

Digital Fluorographic Video-Urodynamics in the Long-Term Morphofunctional Evaluation of Alcini's Ileocecourethrostomy and Ileal Reservoir

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Key Words

Bladder tumor • Urinary diversion • Follow-up

Abstract

Introduction: The authors present the functional long-term follow-up by means of digital fluorographic videourodynamics (DFVUDM) of two different surgical urinary diversions. **Materials and Methods:** 64 of 101 patients submitted to radical cystectomy from 1983 to 1999 for infiltrating bladder cancer, were diverted by means of an Alcini's ileocecourethrostomy (ICUS+T), and the remaining 37 patients by means of an ileal reservoir (IR). All of those orthotopically diverted patients were submitted to an accurate follow-up which included DFVUDM 1, 3, 6, and 9 years after the surgical procedure (mean follow-up 51 ± 42 months). **Results:** All the evaluated patients showed a neobladder with good function during both the filling and the voiding phases. In 88.8% of the DFVUDM examinations, it was possible to find a residual peristaltic activity of the neobladder walls. Such a residual peristaltic activity caused urinary leakage during the examination in 11.1% of cases, while vesico-ureteral reflux was detected in 12.5%. The patients voided by relaxing the perineal floor and/or by contracting the abdominal mus-

cles: the emptying of the reservoir was often excellent with average residual urine of 28.5 ml. None of the patients needed clean intermittent catheterization. EMG evaluation of the pelvic floor in some of patients showed a peculiar EMG pattern characterized by an insufficient voluntary control of the perineal musculature with a slight increase of EMG activity during bladder filling. Moreover, an insufficient relaxation of the pelvic floor muscles in the beginning of and during the micturition has been seen. This particular EMG pattern was present in 22.22% of all patients included in this study while it was particularly high (81.81%) in patients with leakage.

Conclusion: DFVUDM evaluation represents a highly sophisticated tool which allows an accurate long-term morphofunctional evaluation of the urinary diverted patients. In this study, it is shown that the functional results of the two studied surgical procedures, namely Alcini's ICUS+T and IR, are quite similar, demonstrating that the taeniotomies on the cecal tract may have almost the same functional effects of detubularization. Although DFVUDM revealed imperfect functional performances in some patients, the quality of life of diverted patients in our series seems to be satisfactory.

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Introduction and Aim of the Study

Orthotopic urinary diversion represents the most physiological urinary diversion in patients submitted to radical cystectomy for infiltrating bladder cancer [1–4]. The ‘ideal goals’ of these diversions are: (1) to preserve the ‘body image’ by avoiding an external diversion; (2) to guarantee good renal functioning without hydronephrosis and neobladder-ureteral reflux; (3) to ensure an adequate neobladder function during filling and emptying phases [5, 6].

Surgical procedures reported in urological literature are often not so simple and free of complications. Alcini’s ileocecourethrostomy (ICUS+T) [7, 8] and ileal reservoir (IR) [9] are valid alternatives to other continent orthotopic reservoirs.

Anyway a meticulous follow-up of the patients diverted by means of orthotopic bladder replacement is needed to verify that the prefixed goals are reached and maintained for a long time. For these reasons it is worthwhile to include, in the follow-up, both morphological and functional evaluation tools to check that the bio-mechanic characteristics of the neobladder walls are able to assure an adequate compliance of the reservoir and to exclude postoperative complications, such as hydronephrosis and reservoir-ureteral reflux.

The authors report their experience in assessing urinary diverted patients by means of digital fluorographic video-urodynamics (DFVUDM). This method perfectly fits the requirements of an accurate morphological and functional follow-up of the reconstructed lower urinary tract. In fact, it allows us to carry out a simultaneous filling cystography and cystometry with pressure/volume evaluation and a voiding cystography with pressure/flow studies.

The aim of the present study is to evaluate the accuracy of the DFVUDM in the long-term follow-up of the urinary diverted patients.

Materials and Methods

From the initial 112 patients, 11 were excluded from the study because 8 died and 3 were lost to follow-up. 64 of 101 patients submitted to radical cystectomy from 1983 to 1999 for infiltrating bladder cancer were diverted by means of an ICUS+T [8], and the remaining 37 patients by means of an IR [9].

The ICUS+T is tailored utilizing about 5–6 cm of terminal ileum, the ileo-cecal junction, and 10 cm of the cecum. With the aim of obtaining a better compliance of the reservoir 5–8 taeniotomies are performed. This technique allows us to utilize the biomechanic properties of the cecum, which make it a proper reservoir using the ileocecal junction as an antireflux mechanism.

Table 1. Urodynamic characteristics of two urinary diversions

	ICUS+T	IR
Cystometric capacity, ml	469	617
Residual peristaltic activity, cm H ₂ O	18–150 average: 67	28–78 average: 40

The IR is performed by using 35–40 cm of ileum, taken 20 cm from the ileo-cecal junction, detubularized and shaped as an ‘S’.

All of our 101 orthotopically diverted patients were submitted 1, 3, 6, and 9 years (mean 51 ± 42 months) after the surgical procedure to an accurate follow-up, which included Quality of Life (QoL) questionnaire, abdominal ultrasound, intravenous pyelography, blood analyses and DFVUDM. Since there is not an accurate questionnaire to evaluate the quality of life of the diverted patients it was decided to use a simplified QoL questionnaire, suitable to be filled in by the patient himself. A score ranging from 0 to 3 was assigned for each of these items: nighttime and daytime continence, intermittent catheterization need, sexual dissatisfaction, social and daily activity limitation, sport practice limitation with a total score ranging from 0 for the better outcome to 24 for the worst. At the end of the questionnaire, the patients were asked to answer questions about their subjective feeling of complete or partial satisfaction or dissatisfaction of their postoperative quality of life.

For the X-ray examination, a digital fluorangiograph is used. All the evaluations are performed with the patients in a standing position. A double lumen 6F catheter is introduced per urethram and Conray 60 is infused as contrast medium. A rectal balloon is positioned in the rectal ampulla. Neobladder, abdominal, subtracted pressures and perineal EMG are recorded simultaneously. The latter is carried out with surface electrodes.

The obtained results were compared in a retrospective manner with the 23 patients studied previously using conventional methods [unpublished data]: urethrocystography and urodynamics.

Results

All the evaluated patients showed a neobladder with adequate function during both the filling and the voiding phases. The average cystometric capacity was 469 ml in the ICUS+T diverted patients, and 617 ml in the IR. In 88.8% of the DFVUDM examinations, it was possible to find a residual peristaltic activity of the neobladder walls. This activity was present in all the patients diverted by means of a ICUS or ICUS+T and ranged between 18 and 150 cm H₂O (average 67.66 cm H₂O); in the IR diverted patients, it was present in 75% of the cases and ranged between 28 and 78 cm H₂O (average 40.25 cm H₂O) (table 1). Such a residual peristaltic activity caused urinary leakage during the exam in 11.1% of the cases, while vesico-ureteral reflux was detected in 12.5% (fig. 1, 2). These

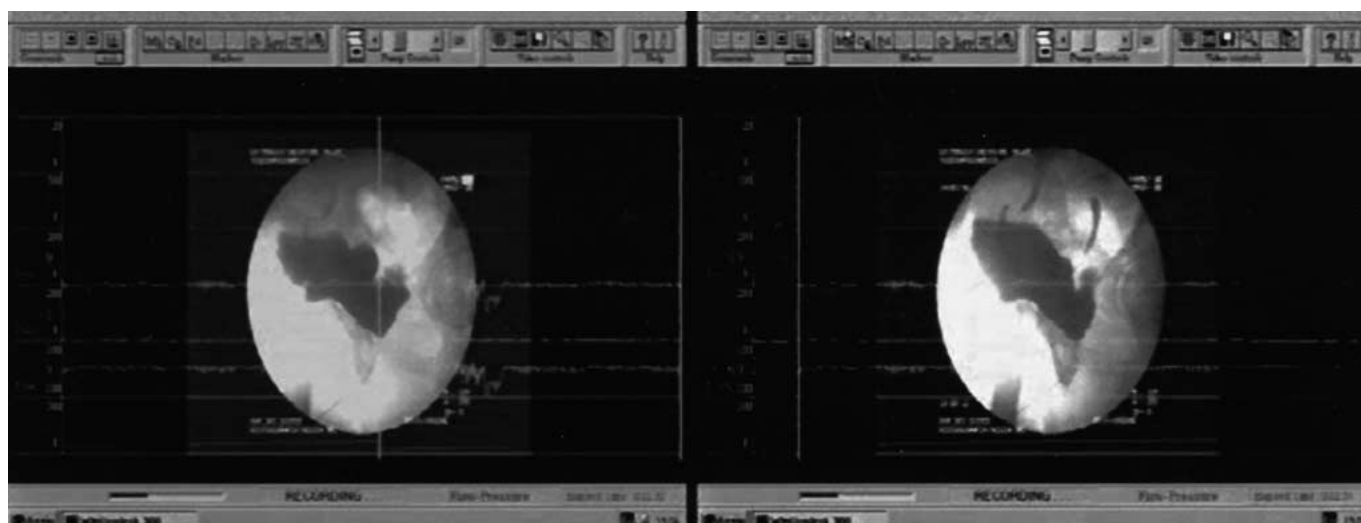


Fig. 1. Right monolateral reflux and bilateral reflux during different phases of the video-cystometry in patients diverted using an ICUS+T technique.

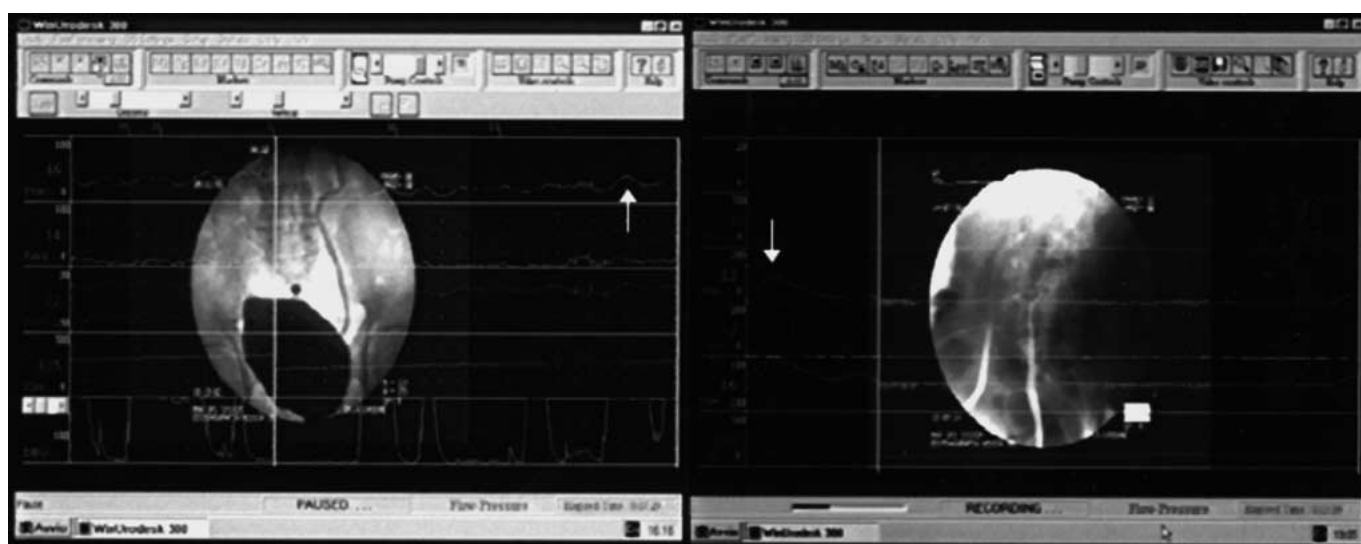


Fig. 2. Left monolateral reflux and bilateral reflux during different phases of the video-cystometry in patients diverted using an IR technique.

patients did not show significant dilatation of the involved upper urinary tract or related damage of the involved kidney with consequent alteration of the blood parameters. The patients voided by relaxing the perineal floor and/or by contracting the abdominal muscles: the emptying of the reservoirs was often almost excellent with average residual urine of 28.5 ml. None of the patients needed clean intermittent catheterization.

EMG evaluation of the pelvic floor in this group of patients showed a peculiar EMG pattern characterized by an insufficient voluntary control of the perineal musculature with a slight increase of EMG activity during bladder filling. Moreover, an insufficient relaxation of the pelvic floor muscles in the beginning of and during the micturition has been seen. This particular EMG pattern was present in 22.22% of all patients included in this study

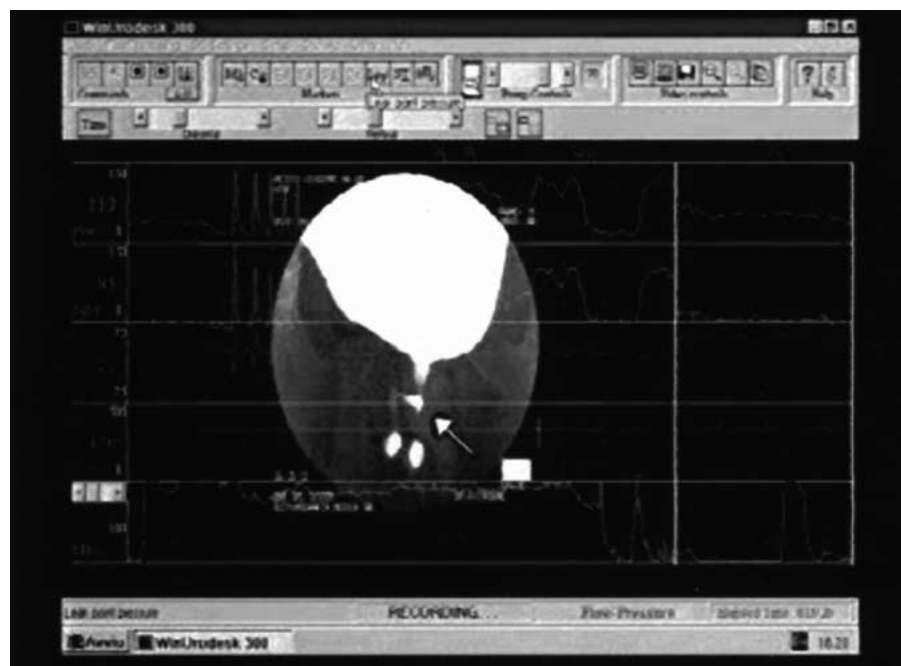


Fig. 3. Urinary leakage during Valsalva maneuver (white arrows) in IR diverted patients.

while it was particularly high (81.81%) in patients with leakage (table 2) (fig. 3).

As a result of the QoL questionnaire, 64% of the patients were satisfied with their postoperative life style while 22% were partially satisfied and 14% were not satisfied.

In our previous series, the patients were submitted first to a traditional urethrocystography which showed reflux in 5 of 23 patients (22%), an incomplete emptying of the neobladder in 3 (13%), incontinence in 4 (17%) or more than one of these findings together in 2 patients (8%). All these patients (for a total of 60%) then required a complete urodynamic evaluation. From the patients with reflux, 4 had residual peristaltic contractility of the neobladder. The one remaining patient did not have any contractile activity. In this latter, we deduced, in an indirect way, that the reflux was caused by an inadequate valve mechanism of the ureteral implantation.

Discussion

In our previous study, the traditional urethrocystography did not give us information about the cause of reflux or leakage or incomplete emptying. To understand if at the base of these functional imperfections there is an altered compliance of the neobladder wall and/or an inad-

Table 2. Percentage of insufficient sphincter relaxation pattern in patients with and without urinary leakage

	Insufficient relaxation pattern in EMG
Patients with urinary leakage, %	81
Patients without urinary leakage, %	22

equate valve mechanism of the ureteral implantation, 60% of the patients underwent a second invasive examination which is the urodynamic examination. This permitted us to better differentiate the neobladder wall compliance problems from other conditions such as an inadequate valve mechanism of ureteral implantation or intrinsic sphincteric incompetence or pelvic floor muscles dysfunction.

Since we had new digital radiological equipment in 1995, we decided to study our patients with DFUVM which is a combined method that overcomes the low sensitivity and scarce accuracy of the traditional cystography in the evaluation of functional problems and spares most of the patients a second invasive examination. The DFVUDM perfectly fits the requirements of an accurate follow-up tool enabling simultaneous morphological and

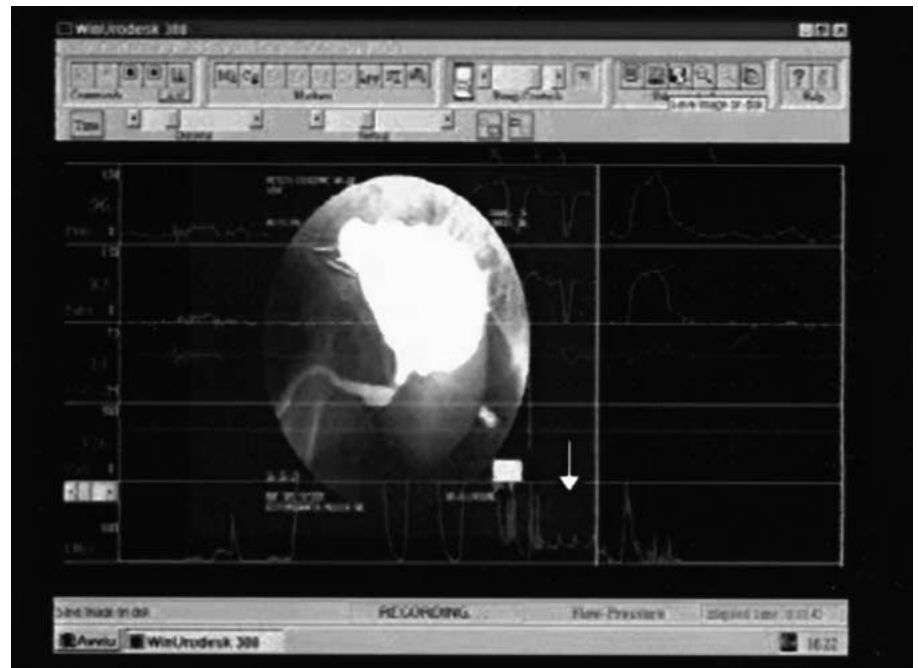


Fig. 4. Dysfunctional pattern of the perineal floor in patient diverted by means of an IR technique. An incomplete relaxation of the perineal floor muscles (white arrows) can be observed during the voiding phase.

functional assessment of the reconstructed lower urinary tract.

The digital fluorangiograph we used is particularly suitable for this aim due to the high definition monitors, the digitalized control in acquiring and storing the radiological images and the opportunity to process the previously stored images

The method used in this study, namely the DFVUDM, was able to detect, both in ICUS+T and in IR diversions, some functional imperfections. In fact, it showed the presence of neobladder wall overactivity leading to transitory high internal pressures in both the reservoirs. This situation is frequently associated with the neobladder-ureteric reflux. Nevertheless, none of our patients had progressive renal failure secondary to the association of neobladder overactivity and reflux. In these cases, it seems that the antireflux mechanisms adopted in both the reservoirs are valid in order to decrease anyway the pressure of an eventual reflux.

In our previous reports nocturnal incontinence was present in 15% [7, 8] and 16% [9] of cases for ICUS+T and IR, respectively. This could be related to the loss of voluntary control of external sphincter during the night and the residual peristaltic activity of the neobladder wall [10, 11]. Such an activity caused urinary urge incontinence during the examination in 11.1% of cases.

It is interesting to observe that most of the patients who showed urge incontinence during the examination had a particular dysfunctional pattern of the perineal floor, described as pseudo-dyssynergy. This dysfunctional pattern seems to be characterized by a lack of the voluntary control of the perineal floor and by an incomplete relaxation of it during micturition (fig. 4).

This could lead to a new concept: the dysfunction of the perineal floor can be an important factor in the pathogenesis of the incontinence in this group of patients. This dysfunction could be the consequence of the unavoidable iatrogenic interruption of the physiological reflex mechanism that, in normal subjects, modifies the perineal activity in relation to the distension of the abdominal viscera. Iatrogenic damage to the sphincteric mechanism, residual peristaltic activity of the neobladder wall or some patient-dependent factors (debilitated patient, insufficient motor coordination) may be other conditions leading to incontinence in these patients. These factors may or may not be associated with perineal floor dysfunction.

The patients submitted to urinary orthotopic diversion after radical cystectomy need an adequate oncological and functional follow-up [12] to ascertain that the scheduled goals (good compliance of the reservoir to preserve the function of upper urinary tract, urinary continence, the maintenance of a good quality of live) are reached and that these goals are maintained over time.

Conclusions

DFVUDM evaluation represents a highly sophisticated tool, which allows an accurate long-term morpho-functional evaluation of the urinary diverted patients. In this study, it is shown that the two studied surgical procedures, namely Alcini's ICUS+T and IR, are quite similar, demonstrating that the taeniotomies on the cecal tract may have almost the same functional effects of detubularization. Although DFVUDM revealed imperfect functional performances in some patients, the quality of life of diverted patients in our series seems to be satisfactory. They have an excellent autosufficient voiding function, low incidence of urinary incontinence and absence of metabolic disorders due to urostasis.

The use of a digital technique permits us to obtain high quality images, submitting the patients to low X-ray exposure. Moreover, the digital storage of the images enables their re-elaboration at the end of the examination (zoom, subtraction of images) for a more detailed and accurate morphological evaluation.

The comparison between DFVUDM and the traditional method permitted us to confirm that the former must be considered a method of choice in the evaluation of the urinary diverted patients.

The cost of the equipment represents the major disadvantage limiting the use of DFVUDM to few specialized centers.

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