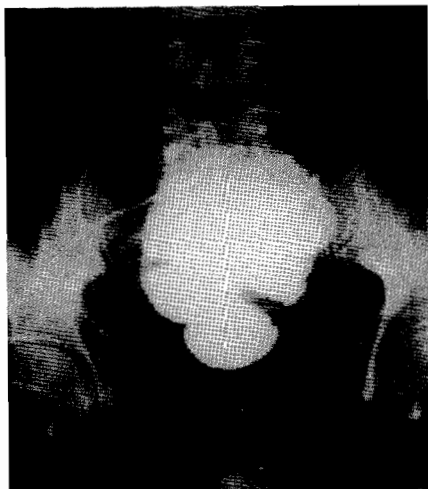


Fig 3

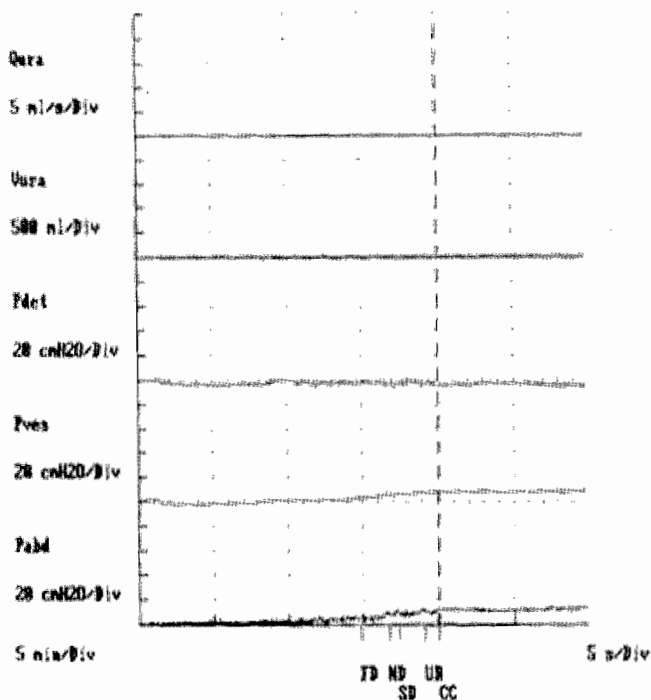


Fig 4

Fig. 3: Pouchogram of a patients with Charleston pouch revealing a good capacity with absence of reflux. **Fig. 4:** Pouchometry of Charleston pouch after 12 months demonstrating a pressure of 6 cm H₂O at a maximum capacity of 1010 ml.

was suitable as a catheterizable stoma in all cases. No significant operative complications were reported. The mean intraoperative appendicular leak point pressure was 96 cm H₂O (range 92-112 cm H₂O).

Early postoperative complications included paralytic ileus in one patient, wound infection in three patients, unilateral iliac deep venous thrombosis in one patient, wound dehiscence in one patient and urinary leakage from the pouch in three patients. All complications were managed conservatively.

All patients reported urinary continence (day and night) on clean intermittent catheterization (CIC). After six months, 28 patients (82.4 %) performed CIC every 4-5 hours and 6 patients (17.7%) every 3-4 hours. After 12 months, CIC was performed every 5-6 hours by 30 (88.2%) and every 4-5 hours by 4 patients (11.8 %).

An excellent cosmetic appearance of the concealed stoma was obtained in all cases. No stomal stenosis or difficult catheterization was recorded during the follow-up period. The results of the laboratory investigations were within normal limits. The biochemical data of blood gases and serum electrolytes are summarized in Table 1. Serial abdominal ultrasound and IVU revealed that the upper urinary tract remained unchanged or even improved in all patients (Fig. 2). Pouchography revealed a good capacity of the Charleston reservoir with no reflux into the renal units (Fig. 3). Pouchometry revealed the characteristics of a low-pressure reservoir. It ranged between 14 and 21 cm H₂O after 6 months and between 4 and 11 cm H₂O after 12 months at maximum capacity (Fig. 4). The maximum reservoir capacity ranged between 450 and 580 ml (mean was 500 ml) after 6 months and 680-1010 (mean was 760 ml). Three patients with bladder cancer developed pelvic recurrence and died of

cancer at 12, 27 and 32 months postoperatively.

DISCUSSION

Continence after construction of a Charleston pouch depends upon a low-pressure reservoir provided by detubularization of an ileo-colic segment of adequate length and the presence of an adequate outlet provided by the in-situ appendix.^{4,6} We agree with other authors about the advantages of using the appendix as a catheterizable outlet in continent urinary diversion.^{2-8,11} An unaltered appendix can provide a reliable continence mechanism.^{9,12-14} This is due to the histological pattern of its wall, the thickening of its circular smooth muscle at the caeco-appendiceal junction and the coaptation of its wall.⁶

The in-situ appendix has definite advantages. It obviates the need for the use of staples, thus minimizing the risk of stone formation. Furthermore, it does not include any mobilization. So, there is no risk of devascularization.⁸ In our series no strengthening of the in-situ appendix was required, because the intraoperative appendicular leak point pressure was > 80 cm H₂O in all cases.⁹

Our experience confirms that the use of a triangular skin flap anastomosed to the spatulated end of the appendix as described by Bissada¹⁵ minimizes the risk of stomal stenosis. The use of the umbilicus as the site of the stoma results in a concealed stoma and is cosmetically appealing.^{15,16}

Radiological studies demonstrated an excellent outcome in terms of absence of reflux at the ureterointestinal anastomosis during the follow-up period. Continence and reservoir capacity are favourably comparable to other series^{9,13,15}. Our modification in choosing 10 cm from the ascending colon and 30 cm from the ileum configured in W-shape configuration instead of 20 cm from both ascending colon and ileum configured in M-shape as originally described^{8,15} seems to yield good results. We think that the lower intra-reservoir pressure at maximum capacity demonstrated on pouchometry in the present study as compared to other studies⁹ may be due to the use of a shorter segment of ascending colon. We believe that this modification has added simplicity to the original technique, and it may add versatility to the original Charleston pouch. However,

further series with a larger number of patients and a much longer follow up are required.

In conclusion, the Charleston pouch is an efficient and reliable catheterizable cutaneous urinary reservoir. It possesses good urodynamic features. The umbilical stoma with a triangular skin flap provides excellent cosmetic results.

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RESUME

Le Réservoir de Charleston avec Appendice In Situ et Stomie Ombilicale Cachée

Objectifs: Evaluer le résultat fonctionnel du réservoir de Charleston comme dérivation urinaire continente cathétérizable via un appendice insitu avec une plicature cutanée triangulaire au niveau de sa stomie ombilicale avec quelques modifications de la technique originale. **Patients et Méthodes:** Trente-quatre patients (31 mâles et 3 femmes) ont été éligés entre février 1999 et octobre 2002 au Département d'Urologie, à l'Hôpital Universitaire d'Assiut, Assiut, Egypte. Les indications pour dérivation urinaire étaient des cystectomies radicales pour carcinome invasif bilharzien de la vessie chez 27 hommes et trois femmes, et épispadias incontinent chez quatre hommes. L'âge des patients était entre 18 et 60 ans (moyenne 48.1 ± 6.1 années). La moyenne du suivi était 30 ± 4.2 mois (11-40 mois). Le suivi était clinique, biologique, bactériologique, radiologique et urodynamique pour évaluer le résultat fonctionnel. **Résultats:** Tous les patients sont continents (jour et nuit). Aucune sténose stomiale n'a été notée. Les examens biologiques étaient normaux. Le haut appareil urinaire est resté inchangé chez tous les patients. L'étude des pressions du réservoir a révélé qu'elle est de basse pression (4 – 21 centimètre H₂O) réservoir avec une bonne capacité (moyenne 750 ml). La récurrence du cancer a été notée chez 3 patients à 12, 27 et 32 mois. **Conclusions:** Le réservoir de Charleston avec appendice in situ est une technique flexible effective pour créer un réservoir urinaire continent cathétérizable cutané. La stomie ombilicale avec flap cutané triangulaire fournit des résultats esthétiques excellents.

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