Nitroblue tetrazolium test in psoriatic arthritis, rheumatoid arthritis, and osteoarthritis

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SUMMARY Nitroblue tetrazolium test scores were obtained in 43 patients with psoriatic arthritis, 32 patients with rheumatoid arthritis, and 16 patients with osteoarthritis. The mean score in all groups was similar and was higher than previously reported in patients awaiting heart surgery or with noninfective dermatoses. The test is not thought to be helpful in differentiating psoriatic arthritis from rheumatoid arthritis, and its usefulness in the diagnosis of septic arthritis superimposed on other forms of arthropathy is limited.

A small proportion of the neutrophil polymorphs of normal subjects can *in vitro* reduce the soluble dye nitroblue tetrazolium (NBT) to an insoluble formazan precipitate. It has been shown that enhanced reduction is found in leucocytes from patients with bacterial infection. This was proposed (Park *et al.*, 1968) as the basis of a rapid test to aid in its diagnosis, the result being expressed as the NBT score. Normal scores were reported in 5 patients with childhood 'rheumatoid arthritis' by Park *et al.* (1968) and in 12 patients with rheumatoid arthritis by Gupta and Steigerwald (1974), who found raised scores (mean 29, range 2-80) in 4 of 8 patients with septic arthritis. However, Okuda, *et al.* (1974) noted high scores in rheumatoid arthritis. Roberts *et al.* (1974) reported that in patients with uncomplicated psoriasis of all types before and after treatment, scores were higher than in control groups. High scores occurred in 2 patients with psoriatic arthritis. To clarify the situation we have studied patients with psoriatic arthritis as well as those with rheumatoid arthritis and osteoarthritis.

Methods

Forty-three patients with psoriatic arthritis fulfilling the criteria of Moll and Wright (1973) were studied. The extent of psoriasis was assessed using the rule of nines (Evans *et al.*, 1952). The severity of arthritis was graded as mild (involvement of fewer than 4 joints

with no loss of function), moderate (involvement of fewer than 4 joints with deformity and/or loss of function, or involvement of many joints with only slight impairment of function), or severe (marked deformity and disability). NBT scores were also determined for 3 patients with psoriasis and rheumatoid arthritis, 4 with psoriasis and osteoarthritis, 2 with psoriasis and nonarticular rheumatism, and 2 with psoriatic arthritis *sine* psoriasis (Baker *et al.*, 1963; Ross, 1964). 32 patients with rheumatoid arthritis and 16 with osteoarthritis were investigated as well as 1 with gout.

The NBT score was determined by the method of Park *et al.* (1968) as modified by Freeman and King (1972), and was performed by one of us (M.R.) who was aware only that patients had some form of arthritis. The upper limit of normal in our hands is 11% and results were taken as definitely raised when over 13%.

Results

The range of scores and mean values were similar in the three conditions, only one patient having a score of over 30% (Fig.). Raised scores were found in 16 (37%) patients with psoriatic arthritis. A raised score was not related to sex, age at review, the presence of nail dystrophy, the extent of psoriasis, the severity of arthritis, erythrocyte sedimentation rate (ESR), the presence of antinuclear factor or HLA-B27, peripheral joint erosions, sacroiliitis, or drug therapy. Patients with raised scores had a longer duration of skin and joint changes and a higher prevalence of distal interphalangeal joint involvement.

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Fig. NBT scores in osteoarthritis, rheumatoid arthritis, and psoriatic arthritis.

Eight (25%) patients with rheumatoid arthritis had raised NBT scores. There was no relation to sex, age at review, duration of morning stiffness, articular index, or presence of erosions. Patients with raised scores had a lower value for ESR ($P < 0.05$; $t = 2.11$) and a lower prevalence of rheumatoid factor ($P < 0.05$; $\chi^2 = 4.44$). A higher prevalence of corticosteroid therapy was found in those with normal scores ($P < 0.05$; $\chi^2 = 5.23$). 3 (18%) patients with osteoarthritis had raised scores, there being no clinical associations.

The mean score was raised in 3 patients with psoriasis and rheumatoid arthritis (16%), in the 2 with psoriatic arthritis *sine* psoriasis (13.5%), and in the patient with gout (34%). Normal scores were obtained in those with psoriasis and osteoarthritis or nonarticular rheumatism.

Discussion

The high levels found in uncomplicated psoriasis by Cotterill *et al.* (1974) suggested that the test may be of diagnostic help in differentiating psoriatic arthritis from rheumatoid arthritis. However, our finding of raised scores in the latter shows this is not so.

The similarity of mean scores suggests that polymorph phagocytic activity may be stimulated by

some component of the inflammatory arthritis in addition to the psoriasis. It is interesting that similar scores were obtained in osteoarthritis where fresh evidence of an inflammatory component has been put forward (Dieppe *et al.*, 1976).

Drugs are known to affect the NBT score. Lower scores have been induced by aspirin (Dounes, 1972) and phenylbutazone (Strauss, *et al.* 1968; Dounes, 1972). High dose corticosteroids have been shown to produce false-negative results (Miller and Kaplan, 1970; Matula and Paterson, 1971; Ng *et al.* 1972) while indomethacin does not affect nor increases the score (Dounes, 1972). In the present study the only significant differences in therapy between those with raised and those with normal scores was the higher prevalence of corticosteroids in patients with rheumatoid arthritis and normal scores. However, all were receiving less than 10 mg prednisolone (or its equivalent) daily and it is unlikely that this would have affected the result.

The test is generally accepted as helpful in the diagnosis of bacterial infection. The high level of false-positive results we have found may limit the usefulness in diagnosing septic arthritis complicating other forms of arthritis.

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