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Research Article

Primary Obstructive Megaureter in Children: to Treat or not?

Abstract

Objective: Primary obstructive megaureter has always been considered a developmental defect. Surgical and conservative treatments were compared through a retrospective study first, and then in a longitudinal observational study.

Materials and methods: Between January 1993 and January 2006 at our Department 42 cases of primitive obstructive megaureter were observed. Patients were divided into two groups: treated and untreated, each with inclusion and exclusion criteria. The efficacy of surgical treatment vs. conservative treatment was assessed through routine laboratory tests, ultrasound of the urinary tract and renal scintigraphy. Follow-up was at least 2 years for all patients.

Results: 26 patients were eligible for the study. Of these, 12 patients underwent surgery and 14 patients received conservative treatment. At diagnosis the left kidney resulted the most compromised and no patient showed improved renal function at the end of the study. Single or relapsing infections of the urinary pathway did not seem absolute indications for surgical treatment. It was not possible to observe a correlation between obstruction grade, ureteral dilation and renal function at scintigraphy nor predictive factors specific for this clinical situation.

Conclusions: The management of primitive obstructed megaureter in children is still a controversial issue. If in the past surgical treatment was considered, sooner or later, an essential procedure, it has been proved that it has no advantages with respect to the conservative treatment. Single or relapsing infections of the urinary pathway and relative renal function > of 40% do not need surgery.

Introduction

Primary obstructive megaureter (POM) is one of the most commonly reported malformations of the urinary system in children. The term 'Megaureter' was introduced by Caulk in 1923 to describe a severe dilation of the distal ureter affecting a 32-year-old female. At cytoscopy the patient showed a ureteral orifice without clear obstruction [1-3].

Before the widespread use of ultrasounds for antenatal screenings, most megaureters were diagnosed in their symptomatic phase (infection of the urinary pathway, renoureteral pain, hematuria and acute renal colic). Now the symptomatic cases of primitive megaureter have a lower incidence, while the number of asymptomatic neonates with antenatal diagnosis has notably increased. POM is more frequent in males and affects mainly the left side. It is bilateral in 12% of cases. In 9% of cases it is associated with a contralateral renal agenesis. Despite the widespread use of many radiology and laboratory tests to assess obstruction, dilation of the urinary pathway and grade of suffering of the renal tissue, the clinical management of POM and the best treatment option for this condition in children are currently under constant discussion [2-4].

Through a retrospective study first of the cases observed at our Department and treated with surgery and through a longitudinal observational study with conservative methods, we wanted to consider primitive obstructive megaureter from different (radiological and laboratory) perspectives in order to point out possible predictive factors that could give early indications on the clinical course of patients.

Materials and Methods

This study involved two phases. Phase 1 - retrospective study and collection of data from the patients treated surgically for POM; determination of inclusion criteria to recruit patients into the conservative treatment group. Phase 2 - longitudinal observational study on patients with POM treated conservatively. The study included patients treated surgically and conservatively between January 1993 and January 2010.

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In the retrospective phase of the study regarding the 1993-2002 period, patients underwent surgery for relapsing infections, changes in the relative kidney function > 40% and ureter dilation >5mm.

From 2001 to 2010 a longitudinal observational study was conducted in order to evaluate the role of conservative treatment in patients affected by POM with the same characteristic that were considered for surgery the previous period.

General inclusion criteria for this study as decided in phase 1 were the following: Age between 0 and 12 years; Caucasian ethnic origin; no neurological or systemic diseases; no abnormalities of the genital tract; no metabolic disease; surgical treatment of P.M.O. at our Centre; at least 2 ultrasounds per year of the urinary system with measurements of the renal parenchyma, pelvis and diameters, and of the prevesical ureter; negative cystography for vesicoureteral reflux; at least 2 renal scintigraphies with evaluation of relative renal function for each kidney (beginning and end of study); S-cystatin C at beginning and end of follow-up, blood values for creatinine and urea nitrogen every six months; clinical or postoperative follow-up of at least 2 years.

Exclusion criteria for the study before and during follow-up were as follows: patients that, after receiving conservative treatment, underwent surgery in another medical Centre; patients receiving corrective surgery at our medical Centre but completing follow-up in another Centre; patients with kidney failure at diagnosis; patients undergoing abdominal surgery during follow-up (appendectomy, cholecystectomy, road trauma); patients receiving corrective surgery with subsequent onset of a secondary vesico-ureteral reflux (postoperative complication).

Only patients with a relative kidney function of each kidney > 40% were included in the study.

Creatinine and urea nitrogen expressed in mg/dL; Cystatin C expressed in mg/L: individual values as recorded at the beginning of treatment (conservative or surgical) and at the end of follow-up.

Parameters assessed in the study: kidney growth; diameter of the renal pelvis; thickness of the renal parenchyma and dilation of the prevesical ureter. The values, recorded at the beginning and, again, at the end of study, refer to the overall and relative kidney function of each kidney at study beginning and end obtained following this procedure: injection of furosemide with a suitable dosage scheme according to the patients' age (0.5-1.5 mg/kg) 20 minutes after injection of the radioisotope; collection and evaluation of the data about radioisotope half-life.

Evaluation criteria

The following points were considered: Correlated abnormalities; making of the diagnosis; function and efficacy of instrumental tests; function and efficacy of laboratory tests; correlation between grade of obstruction and kidney function; correlation of the dilation of the pre-vesical ureter with the dilation of the renal pelvis and renal function; correlation between POM side and seriousness of the condition; correlation between US findings and kidney function, scintigraphy and POM side.

Statistical analysis

Different tests were used to correlate the data obtained: Chi-square test, Fisher test and T-student test for coupled data; univariate and multivariate correlations with cross study for each kidney. A p value < 0.05 was considered as statistically significant.

Results

Between 1993 and 2010 at our Unit we examined 42 patients affected by POM. Following the retrospective study and the inclusion criteria for the study, 26 patients aged between 1 month and 132 months were eligible to form the study group.

The study group was formed by 15 males and 11 females. Eight patients (5 males and 3 females) had an antenatal diagnosis of (ipsilateral or bilateral) dilation of the urinary pathways, while the remaining 18 patients had a diagnosis after the onset of infection of the urinary pathways. 12 patients were treated surgically (group A), while 14 patients (group B) received conservative treatment. POM affected the left side in 14 cases and the right side in 9 cases. The remaining 3 cases showed a bilateral condition. The left side was mostly affected in males (9 males and 5 females); females showed to be more affected in the right side (5 females and 4 males). Bilateral POM affected 2 males and 1 female. Nine patients showed abnormalities of the contralateral side: renal hypoplasia in 5 cases; complete pelviureteral duplication in 3 cases and horseshoe kidney in one case. The right side resulted the most frequently affected ($p<0.05$).

Group A: surgically treated patients (12 patients, 1-132 months)

At diagnosis all patients showed infection of the urinary pathways or, at least, a history of unexplained fever with decreased height-weight development.

This group included 8 females and 4 males; 7 patients had a correlated abnormality of the contralateral system. In 5 cases out of 7 the correlated abnormalities affected the right kidney, in the remaining cases they affected the left kidney. These abnormalities were more frequent in females ($p<0.05$). Median age at surgery was 81 ± 59 months for the right side and 43 ± 41 for the left side ($p=0.23$). Before surgery function of left kidney was 52 ± 6% and 53 ± 7% after one year. Kidney function was maintained over time with $p=0.34$. Before surgery the function of the right kidney at scintigraphy was 48 ± 4%, and 42 ± 2% one year after surgery. Although on average these values show a considerable reduction, this is not statistically significant, with a p value=0.23.

All patients showed infection of the urinary pathways with an average of 2 occurrences a year per patient.

Group B: conservatively treated patients (14 patients, 1-84 months) long time follow-up (5 years).

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The median age at diagnosis of patients treated conservatively was 28 ± 23 months for the right side and 28 ± 26 months for the left side, p=0.99.

Median age at the end of the study was 36 ± 14 months for the right side and 40 ± 16 months for the left side, p=0.67. For 8 patients megaureter was diagnosed by the antenatal third trimester US scan, while for the remaining 6 POM was diagnosed after an infection of the urinary pathways. The left side was affected only in males (p<0.05), while the right side was equally affected: 2 males and 2 females. One male and one female showed bilateral megaureter. Median function at scintigraphy was 48 ± 10% for the right side and 51 ± 10% for the left side. There was not a statistically significant difference, p=0.32. Comparing the renal function at the beginning of the study and at the end of the study there was not find a difference.

Infection of the urinary pathways affected 72% of patients during follow-up, with an average of 2 occurrences a year per patient.

Analysis of blood tests did not show statistically significant differences between surgery and conservative treatment, at study beginning and end. None of the values obtained from blood tests was a predictive factor.

Ultrasound data

Treated patients

Diameter of right pelvis of 13.8 ± 6.8 mm with right pathology and diameter of left pelvis of 18.3 ± 12.1 mm with left pathology; diameter of prevesical right ureter with right pathology of 12.1 ± 4.2 mm and diameter of prevesical left ureter with left pathology of 17 ± 6 mm. Thickness of right renal tissue of 6.8 ± 2.3 mm with right pathology and thickness of left renal tissue of 3.6 ± 2.8 mm with left pathology; at diagnosis the left kidney appeared to be more seriously affected than the right kidney (p<0.05);

Untreated patients

Diameter of right pelvis of 14.8 ± 5.9 mm with right pathology and diameter of left pelvis of 13.6 ± 6.3 mm with left pathology; there was not a statistically significant difference (p=0.72); diameter of right ureter with right pathology of 10 ± 2.2 mm and diameter of left ureter with left pathology 14.7 ± 4.3 mm; there was not a statistically significant difference (p=0.07). Thickness of right renal tissue of 6.9 ± 2.5 mm with right pathology and thickness of left renal tissue of 4.8 ± 2.9 mm with left pathology; there was not a statistically significant difference (p=0.97).

Treated vs. Untreated

Although the left kidney was more seriously affected than the right kidney in the patients treated surgically, the comparison with data from the group receiving conservative treatment did not show any statistically significant difference. Infection of the urinary pathways, first cause of surgery, had no correlation with the clinical course of patients (conservative treatment group).

Discussion

At present there is not a clear scientific consensus of the management to treat Obstructive megaureter, even if there is an increasing number of studies and experiences comparing surgical or conservative treatment [3-8].

Not all patients affected by megaureter should receive early surgery, but a long time follow-up is necessary. It has been postulated that since the renal damage is progressive, then it is necessary to stop it early with surgery, but many papers suggest to correct surgically the magaureter only if associated with symptoms (reduced renal function or relapsing urinary infections) [9-15].

Renal scintigraphy, for this reason, is currently the key instrumental test to opt for surgical or conservative treatment. This is a standard test to obtain data about the grade of obstruction of megaureter and the grade of dilation of the urinary system

Some authors reported a spontaneous resolution of 30-45% of cases by the first two years of age: so conservative treatment started to be used when it became clear that the rate of megaureters with long-term spontaneous resolution was directly proportional to age [16].

It is interesting to note that in the patients enrolled in the study megaureter affected mainly male patients, but females underwent surgery more often (p<0.05). Analysis of data showed that the left side, the most frequently affected by the condition, in the surgically treated group was also more compromised than the right side at diagnosis. However, the right kidney seemed more affected by renal malformations like renal agenesis, renal dysplasia and multicystic kidney. Partial ureteral and pelvic dilation seemed to be strictly correlated to age: resolution occurred more frequently in the first two years of life; after that the condition had a tendency to stabilize. None of the patients receiving conservative treatment underwent surgery during the study, showing that this kind of treatment offers more guarantees and advantages. However, there were no cases of complete regression of the ureteral dilation. Other interesting data are that ureteric dilatation stabilization seemed to be strictly correlated to age, those patients with a stable dilatation in the first two years of age had a tendency to stabilize the renal function. However, at present the predictive markers for the stabilization of the dilatation without deterioration of renal function are still controversial and unknown. It has been reported, that many conservative treatment failed in adulthood, so for this reason is essential to follow these patients.Our study have some limitation and probably the number of patients is the main one; on the other hand it is clear that due to the relative low prevalence of megaureter, it is very difficult to enroll homogeneous patients. Probably a longer and well defined follow-up could be associated with different results.

The number of infections of the urinary pathways or a clinical history positive to relapsing infections of the urinary pathways could not be correlated with the clinical courses

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of patients either treated surgically or with conservative treatment, nor with a significant functional improvement in patients receiving surgical treatment. As for this statement,long time antibiotic prophylaxis is still controversial and should be better studied with more criteria.

Conclusions

Primitive obstructive megaureter is a congenital developmental condition. The clinical trend to the use of conservative treatment over the last 15 years has brought many advantages to patients affected by this pathology. While the onset of acute renal failure or upper urinary tract infections due to urine stasis, contralateral renal pathology, pain and decreased renal function are always clear indications to surgery, conservative management seems the best treatment option at least in the first years of life [16-19].

Grade of dilation of urinary tract, together with relapsing infections do not seem clear indications to surgery in patients with a relative renal function > 40%.

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