

# Continence after bladder-neck reconstruction in patients with bladder exstrophy and pubic diastasis

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**Objective** To review the results of bladder-neck reconstruction in patients with repaired bladder exstrophy and pubic diastasis.

**Patients and methods** Nine girls (mean age 7 years, range 4–17) and four boys (mean age 9 years, range 5–15) underwent a modified Young-Dees-Leadbetter bladder-neck reconstruction with augmentation cystoplasty (YDL-C). The patients were reviewed retrospectively (follow-up, 1–6 years) to assess continence, particularly in relation to the degree of pubic diastasis measured on an appropriate abdominal radiograph.

**Results** Ten patients were continent; seven girls and one boy are managed by clean intermittent catheterization (CIC) and one girl and one boy void normally. One girl who would not allow CIC and one boy in whom CIC was not possible are incontinent and are scheduled for construction of a continent diversion. One inconti-

nent boy who also would not allow CIC was lost to follow-up. Pubic diastasis had no bearing on the surgical results, the 10 continent patients having diastasis ranging from 4 to 9 cm (mean 5.5 cm) and the incontinent patients a diastasis of 3, 4 and 6.5 cm (mean 4.5 cm).

**Conclusion** Young-Dees-Leadbetter bladder-neck reconstruction with augmentation cystoplasty is a satisfactory operation in patients with bladder exstrophy. We believe that the rate of continence reflected a competent tubularization with an adequate bladder capacity and assured bladder emptying. A closed pelvis with approximated pubic bones is not necessary to achieve this objective.

**Keywords** Bladder augmentation, bladder exstrophy, bladder neck reconstruction, pubic diastasis, urinary continence

## Introduction

The management of bladder exstrophy and epispadias has been revolutionized in the last 20 years. Whereas urinary diversion was previously considered appropriate, staged reconstruction is now the accepted procedure [1–3]. The aim is to have a functionally closed bladder with satisfactory urinary continence, preservation of renal function and the creation of an aesthetically acceptable and functional external genital appearance [3].

The principles of the staged management of bladder exstrophy include primary bladder closure, usually with iliac osteotomies, followed by an incontinent interval. Subsequently, epispadias is repaired (in boys) and finally, the bladder neck is reconstructed, with or without cystoplasty. However, controversies persist about the various aspects of the reconstructive surgery, including the importance of approximated pubic bones [4]. We have reviewed 13 consecutive patients with bladder exstrophy managed using a modified Young-Dees-Leadbetter bladder-neck reconstruction and aug-

mentation cystoplasty (YDL-C) in whom pubic diastasis was disregarded.

## Patients and methods

During the 5-year period from 1989 to 1993, 13 patients (nine girls, mean age 7 years, range 4–17; four boys, mean age 9 years, range 5–15) with bladder exstrophy underwent YDL-C as a procedure for continence. The tubularization procedure was modified by using a simple one-layer closure (without double-breasting) [5]. All patients were referred cases, in that the bladder exstrophy had already been closed, three patients having had more than one procedure to achieve success. The age at primary closure varied from newborn to 15 years and only eight patients had a simultaneous osteotomy (Table 1). Their previous surgical history included exomphalos repair in one patient, nephrolithotomy and cystolithotomy in another, and multiple epispadias surgery in four boys. In addition, an unsuccessful reconstruction of the bladder neck had been undertaken in four patients, and two patients had an AMS 800 artificial urinary sphincter inserted, which had subsequently been removed because of complications.

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**Table 1** Characteristics of the patients and outcome after surgery

Age at primary closure* /Sex	Previous sphincter surgery†	Age at YDL-C (years)	Progress	Result	Final follow-up (years)	Bladder capacity (mL)		Pubic diastasis (cm)
						Pre-op	Post-op	
2 weeks/F‡	None	5	Satisfactory	Normal voiding, Mitrofanoff after 3 years; Continent	6	10	500	7
2 months/F	None	6	Satisfactory	Continent; CIC	6	<10	270	5
4 years/F	None	9	Satisfactory (nocturnal enuresis)	Continent; normal voiding	3	30	170	4
5 months/F	None	5	Satisfactory (required local adjustment)	Continent; CIC	1	90	200	4
Newborn/F	None	8	Satisfactory	Continent; CIC	1	50	250	9
1 week/F	AMS 800	6	Satisfactory (cystolithotomy after 4 years)	Continent; CIC	6	10	200	4
15 years/F	BNR at Iry closure	17	Satisfactory	Continent; CIC	5	?	350	8
2 weeks/F	AMS 800	5	Satisfactory	Continent; CIC	3	120	130	4
6 months/F	Multiple BNR	6	Unsatisfactory	CIC declined; Incontinent	2	25	120	4
5 years/M	BNR	11	Satisfactory (cystolithotomy after 4 years)	continent reconstruction planned	5	50	200	7
6 months/M	None	15	Satisfactory, temporary cystotomy at 6 months	Continent; normal voiding	4	80	200	5
1 month/M	BNR	7	Unsatisfactory; CIC impossible	Incontinent; continent reconstruction planned	1	35	230	6.5
8 months/M	None	5	Unsatisfactory; CIC declined	Incontinent	Lost to follow-up	?	?	3

\*Only eight patients had osteotomy. †AMS 800, artificial sphincter. BNR, bladder neck reconstruction. ‡Had more than one bladder repair.

Patients underwent a complete pre-operative clinical and radiological evaluation and informed consent was obtained after stressing the importance of clean intermittent catheterization (CIC). YDL-C was then carried out using detubularized colon in 12 patients and ileum in one. No effort was made to close the pelvis, which was open in all cases, with a pubic diastasis ranging from 3 to 9 cm. The patients were followed at regular intervals to evaluate their clinical status, the status of the upper urinary tract and the degree of continence. This was compared retrospectively with the extent of pubic diastasis to determine whether the diastasis had any bearing on the result.

## Results

The clinical details of and results from the 13 patients are summarized in Table 1. Five girls with no previous sphincter surgery and three with previous surgery had a satisfactory result, based on the criteria of Hollowell and Ransley [6]. Seven were managed by CIC and one voided normally, within a follow-up of 1–6 years. Two boys (one with previous sphincter surgery) had a satisfactory result; one voids normally and one manages by CIC. One girl and two boys are incontinent; two of them had undergone previous bladder-neck procedures which failed, but the common factor was their failure to carry out CIC because of non-compliance in two and technical difficulties in one. Two patients required cystolithotomy 3 and 4 years after reconstruction and one has had a spontaneous perforation [7]. In addition, one girl with difficulties in performing urethral CIC underwent a successful conversion to a Mitrofanoff appendicocystoplasty [8].

The overall results were not affected adversely by delayed repair of the bladder exstrophy, multiple bladder repairs or failed previous sphincter procedures. In particular, they were unaffected by pubic diastasis, which ranged from 3 to 9 cm (mean 5.5 cm) in continent patients (Fig. 1) and 3 to 5 cm (mean 4.5) in the incontinent patients.

## Discussion

The successful management of bladder exstrophy entails closure of the bladder, stabilization of the upper urinary tract, socially acceptable continence and, in male patients, a cosmetically acceptable and functional penis.

Although several controversial issues exist in the management of this difficult problem, staged surgical reconstruction has undoubtedly stood the test of time [3]. The final stage is the construction of a sphincter, for which various modifications of the YDL method have been described [9]. The present technique of a one-layer



Fig. 1. Pre-operative intravenous urogram in an 8-year-old girl showing normal kidneys, undilated ureters and a good bladder. The pubic diastasis measured 9 cm. The patient had excellent continence after YDL-C and post-operative ultrasonography showed normal kidneys.

closure (without double-breasting) is effective and is commended because it is simple [5]. All the present patients had simultaneous bladder augmentation (YDL-C), as was also advocated by others [5,6,10–13]. YDL-C has the advantage that both a competent sphincter and an adequate bladder capacity are assured, these being the main criteria for success [5,11,14]. However, other authors were more selective in their use of augmentation [15]. Another important criterion in the management of patients after the reconstruction is assured bladder emptying, for which CIC was used in 10 of the 13 patients in the present study. However, there may be considerable technical difficulties, especially in males [16]. Despite adequate pre-operative counselling and pre- and post-operative teaching, two patients declined to use CIC and in one it was technically impossible; all three are incontinent. In patients who cannot void or in whom urethral CIC is not possible, construction of a catheterizable and continent abdominal stoma is recommended [8]. This was undertaken

successfully in one patient and two incontinent patients are scheduled for the same procedure.

Apart from the three factors already analysed (sphincter, capacity and emptying), other factors generally considered important in achieving continence include early primary bladder closure and a closed pelvis. Osteotomy and re-osteotomy have been recommended for the latter [4], but it was not considered necessary at the time of YDL-C in the present study, and the results support this approach. The degree of pubic diastasis had no bearing on the result, the mean diastasis being larger in the 10 continent patients than in the three who were not. Mollard, who achieved similar results, also did not consider approximated pubic bones to be important, even at the time of the primary closure [15]. We conclude that YDL-C is a satisfactory operation in bladder exstrophy [5,6,15]. Post-operatively, CIC and a close follow-up are necessary, but further surgery to correct the pubic diastasis cannot be justified. Also, success is possible even when there is a history of previously failed 'sphincter' procedures.

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