Evolution of upper urinary tract and renal function in patients with posterior urethral valves

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Abstract From January 1972 to June 1993, 166 patients with posterior urethral valves (PUV) were treated in our surgical department. According to Hendren's classification [14], 59 had a less severe form of PUV, and in this group the UUT complication rate was 29%. The diagnosis was performed by voiding uroflowmetry (VUCG), uroflowmetry studies, and endoscopy. One hundred seven patients presented with a severe form of PUV, and in this latter group the UUT complication rate was 96.3%. Two of the 107 patients had been operated upon elsewhere and had bilateral cutaneous ureterostomies. Only the 105 patients primarily treated in

Materials and methods

From January 1972 to June 1993, 166 patients with PUV were treated in our surgical department. According to Hendren's classification [14], 59 had a less severe form of PUV, and in this group the UUT complication rate was 29%. The diagnosis was performed by voiding uroflowmetry (VUCG), uroflowmetry studies, and endoscopy. One hundred seven patients presented with a severe form of PUV, and in this latter group the UUT complication rate was 96.3%. Two of the 107 patients had been operated upon elsewhere and had bilateral cutaneous ureterostomies. Only the 105 patients primarily treated in
years). In 17 patients one of the so-called "protective factors" [27] was using proportion tests [33]. Our attitude in the management prejudicial to the reliability of our results. In 53 patients we also reaching adult levels at 1 year of age [13, 21]. Furthermore, the premature infant; 0.45 in the full-term newborn; 0.50 in the infant; 0.55 in the child; and 0.70 in the adolescent [30, 31]. The correlation variability of plasma creatinine concentrations during the first weeks of life decreases the accuracy of CCr in neonates and small infants [13]. However, it is our opinion that these limitations were not prejudicial to the reliability of our results. In 53 patients we also determined the postoperative CCr after protein intake (1 g/kg) [28] or amino acid infusion [34] to calculate the functional renal reserve (FRR). We defined as "good" FRR an increase in GFR after protein intake and/or assessed by Schwartz's formula: $\text{GFR (ml/min \cdot 1.73 m}^2) = \frac{K \times BL}{\text{Serum creatinine}}$ where BL = body length (cm) and K is an age-related constant (0.35 in the premature infant; 0.45 in the term newborn; 0.50 in the infant; 0.55 in the child; and 0.70 in the adolescent) [30, 31]. The correlation between GFR by this formula and clearance of endogenous creatinine was excellent ($r = 0.935$) [29]. In fact, in our experience of more than 300 comparative cases, GFR values obtained by this formula correlated strictly with those obtained by CCr.

At birth, GFR is low compared with adult values; it rises quickly, reaching adult levels at 1 year of age [13, 21]. Furthermore, the variability of plasma creatinine concentrations during the first weeks of life decreases the accuracy of CCr in neonates and small infants [13]. However, it is our opinion that these limitations were not prejudicial to the reliability of our results. In 53 patients we also determined the postoperative CCr after protein intake (1 g/kg) [28] or amino acid infusion [34] to calculate the functional renal reserve (FRR). We defined as "good" FRR an increase in GFR after protein or amino acid infusion of more than 25 ml/min \cdot 1.73 m\(^2\); lower values were defined as "poor."

### Results

The statistical significance of the results was evaluated using proportion tests [33]. Our attitude in the management of PUV after endoscopic valve fulguration or temporary vesical diversion has been "wait and see" under careful control (ultrasound, renal-function and urodynamic studies) [1–3]. Spontaneous resolution (52) or clear amelioration (10) was observed in 62 refluxing ureters (59.2%); in the other 41 the reflux remained unchanged or worsened. In the vesicostomy group, the spontaneous resolution or amelioration rate was 72%. In this group no ureteral reimplantations were carried out.

Only 31 of the 103 refluxing ureters (30.1%) were reimplanted, 8 simultaneously with and 23 from 1.5 to 3 years after valve ablation. Our indications for reimplantation were unmodified persistence of reflux, pyelonephritis, and progressive renal damage in a large-capacity, stable, and compliant bladder. Simultaneous reimplantation was carried out in the presence of non-decompensated, bilateral degree 3 and 4 reflux and a good-capacity, compliant, stable bladder. In other cases we preferred to delay surgical treatment. In 2 ureters reflux persisted postoperatively; it was mild in 1 and resolved spontaneously over 22 months, while the other required re-reimplantation.

Ten nephroureterectomies were carried out in cases of unilateral, massive reflux and renal dysplasia, 9 on the left and 1 on the right side. One late nephrectomy was performed for arterial hypertension. After removal of the lower tract obstruction, there was spontaneous improvement or normalization of the UUT in nearly 70% of dilated ureters; 24 remained unchanged and 5 worsened. Only 10 out of 99 dilated, non-refluxing ureters (9.9%) were reimplanted.

Indications for surgery were worsened or unchanged ureteral dilation associated with deterioration of renal function; a prerequisite for ureteral reimplantation was, as in cases of reflux, a large-capacity, stable, compliant bladder. One failure (obstruction) was successfully treated by transureteroureterostomy.

Altogether, reconstructive surgery was performed on 41 of 202 dilated ureters (surgical rate 20.3%). The overall failure rate requiring reoperation was about 5.0% (2/41). In about 80% of unchanged dilated, non-refluxing ureters, renal function remained stable.

On examination of the evolution of renal function in the vesicostomy group at presentation, after primary treatment (from 3 to 6 months), and at follow-up (mean 7.8 years, range 16 months to 14.5 years), we were impressed by the progressive improvement of renal function, which was statistically significant ($P = 0.000$ if GFR is divided into two groups: more or less than 50 ml/min \cdot 1.73 m\(^2\)) (Table 2). At presentation, all these patients showed reduced GFR (less than 50 ml/min \cdot 1.73 m\(^2\)). In this regard,