

SHORT REPORT

Follow-up of early unilateral nephrectomy for hypertension

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Early unilateral nephrectomy was carried out in four young children with unilateral renovascular disease, a poorly functioning kidney and hypertension. At follow-up 5–16 years later all showed normal growth, blood pressure and renal function, and only one child had low-grade albuminuria. Unilateral nephrectomy seems to be a safe and effective alternative to long-term hypotensive treatment.

In selected groups of adults and children with severe unilateral renovascular hypertension unilateral nephrectomy may be of benefit as it may avoid or substantially reduce the need for long-term hypotensive medication, specially if the resected kidney is contributing little to the overall renal function and the remaining kidney is normal. However, unilateral nephrectomy in the very young may raise particular concerns as complete normality of the remaining kidney cannot be assessed as certainly as in older patients. In 1990, we reported on unilateral nephrectomy for hypertension in three young children.¹ Here we report on their follow-up, and of another similar infant.

CASES

The three previously reported cases are summarised in table 1, along with case 4, a 3.3 kg, 37 weeks' gestation baby boy who required ventilatory support for two days for respiratory distress. An umbilical artery catheter was placed with its tip above the origin of the renal arteries, through which the baby's systolic blood pressure was recorded as normal at 44–69 mm Hg. The catheter was removed soon after he showed clinical recovery, and he was discharged. At 2 weeks he re-presented

with recurrent respiratory distress, a markedly raised systolic blood pressure of 120 mm Hg, and cardiac failure with a poorly functioning, dilated, slightly hypertrophied left ventricle. His hypertension was renin-driven, with normal plasma creatinine (53 $\mu\text{mol/l}$), but very high plasma renin activity (110 pmol/ml/h; normal <7 pmol/ml/h). A dimercaptosuccinic acid (DMSA) scan showed a normal left kidney but an irregularly shaped right kidney, which was contributing only 27% of the overall function. A presumptive diagnosis was made of a thrombotic embolus dislodging from the baby's umbilical arterial catheter and entering the right renal artery. His blood pressure and heart failure became increasingly difficult to control, and he rapidly deteriorated clinically despite hydralazine (5 mg/kg/day) and sodium nitroprusside (5 $\mu\text{g/kg/min}$) infusions. A right nephrectomy was therefore carried out urgently, and histological examination confirmed widespread infarction. His blood pressure and clinical condition began improving at once and subsequently returned to normal.

All four children were followed up closely until their blood pressure was consistently normal without medication, their cardiac function and hypertrophy had resolved, and they were thriving. They then underwent annual blood pressure monitoring by their general practitioner. We recalled them for review 5–16 years later to assess their long-term growth, blood pressure, estimated rate of glomerular filtration and rate of excretion of urinary albumin (table 1).

COMMENT

The therapeutic options for an infant who has unilateral renovascular disease causing marked hypertension are curative surgical or interventional radiological revascularisation, unilateral ablation or nephrectomy, or long-term treatment with

Table 1 Clinical details and follow-up results of four cases (three previously published¹), who underwent unilateral nephrectomy at a very young age for hypertension

Case	Sex	Function (%) [*]	Age in years		Growth SD scores [†]		Systolic blood pressure	UA/UC [‡] (normal ≤ 3)	GFR [¶]	Clinical information
			At surgery	At follow-up	Height	Weight				
Reference Case 1	Boy	24	0.2	16.4	-0.17	2.1	124	0.3	92	Cardiac failure day 3; ventricular hypertrophy Left kidney small, with patchy nephrogram Histological picture: areas of ischaemia
Reference Case 2	Boy	14	2.5	19.0	1.07	1.93	120	8.3	92	Failure to thrive at 1 year, with cardiac failure and hypertrophic ventricles Left renal artery stenosis
Reference Case 3	Girl	23 (0 after captopril)	0.9	16.9	1.32	-0.13	122	2.0	111	Failure to thrive; cardiac failure and ventricular hypertrophy at 10 months Right renal artery stenosis
Case 4	Boy	27	0.05	4.9	-0.90	-0.17	86	1.0	105	Respiratory distress and cardiac failure at 2 weeks; imaging suggested a thromboembolus from the umbilical artery catheter Hypertension difficult to control medically, so urgent right nephrectomy; infarction confirmed

^{*}Percentage of the total renal function supplied by the kidney that was removed, estimated from a dimercaptosuccinic acid (DMSA) scan.

[†]Growth standard deviation scores.

[‡]Early morning urine albumin (UA):creatinine (UC) ratio, mg/mmol.²

[¶]Glomerular filtration rate, ml/min/1.73m², estimated from the plasma creatinine concentration and height.³

hypotensive drugs.^{4,5} However, more than half of the children with renovascular disease are not suitable candidates for revascularisation because they have peripheral renal artery disease (2/4 of our infants), and only about 20% of those with suitable lesions are likely to have their hypertension cured.⁴ Because it is not feasible to undertake surgical or radiological revascularisation in small infants, this approach inevitably requires that the child's blood pressure is controlled with medication until they have grown large enough to undertake such procedures. Thus the realistic initial therapeutic options in the neonate are ablation or removal or very long-term drug treatment, unless the ischaemic renal tissue undergoes spontaneous infarction or recovery. In the paediatric series published so far, unilateral nephrectomy cured hypertension completely in about 75% of cases, and partially in the rest.^{5,6}

There is a clear trade-off between the benefits of preserving kidney function and the risks and morbidity associated with controlling the blood pressure with long-term drug treatment. The balance is influenced by: the amount of kidney function that might be lost or saved; the amount of medication required to maintain normotension; and the stability of the blood pressure achieved. The relative contribution of the affected kidney is best measured by DMSA scan, but it cannot be assumed that a damaged kidney will have the same growth potential as the contralateral normal one; it is possible that the relative contribution made by an ischaemic kidney will fall with time.

Medical management of severe hypertension in infants can be hazardous; there is recognised mortality⁴ as well as morbidity associated with the potential side effects of multiple hypotensive drug treatment. Non-compliance is common, compounded by practical difficulties of administration in young, uncooperative children, especially when they have intercurrent illnesses. Because of these issues few children with hypertension will have consistently smooth control of their blood pressure. A child dependent on their medication may become hypertensive if they are suddenly unable to take it reliably. Home blood pressure monitoring may help but is an additional burden for the family.

Although theoretically reduced renal mass may have important long-term consequences,⁴ if the loss of relatively little kidney cures the hypertension, thus eliminating its direct risks and drug morbidity, this consideration is clearly outweighed.⁵ Long-term follow-up results of childhood⁷ and adult⁸ unilateral nephrectomy

suggest that the real risks such as hypertension, impaired renal function and proteinuria are relatively low. This seems to be the case in our four children who are thriving, are free of symptoms, are not taking any treatment, and have measurably normal renal function. Only one child has low-grade urinary albumin excretion. Our experience suggests that unilateral nephrectomy may be a more effective, safe, and definitive treatment than long-term hypotensive treatment in this particular group of children. Undetected or unsuspected disease in the contralateral kidney could affect the rate of success and needs to be considered at follow-up, which should include annual assessments for hypertension and proteinuria. A multicentre long-term follow-up study of similar children might clarify the risk-benefit relationship for clinicians in this relatively controversial area.

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