RADIOLOGICAL CASE

CLINICS IN DIAGNOSTIC IMAGING (2)

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CASE REPORT

A 36-year-old Chinese man presented with facial puffiness and generalised oedema. Since 15 years of age, he had recurrent attacks of hot, painful joint swellings. These started initially at the metacarpo-phalangeal joints of the hands and feet, and subsequently involved the elbows and ankles.

On examination, his complexion was noted to be uraemic. Mutilating deformities were present in his hands and feet, with multiple subcutaneous nodules distributed over most of his digits, the ankles and elbows. His renal function had deteriorated rapidly within the past year. Present biochemical profile was: blood creatinine 0.69mmol/l, urea 4.74mmol/l, uric acid 0.60mmol/l and proteinuria 3.83g/day.

Radiographs of his hands (Fig 1) and feet (Fig 2), and ultrasound examination of his kidneys (Fig 3) were performed. What do these show? What is the diagnosis? Is it unusual for such findings to occur in a patient of this age?

Fig 1 – Anteroposterior radiograph of both hands.

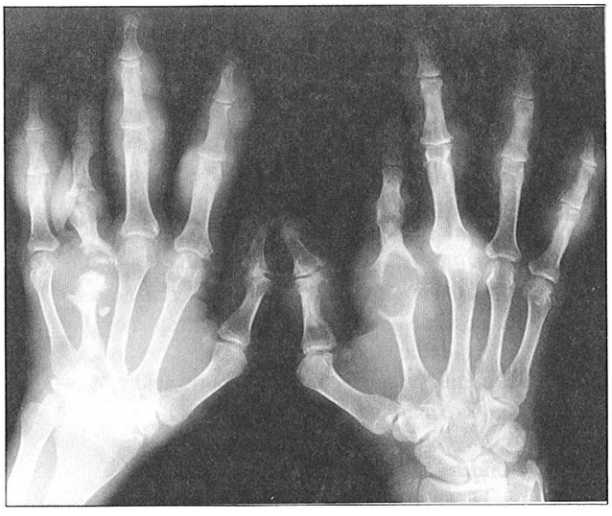

Fig 2 – Anteroposterior radiograph of both feet.

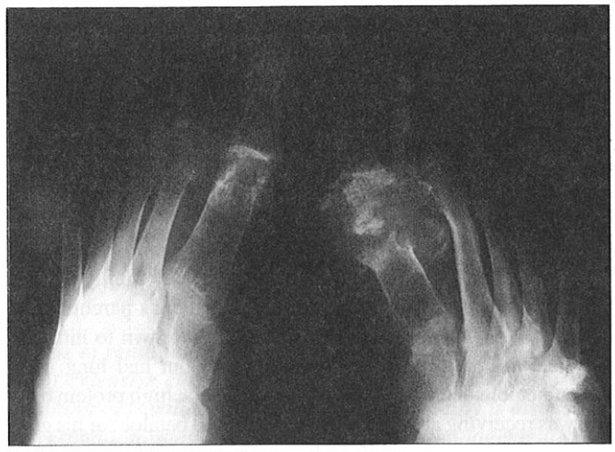

Fig 3 – Ultrasound of the right kidney (transverse plane).

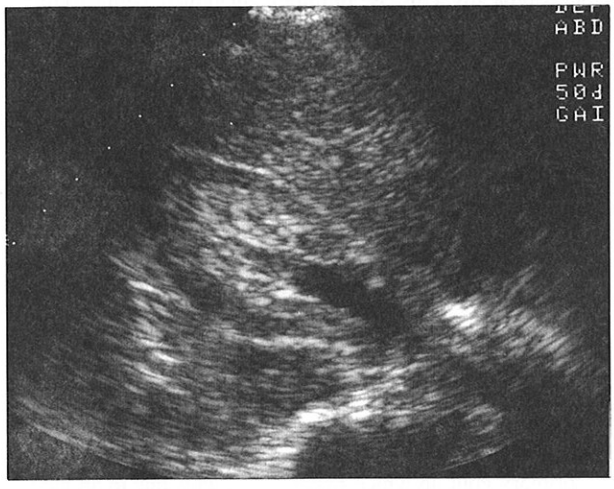

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IMAGE INTERPRETATION

Radiographs (Fig 1 and 2) demonstrated multiple intra- and peri-articular bony erosions involving the metacarpo-phalangeal and inter-phalangeal joints of the hands and the first metatarso-phalangeal and inter-phalangeal joints of the feet. The erosions had a characteristic punched-out appearance with overhanging edges and sclerotic margins, and were associated with soft tissue masses. These eccentric masses were distributed asymmetrically and contained internal calcifications. Despite the extensive deformities, bone density was preserved and joint spaces were generally intact. These features were typical of arthritis mutilans of chronic tophaceous gout. Ultrasound (Fig 3) showed thinning and increased echogenicity of the renal parenchyma. The renal outline was smooth, its size was within normal limits and there was no calculus or hydronephrosis. The left kidney had an identical appearance. In this clinical setting, ultrasonic features were consistent with that of urate nephropathy.

Diagnosis: Juvenile gouty arthropathy with associated nephropathy

Clinical course

Unfortunately, it was not possible to obtain any family history of renal disease or gouty arthritis as the patient's parents were both deceased, the causes of which were unknown to him. He also had a sibling who had hypertension, but had long been uncontactable. He was started on a low purine high protein diet, and was receiving allopurinol, colchicine and betaloc for his gout and hypertension. In view of his poor and deteriorating renal function, the patient was scheduled for peritoneal dialysis.

DISCUSSION

Gout is typically a disease of middle-aged men, being 10 times more frequent than in women. Uric acid, the final product of purine metabolism in humans, is barely soluble in extracellular body fluids as its normal concentration is near the saturation limit. Hyperuricaemia, which is generally accepted as greater than 0.42mmol/l in men and 0.36mmol/l in women, may be caused by increased production of uric acid, decreased excretion or both. Increased plasma concentration will cause supersaturation and precipitation of uric acid crystals in various extracellular compartments, producing an exudative inflammatory reaction and giving rise to the symptoms of acute gouty arthritis. Long-standing disease may result in chronic tophaceous gout, producing radiographic changes such as those present in our patient.

Traditionally, gout has been classified into two types[1], namely:

1. primary gout, in which hyperuricaemia is due to an inborn error of metabolism; and
2. secondary gout, in which hyperuricaemia is a result of a number of other known disorders which disturb uric acid metabolism.

Subsequently, various metabolic defects have been observed in hyperuricaemic patients previously grouped as primary gout, leading to suggestion of a newer classification[2]. In this classification, now generally accepted, cases are separated into idiopathic gout, which includes the vast majority of patients, and those with known disorders or enzyme defects (Table I).

Early-onset gouty arthritis is an unusual disorder in which radiographic abnormalities of gout are evident prior to the age of 20 years[3]. In this discussion, we prefer the term 'juvenile gouty arthropathy" as the clinical and radiological features of gout are similar to those in middle-aged adults except that juveniles are afflicted instead. Moreover, this term can be used to encompass a host of specific enzyme defects and hereditary disorders (listed in Table I), for which a thorough investigation should be initiated. Although not proven, our patient most likely suffered from familial juvenile gouty nephropathy. This condition, also known as familial hyperuricaemia, precocious familial gout and familial juvenile hyperuricaemic nephropathy, was first described by Duncan and Dixon in 1960[4] and has subsequently been documented in various reports[5-9].

Familial juvenile gouty nephropathy is an autosomal dominant condition with high penetrance and characteristic features. It affects young men and women in equal proportions. Level of hyperuricaemia is disproportional to the degree of renal dysfunction, with extreme renal hypoexcretion of urate resulting in the fractional urate clearance being even lower than middle-aged chronic gouty arthritic patients. Renal function is initially normal for age, apart from the selective urate hypoexcretion. Without proper treatment, however, renal impairment becomes rapidly progressive, leading to end-stage renal disease as early as the third decade. Hyperuricaemia, with or without clinical gout, and varying degrees of renal impairment have been found in the family members of these patients[5,7,8]. To date, the metabolic defect causing familial juvenile gouty nephropathy has not been identified, but this condition remains an important purine related disorder of childhood onset and should be considered in juveniles with gouty arthritis or hyperuricaemia.

Table I – Classification of Hyperuricaemia and Gout*

- I. Idiopathic gout
- II. Gout associated with other clinical disorders
  - A Hereditary disease
    - 1. Excess purine production
      - a. Glycogen storage disease, type I (glucose-6-phosphatase deficiency)
      - b. X-linked uric aciduria (hypoxanthine-guanine phosphoribosyltransferase (PRT) deficiency)
        - i. Lesch-Nyhan syndrome with virtual complete PRT deficiency
        - ii. Gout with incomplete PRT deficiency
      - c. Possible phosphoribosylpyrophosphate amidotransferase deficiency
    - 2. Diminished renal clearance of uric acid
      - a. Hereditary nephropathy
      - b. Glycogen storage disease type I
    - 3. Undetermined
      - a. Down's syndrome
      - b. Vasopressin-resistant nephrogenic diabetes insipidus
  - B Haematological disorders
    - 1. Haemolytic anaemia
    - 2. Myeloproliferative disease
  - C Renal disease
    - 1. Glomerulonephritis and pyelonephritis
    - 2. Lead poisoning
  - D Endocrine abnormalities
  - E Vascular disease
  - F Miscellaneous disorders
- III. Drug induced gout

*Modified from Seegmiller JE. Diseases of purine and pyrimidine metabolism. In Bondy PK, Rosenberg LE. eds. Metabolic Control and Disease. 8th ed. Philadelphia: W B Saunders Co, 1979:780.

In our patient, it may be argued that gouty arthritis could have occurred secondary to renal failure, but there are several reasons against this. The patient had been having attacks of gouty arthritis for 20 years, but his renal function had only deteriorated significantly in the recent one year. Moreover, the extent of gouty arthritis was out of proportion to the relatively mild sonographic renal changes. Significant bony radiographic lesions, let alone such florid ones, are rare in secondary gout. The age of onset of gouty arthritis was much too young to be due to secondary gout, especially in the absence of other known causes of increased production or decreased excretion of uric acid. Furthermore, when gout develops, it usually does so after 20 to 30 years of sustained hyperuricaemia[10].

At present, kindreds are discovered only by index cases with early onset of clinical gout. It is emphasised that patients with juvenile gouty arthritis and their family members be thoroughly investigated, as early identification and simple treatment with allopurinol may ameliorate the progression of the renal lesions[7,9].

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ABSTRACT

A 36-year-old Chinese man presented with clinical and biochemical features of renal failure. He has had recurrent attacks of acute gouty arthritis since the age of 15 years. Present radiographic features of extensive chronic tophaceous gout included soft tissue masses, calcification, and typical erosions in the hand and feet. The condition of familial juvenile gouty nephropathy is discussed. Awareness of juvenile-onset gouty arthropathy should lead to early investigation, diagnosis and appropriate management. The complication of associated nephropathy may potentially be prevented.

Keywords: *arthritis, familial juvenile gouty nephropathy, gout, hyperuricaemia, precocious familial gout*