Case Report
‘The use of acacia gum in end stage renal failure’

by Aamir Jalal Al Mosawi
Head of the department of Pediatrics, University Hospital in Al kadhimiyia, Po Box 70025 Baghdad Iraq

Summary
Objective: To describe a new model for the management of end-stage renal failure (ESRF) associated with longest period of dialysis freedom (4-year) achieved with this novel form of renal replacement therapy (RRT). The research was done in accordance with Helsinki declaration and approved the scientific committee in the hospital. Conservative management of chronic renal failure (CRF) can only be successful in nonterminal CRF, and patients with ESRF cannot sustain life in the absence of renal replacement therapy. A new regimen combining the traditional conservative management of CRF (dietary and pharmacologic) with addition of Acacia gum (AG) 1 g kg⁻¹ per day has been reported to provide patients with ESRF dialysis freedom. An 11-year-old girl with ESRF initially required four sessions of intermittent peritoneal dialysis to control uremic symptoms. The parents refused further treatment by dialysis. Thereafter, she was managed with a new regimen combining the traditional conservative management of CRF with addition of AG. Four year dialysis and improved well-being was achieved. The chronicity of her illness was confirmed by the presence of small contracted kidneys, a finding that has not changed during the subsequent follow-up. During these 4 years she continued experiencing improved well-being and good participation in outdoor activities, had never been acidotic or experienced significant uremic symptoms.

Conclusion: This is the longest period of dialysis freedom reported in children with ESRF.

Key words: New model management—end-stage renal failure, long dialysis freedom.

Introduction
With appropriate dietary and pharmacologic management (protein and phosphorus restriction, calorie and water soluble vitamins supplementation, phosphate binders, etc.), patients with nonterminal renal failure (RF) can be maintained surprisingly well [1], and the transition from nonterminal chronic renal failure (CRF) to end-stage renal failure (ESRF) represent a small decrement of renal function resulting in a large physiologic hurdle for the patient [2]. Conservative measures can only be successful in nonterminal CRF, and patients with ESRF and glomerular filtration rates <5% of the normal cannot sustain life in the absence of renal replacement therapy (RRT), and either dialysis or transplantation is required. In addition to these effective traditional measures, an agent enhanced fecal nitrogen excretion can possibly bridge this gap resulting from this small decrement of renal function, obviating the need for RRT for some period of time. A new regimen combining the traditional conservative management of CRF including low protein diet with addition of Acacia gum (AG) 1 g kg⁻¹ per day has been reported to provide patients (children, adolescents and adults) with ESRF dialysis [intermittent peritoneal dialysis (IPD) and hemodialysis] freedom [3–5]. The aim of this article is to describe the longest period of dialysis freedom (4-year) achieved in history with this novel form of RRT.

Case Report
An 11-year-old girl reached the state of ESRF during September 2001. The cause of her CRF could not be determined exactly because of her late referral. The presence of albuminuria and occasional granular casturia has made difficulty in excluding chronic glomerulonephritis as the possible etiologic factor. The state of ESRF was confirmed by the need for dialysis to maintain health and life during period exceeding 3 months, small contracted kidneys on ultrasound and pre-dialysis creatinine clearance of less than 5 ml min⁻¹ as calculated by a formula developed by Cockcroft and Gault [6]. On day 93, she experienced symptomatic uremia (anorexia, vomiting, fatigue and tachypnea) despite protein restriction, and required four sessions of IPD...
to control uremic symptoms and to maintain life. She received blood transfusion during each session. The maximum dialysis-free period was 27 days. She was enjoying a good quality of life only during the few days after each dialysis session. The parents refused subjecting their daughter for further dialysis sessions. Thereafter she was managed with a novel regimen combining the traditional conservative management of CRF including low protein diet with addition of AG 1 g kg\(^{-1}\) per day. Table 1 summarizes the items of this comprehensive conservative management of ESRF. On referral she was symptomatic with anorexia vomiting and tachypnea. Serum creatinine was 680.7 \(\mu\)mol\(\text{l}^{-1}\) and blood urea was 41.8 mmol\(\text{l}^{-1}\). During the first 3 days of therapy, nausea and vomiting were controlled by anti-emetic and intra-muscular pyridoxine. During the first 24 h she was advised to take high-calorie fluids.

During the first year of therapy her arrested growth was stimulated. During the third year of therapy, she received eight injections of non-17\(\alpha\) alkyl testosterone derivative anabolic agent, nandrolone decanoate (ND) to improve her growth, which has slowed down during the second year of AG therapy and growth hormone was only available on limited basis for children with growth hormone deficiency, and her bone age was well below the chronologic age. Bone age was estimated to be 8 years. The trochlea and olecranon at the elbow and the pisiform at the wrist were absent [7]. The skeletal maturation was monitored every 2 months by radiographs of the wrist and elbow. On day 21 of AG administration serum creatinine was 300.5 \(\mu\)mol\(\text{l}^{-1}\) and blood urea 20.7 mmol\(\text{l}^{-1}\).

During the 4 years she continued experiencing improved well-being and good participation in outdoor activities, had never been acidotic or experienced any uremic symptoms. Blood urea level was generally maintained below 17 mmol\(\text{l}^{-1}\). The lowest urea level of 14.5 mmol\(\text{l}^{-1}\) was recorded during the first year of therapy in association with serum creatinine of 230 \(\mu\)mol\(\text{l}^{-1}\). A maximum urea level of 23.4 mmol\(\text{l}^{-1}\) and a serum creatinine of 442 \(\mu\) were noted during a period of decreased adherence to dietary restriction and less compliance with AG therapy. Periods of decreased compliance with other pharmacologic therapies such as iron and erythropoietin were also associated with hypochromic microcytic anemia with Hb level as low as 7.6. Noncompliance with calcium carbonate and one alpha-calcidol were associated with clinical, biochemical, and radiological features of renal osteodystrophy. These problems of anemia and renal osteodystrophy were solved by returning to the strict adherence to all of the items of the regimen. However some degree genue vulgum has resulted.

Before referral the child’s growth was almost arrested. AG supplementation was associated with an obvious acceleration of growth (Figure 1). The child’s growth slowed down during the second year of therapy. The use of ND during the third year was associated the stimulation of growth. Figure 1 shows the growth of the child during the first 3 years of treatment. No apparent advancement of the bone age was noted. The trochlea and olecranon at the elbow and the pisiform at the wrist were absent before therapy and remained so 2 months after therapy. The use of nandrolone was associated with a beneficial effect on growth without any obvious adverse effect.

A potential role of AG in the management of CRF has recently been suggested [5]. Table 2 summarizes the accumulating scientific evidence supporting the use of AG in CRF [1, 3–5, 8, 9]. ESRD causes growth

### Table 1

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<th>The items of comprehensive conservative management of ESRF</th>
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<td><strong>Dietary proteins restriction:</strong> Protein was restricted to 1 g kg(^{-1}) per day with at least 50% of the total intake given as egg albumin (1 egg = 6 g). Protein and phosphorus restriction was primarily achieved by restricting meat, poultry, fish, milk, cheese and yogurt.</td>
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<td><strong>Traditional conservative measures:</strong> High calorie diet, water soluble vitamins, calcium carbonate supplements, erythropoietin and one alpha-calciferol.</td>
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<td><strong>Powder AG:</strong> AG was given in 1 g kg(^{-1}) per day in divided doses as convenient diluted with desired amounts of water with or without the addition of sugar and juices.</td>
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<td><strong>Hormonal stimulation of growth:</strong> Nandrolone decanoate started during the 3rd year.</td>
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Experimental evidence

Increased fecal nitrogen excretion from the ingestion of dietary fiber especially AG has also been reported in animals, normal human subjects and patients with cirrhosis.

Renoprotective effect: of AG protective effects on gentamicin-induced nephrotoxicity in rats.

Controlled trial in adult with asymptomatic nonterminal renal failure

The use of AG (50 g daily) in eight adult patients with asymptomatic nonterminal renal failure consuming LPD was associated with lower serum urea, and the patients had greater fecal masses and greater fecal nitrogen excretion in comparison with eight control patients on pectin supplementation instead of acacia.

One-year dialysis freedom in children with ESRF

Among six patients with ESRF and significant uremia that required at least one dialysis session to maintain life despite LPD and other conservative measures. Two patients were treated with added AG supplementation, experienced 1 year of dialysis freedom and improved well-being. Both patients maintained serum creatinine and urea levels not previously achieved without dialysis. The four nonenrolled patients died from uremia despite IPD within 6 months.

Uncontrolled trial in adults with symptomatic uremia: hemodialysis freedom

Eleven adult patients with symptomatic uremia. Two of them were on HD. The remaining were on LPD combined with other medical treatments of CRF, including one of the undergone one PD session before referral. The initiation of AG in addition to the traditional conservative measures was associated with alleviation of the uremic symptoms and improved general well being as long as they were compliant with therapeutic protocol. These patients were followed for 2–16 weeks. HD freedom was achieved in two patients. Two patients who did not comply with our therapeutic protocol died, one during treatment with IPD and one within 1 month after renal transplantation.

The use of AG in patient with no renal function (anuric)

The use of AG (powder form 0.5 g kg⁻¹ in divided doses with minimal amount of fluid to make it acceptable) in patient with no renal function (anuric) in a 7-year-old boy with most extreme form of ESRF; anuric with no renal function treated with combined IPD and conservative medical treatment (LPD, fluid restriction) was associated with significant reduction in the frequency of IPD.

References