The rheumatoid foot. Pathomechanics, clinical and radiological features. Therapeutic conditions

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General remarks

The incidence of rheumatoid arthritis in the general population is 0.5%. This progressive disease affects 3 times more women than men and occurs at any age, but especially between 40 and 60 years. Initially, it may remain localized to the foot and ankle for a long time. During its progress, the foot is affected in 90% or more of cases (1, 19, 78, 82, 97, 104, 109).

Despite progress in therapeutics, rheumatoid arthritis often remains a serious disorder with severe morbidity (3, 98). Disability related to the foot in rheumatoid arthritis has not been objectively assessed but the frequency of foot surgery enables us to give an estimate: it occurs in approximately 20 to 30% of cases (96, 106, 107). This high incidence is an argument for optimal management of the foot in rheumatoid arthritis.

Pathomechanics

Biomechanical factors account for the main deformities of the rheumatoid foot; the great variety of factors involved is evidenced by the numerous atypical forms. It is
impossible to summarize the pathophysiology of the foot in rheumatoid arthritis in a few lines but the following schema may be suggested.

Inflammatory synovitis predominates and is the initial factor. It leads to weakening of the structures which support the foot: joint capsules, ligaments, tendons and certain muscles. Its consequences appear more in the metatarsal area, on the subtalar joint complex and on the tendon of the tibialis posterior muscle. Some authors make a comparison with the hyperlaxity of Ehler-Danlos disease (99).

At a later stage there is osteoarticular destruction with subsequent dislocation (or, in certain cases, ankylosis). In some lesions, the healing process with postinflammatory contracture plays a part in causing deformities (2, 86, 105).

In this weakened setting, mechanical stresses, which are common, appear as factors predisposing to deformity. These are anatomic or functional factors of congenital or acquired origin. They are situated not only in the feet (morphotype of the forefoot, more or less marked pronation of the hindfoot), but also at the hips and knees (genu valgum, fixed flexion of the knee) (2, 86, 105).

Other factors promote and aggravate the deformities. The footwear may either stress the foot or fail to support it (wearing of slippers or worn-out shoes) (109). Weight-bearing is particularly harmful during inflammatory crises.

The causes cited increase muscular imbalance, between the flexor and extensor muscles and between the abductor and adductor muscles. Not only are the intrinsic muscles affected (lumbricals, interossei, extensor digitorum brevis) but also the extrinsic muscles, whose eccentric action gives rise to deformity (105, 112). Ordinary movements, particularly intense activity, accentuate the imbalance of forces. Some authors minimize the role of this muscular imbalance which is difficult to study during walking (85). Thus, inflammatory rheumatism make certain deformations appear, or worsen them when previously these deformities had been prevented by healthy supporting structures. The mechanism of deformation, if understood, enables us to envisage treatment programmes better.

**Hindfoot deformities**

**Pes planovalgus** is the commonest deformity of the rheumatoid hindfoot. Its causes are varied and complex. Even the minimal calcaneal valgus, which is present beforehand and which is usual in the general population, is a predisposing factor in the great majority of cases. The inflammatory disease impairs the structures which stabilize the subtalar joint complex and the valgus deformity appears as a result of lesions of the supporting soft tissues (63, 105, 108, 109). Other causes exist but are often more difficult to distinguish (see below).

Several disease sites promote this tendency: the tarsus and especially the medial articular chain of the foot; the talonavicular and subtalar joints, which are more subject to mechanical stress, are the most frequently affected (14, 24, 109). Tillmann emphasizes the role of tarsometatarsal arthritis which is also frequently observed by Resnick (87, 105). The increased susceptibility to torque accentuates the tendency to valgus deformity (or sometimes varus, if there was prior varus) (1, 96, 99, 102, 109, 111). On the whole, the flat-foot is initially flexible, and then becomes rigid. This secondary rigidity of the deformity is due to the consequences of tarsal arthritis