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Preventive Nephrology – A Proposed Option in Childhood Nephropathy

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Summary

Adedoyin OT, Adeniyi A. Preventive Nephrology – A Proposed Option in Childhood Nephropathy. *Nigerian Journal of Paediatrics* **2001; 28:46.** Three children with renal disorders managed at the University of Ilorin Teaching Hospital are reported as case studies to underscore the need for preventive nephrology . The first case illustrates the inevitability of rapidly progressive renal failure when remedial management desired in the early stages of the nephropathy is not offered or available. Subsequent efforts to help the child were inadequate, too late and foreclosed by extreme poverty of the family. The second case typifies the acute on chronic nephropathy complicated by hypertension and again, extreme poverty of the family. The prognoses in such cases are uniformly bad. The third case represents an important group with relapsing type of nephrotic syndrome, which is amenable to remedial management, and a fair chance of a good span of life. A long term follow-up and attention to possible trigger factors that might lead to relapse is called for. In the three cases, it was posited that primary, secondary or tertiary preventive strategies would have been useful or was useful.

Introduction

THE aetiology of renal disease commonly seen in the tropics remains incompletely understood. Many cases of renal diseases diagnosed, especially in late childhood, are often at various stages of acute disease or progression to chronicity or end stage renal disease. Except for cases of acute glomerulonephritis or idiopathic nephrotic syndrome, which generally carry good prognosis, the outcome of renal disease is most unfavourable. Notwithstanding our basic insight into the pathophysiology of childhood nephropathies in the tropics, the management of serious renal disease remains rudimentary[1] and the need for replacement therapy poses major technological and financial problems. Our current resources, expertise and technical know-how put us far behind in the effective management of progressive and/or end stage renal disease practised in advanced countries. General preventive paediatrics and preventive nephrology in particular becomes the logical step worthy of exploration in Nigeria.

Preventive paediatrics consists of efforts to avert rather than to cure disease and disability.[2] The goal of preventive nephrology is not in any way different from this except that the effort is directed at averting renal disorders. It includes primary prevention, which is the attempt to avoid renal disease before it begins as illustrated by public enlightenment on the danger of using mercury containing soap or cosmetics. Secondary prevention, which is the recognition and elimination of the precursors of renal disease such as screening programme for asymptomatic bacteriuria and also efforts to identify or reverse renal disease in its early stages. Tertiary prevention consists of the measures for ameliorating or arresting the damage or disability arising from established renal disease; such measures include dialysis and renal transplantation in chronic renal failure or end stage renal disease.

The preventive strategies proffered would ensure that before or after renal disorder presents, strenous efforts are made to avert complications, disability and even further progression. Three case studies to illustrate efforts aimed at preventing progression and complication in renal disorders are described. The cases underscore the need for interplay of efforts by the government who will provide the necessary 'high-tech' renal care facilities at affordable prices, parents who will cooperate with the physician by reporting promptly and purchasing required items and the physician who will promptly bring his expertise to the fore to the advantage of the patients. Any missing link among them jeopardizes the preventive efforts.

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Case Reports

Case 1

A five-year old male patient presented in our hospital with a four-week history of progressive generalised body swelling. There was no preceding history of sore throat or skin eruption. There was associated noticeable decrease in urinary frequency by the parents, but no dysuria and preceding history of bee sting or use of mercury containing soap. The child had earlier presented in a private hospital where some unidentified drugs were administered before presenting at our hospital. He was the fifth and youngest child of the mother.

Physical examination at the first visit revealed anasarca with a blood pressure of 80/40mmHg. Urinalysis revealed proteinuria of 4+. The patient was promptly offered admission to facilitate further management of the nephrotic syndrome. This was however declined and he was not seen again until two months later when he presented with more severe anasarca, and an increase in the blood pressure to 100/70mmHg. He was conscious and alert. The findings in the cardiovascular and respiratory systems were within normal limits. Laboratory findings were 24-hour urinary protein, 3.37g/24hrs; serum protein, 22g/1 and albumin, 10g/1. *Plasmodium malariae* was absent in the blood film. The serum creatinine was mildly elevated (158μmol/1). An assessment of nephrotic syndrome was made. Frusemide (2mg/kg/dose, eight hourly) and spironolactone (1mg/kg/dose, twelve hourly) were commenced. By one week post-admission, oedema had reduced considerably and he was making adequate urine. Blood pressure also remained within normal limits. However, on the 14th day of admission, following the initial apparent recovery and improvement, he became oliguric, the urine output being 0.14ml/kg/hr. This further reduced from 59mls to 10mls per day over the next four days. There was no dehydration and the pulse was of good volume. However, the serum urea and creatinine had risen to 10mmol/l and 297μmol/l, respectively. The renal ultrasound revealed loss of corticomedullary differentiation, which was in keeping with renal parenchyma disease. An assessment of acute renal failure following the nephrotic syndrome was made. A fluid challenge with normal saline (20ml/kg) was tried with no response. Frusemide 2mg/kg/dose six hourly was commenced again but the patient remained oliguric. Frusemide was therefore stopped on the 7th day post-oliguria when he was anuric. Meanwhile, on the 12th day post-oliguria (5th day post anuria), the serum creatinine had risen to 602μmol/l, and urea to 23.6mmol/l. Packed cell volume was 11 per cent and fresh packed cell transfusion was carried out while his fluid intake was restricted to insensible loss of 500mls/m^2.

By the 13th day post oliguria (6th day post anuria), he had become oedematous, was coughing, had difficulty in breathing and coarse crepitations over the right upper zone suggesting a complication of pneumonia. He also developed flapping tremor, while the blood pressure had risen to 120/100mmHg and he was lethargic. He was commenced on parenteral ceftriaxone for the pneumonia and captopril for the hypertension.

The patient had the dialysis, which had been suggested to the parents at the onset of oliguria, only on the 14th day post-oliguria and the 7th day post-anuria. Despite the dialysis however, the renal shutdown persisted and the parents could not afford to pay for further sessions of peritoneal dialysis. Although there was improvement in the respiratory infection, the serum creatinine and urea continued to rise. At the time the patient was discharged against medical advice, serum chemistry revealed creatinine, 713μmol/l; urea, 26.0mmol/l; potassium, 4.8mmol/l and sodium, 142mmol/l. The patient did not report back to the hospital and was presumed dead.

Case 2

SA was a 10-year old female patient referred from a private hospital with a history of generalised oedema and oliguria of one week duration. There was no preceding history of sore throat, skin eruption, convulsion or loss of consciousness. Furthermore, there was no history of usage of mercury containing soap or of a similar illness previously.

Physical examination revealed anasarca and a blood pressure of 170/120mmHg. She was conscious and alert with good muscle tone. She was not pale or dehydrated and was not in respiratory distress. Urinalysis showed proteinuria of 4+ and blood of 3+. Initial blood urea nitrogen was elevated (13.6mmol/l), serum sodium was 132mmol/l, serum albumin was low (29g/l), serum calcium and phosphate were within normal limits being 2.6 and 2.5mmol/l, respectively. Urine output in the first four days was 78, 100, 156, and 29mls, respectively. These amounted to 0.12, 0.15, 0.08 and 0.04ml/kg/hr, respectively. The patient became anuric after the first four days of admission. An assessment of nephrotic syndrome in the nephritic stage proceeding into acute renal failure was made. The hypertension was managed initially with parenteral hydralazine and subsequently nifedipine tablets when the diastolic blood pressure fell to 100mmHg. Daily fluid intake was restricted to insensible loss (500mls/m^2) and previous day's output, if there was any. The hyperkalemia was managed with insulin and dextrose infusion. In spite of all these measures, the patient became more pale (PCV, 10 per cent) and was transfused with fresh packed red cells. Meanwhile, the level of consciousness deteriorated. Peritoneal dialysis, which had been offered on the day of admission, could only be carried out on the 14th day because the parents could not afford it earlier. No improvement was noticed post-dialysis, rather, the patient developed convulsion and became comatose. Further dialysis could also not be undertaken until death occurred on the 35th day after admission. Meanwhile the biochemical profiles, especially serum urea and creatinine were increasing, and reached 28mmol/l and 1171μmol/l, respectively, a few days before her death.

Case 3

LM, a 12-year old female patient was diagnosed as a case of nephrotic syndrome at the age of five years and was admitted because of recurrence of facial puffiness. She had responded initially to steroid therapy and was in remission for about six years. This time, she also had throbbing frontal headache, which was associated with ocular pain, and intermittent palpitations but no chest pain, orthopnoea or paroxysmal nocturnal dyspnoea. There was associated increase in urinary output and frequency from about three to seven times a day. She had vomited thrice before presentation with the vomitus containing recently ingested food. She was the third of five children. There was no history of a similar illness in the other siblings.

Physical examination confirmed the facial puffiness but there was no pedal oedema. There was praecordial hyperactivity with the apex beat in the 5th left intercostal space, anterior axillary line. The blood pressure was 210/160mmHg and the pulse was 120 beats/min, regular and of good volume. She was conscious with normal muscle tone and power. She was not in respiratory distress and the breath sounds were normal. Urinalysis showed proteinuria of 4+ and no blood. Serum creatinine was 420μmol/l, potassium was 3.3mmol/l and sodium 137mmol/l; 24-hour urinary protein was 5.8g/24hrs. An assessment of a relapsed state of nephrotic syndrome in acute on chronic renal failure was made. The oedema was successfully managed with hydrochlorothiazide and spironolactone. The hypertension was first managed with intravenous hydralazine and subsequently captopril and propanolol when the diastolic blood pressure fell to100mmHg. The blood pressure became normal by the 9th day of admission and the headache had subsided by the third day. Subsequent serum urea and creatinine levels were normal and remained within normal limits with the last values before discharge being 6.0mmol/l and 94μmol/l, respectively. Proteinuria also became 1+ before discharge. She was discharged from the hospital after 14 days of admission. Blood pressure has remained within normal range (100/60 – 110/70mmHg). She is currently on oral thiazide and spironolactone.

Discussion

The first patient typifies cases in which prompt attention at initial presentation probably could have made a great deal of difference. The age of the patient favoured a type of nephropathy that is known to be amenable to early management and treatment. It may be assumed that whatever treatment, if any, the patient had over the period of two months when his parents refused the offer of hospital admission was ineffective. The patient's condition certainly deteriorated during the period and the advantage of early control and management of progressive renal disease was lost. Moreover, renal failure had set in, necessitating the need for dialysis. However, the cost benefit of dialysis in such a patient without concrete plan towards eventual renal transplantation is questionable; for dialysis to be effective and beneficial, it should be carried out early so that residual renal function may be preserved and activated. Furthermore, the deleterious effect of renal dysfunction and uraemia could have been minimized through earlier intervention. The effect of poverty and serious financial handicap is very obvious in this case which highlights the need for prompt management of all cases of nephropathy in order to interrupt their progression. Prompt management of renal disorder at the early stage is a secondary prevention in renal disorder as it helps to reduce the possibility of complications setting in. However, if the case is complicated by renal failure as in this case, tertiary prevention in the form of dialysis is useful.

The second case is an example of the acute on chronic nephropathy associated with various aetiologies seen among our children. These may be attributable to progressive forms of acute glomerulonephritis such as rapidly progressive glomerulonephritis, membranoproliferative glomerulonephritis, quartan malaria nephropathy and others. Such cases may present clinically with rapid deterioration of renal functions and death in end stage renal failure. They are therefore noted for their poor prognosis. However, some of them respond to steroids, which were not tried in this case because of the associated hypertension. The only remedy that is effective in cases such as these includes various dialysis regimens and renal transplantation as the ultimate goal. Such services which are not beyond the technical capability of Nigerian personnel are however not readily available and costs are beyond the reach of the vast majority of the citizens as demonstrated by this case. As clearly shown in this case, the patient could only benefit from a tertiary prevention, in the form of dialysis and renal transplantation.

The third case represents an important group of children with a relapsing type of nephrotic syndrome. Some of these respond promptly to steroid and other drugs but may relapse on withdrawal of drugs or become resistant to the therapy.[3] The possibility of a quartan malaria nephropathy (QMN), grade 1 initially, with a high index of protein selectivity but now in progression to a state of chronic renal failure is also tenable. Another possibility in this case is that of an initial minimal change nephrotic syndrome which has undergone transformation to either a focal glomerulosclerosis or membranoproliferative glomerulonephritis. Some of such patients are known to benefit from steroids alone or in combination with cyclophosphamide. A renal biopsy in this patient would have been useful, as it would have revealed the histological type. This case shows the benefit of quick intervention in renal disorders. It also highlights the benefits that can accrue from co-operation given by the parents in terms of prompt supply of needed items. The child benefited from a secondary prevention in terms of reversal of renal diseases in their early stage.

Other preventive measures worthy of note in childhood nephropathy include the use of angiotensin-1-converting enzyme (ACE) inhibitors. These drugs apart from their ef-

fect in lowering blood pressure, have been shown to delay significantly, end stage renal failure in chronic glomerulonephritis. They can be given or continued even when the blood pressure is normal. On a long term basis, lisinopril, which is a related derivative is better tolerated in children. Furthermore, pyelonephritis complicating chronic renal failure when discovered and treated early can delay end stage renal disease.

The three cases reported here show that the secondary and tertiary preventive strategies are basically management modalities that could interrupt the progression of the disease and prevent complications. It can also be seen that the tertiary preventive strategies (dialysis and renal transplantation) are still very expensive and beyond the reach of the average Nigerian. Furthermore, the success of any of these preventive strategies requires the cooperation of the government, parents and the doctors. Government must provide the enabling environment so that dialysis services and consumables are available at cheap and affordable cost. It should also establish at least, one renal transplantation centre and provide heavily subsidised service. Parents on the other hand, must provide all that is required to take care of their children promptly while the doctors must be available to provide expert services at all times.

While secondary and tertiary prevention take the frontline once renal diseases are established, primary prevention must be ongoing through public enlightenment on the danger of using mercury containing cosmetics, buying drugs over the counter without prescription, prevention of sickle cell disease and prompt treatment of malaria.

Morbidity and mortality as outcome of renal disease manifest in form of hypertension, cardiac failure, terminal renal failure, among others and cuts across all age groups. Its effects are devastating in young adults and those in their middle ages, who are the most productive in all spheres of human endeavour. Previous studies have shown that renal disease and its complications are causes for serious concern in all communities. Because of the serious handicap posed by inadequate technical expertise, poverty and ignorance, the response to the challenges of advanced and/or terminal renal disease is only palliative in the Nigerian context. Very few can afford the maintenance therapy offered by dialysis regimen and the ultimate of organ transplantation for which a travel abroad is still mandatory. Furthermore, post-transplantation medical care can be offered only in a few centres nationwide.

Notwithstanding the current optimism that health care may receive greater attention from the government, it has to be admitted that the sheer cost of establishing centres to manage the vast number of patients with end stage renal disease is daunting and may take a long time to materialise. This fact makes the call for positive thinking directed at preventive processes along the lines postulated above, of serious import.

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