

## ULTRASTRUCTURE OF MICROCIRCULATION OF ARTICULAR CARTILAGE IN RHEUMATOID ARTHRITIS

V. A. Dulyapin

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The interstitial microcirculation of avascular articular cartilage is considered to be a process of diffusion of dialyzate of synovial fluid along layers of ground substance contained between collagen fibers [2]. No morphologically distinct signs of metabolism have been found. On electron-microscopic investigation of one of five biopsy specimens

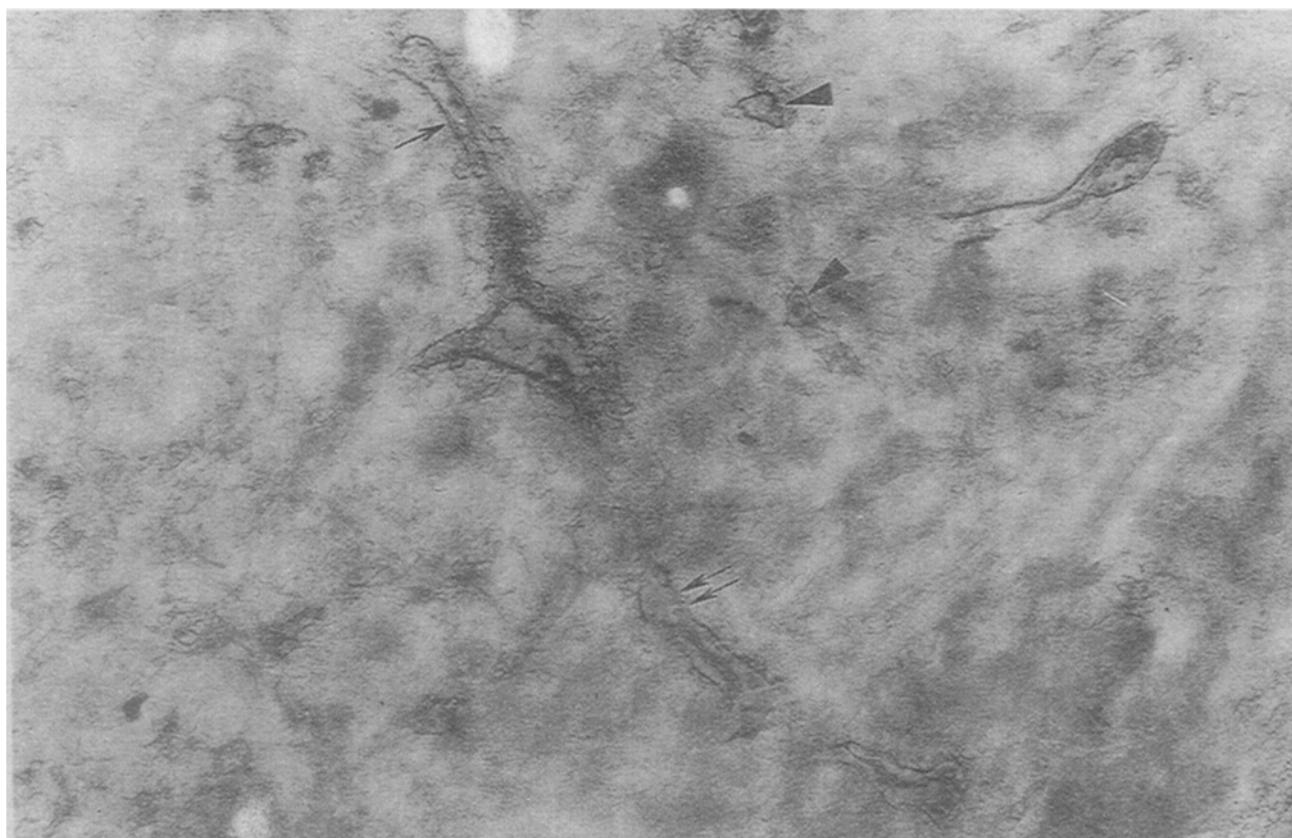


Fig. 1. Ultrachannels in homogenized cartilaginous matrix of patient with rheumatoid arthritis, formation of double limiting membrane ( $\uparrow$ ), evagination into lumen of UC ( $\uparrow\uparrow$ ), with osmiophilic pale contents ( $\blacktriangle$ ) 20,000 $\times$ .

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Fig. 2. Ultrachannels arising from cartilaginous lacunae in zone of necrosis of chondrocytes: straight ( $\uparrow$ ), twisted ( $\uparrow\uparrow$ ); 10,000  $\times$ .

of articular cartilage (the tissue was not decalcified) from a patient with rheumatoid arthritis we found unique structures not previously detected during the study of unchanged articular cartilage [1], and to which we gave the name of "ultrachannels" (UC) (Fig. 1). The walls of UC are lined by osmiophilic single membranes. For a short distance there were possible traces of formation of a double membrane or of infrequent short, thin evaginations of "microvilli" on the inner membrane. The internal contents in some areas were osmiophilic: homogeneous — granular, more frequently electron-translucent. The tubules penetrate into the matrix in all directions, and for that reason they appear to be interrupted on sections, so that it is impossible to form any direct idea of their maximal extent in the interterritorial matrix. In transverse sections they appear as vacuoles — pale or with osmiophilic contents. Their diameter varies, and may correspond to the diameter of the large collagen fibers found in less altered areas. It can be confidently stated that UC in the matrix in the zone of cartilage cells are not an accidental artefact in the interterritorial zone of cartilage (Fig. 2). They arise from lacunae of chondrocytes that have undergone necrosis (Fig. 2). Consequently, their total area may be considerable. Spreading out from the lacunae in a radial direction, the UC may be straight, forming osmiophilic thickenings with smaller branches along their path, or they may be twisted.

In some sections it was possible to see interlacunar UC (Fig. 3), connecting in this particular case a lacuna in which a chondrocyte has undergone vacuolar destruction, with a lacuna filled with numerous very slender fibrils (Fig. 2), and with osmiophilic residual bodies. The only possible source of the intralacunar fibrils is altered cartilage cells. The presence of clumps of very thin fibrils at the site of a necrotic chondrocyte ("skeleton") essentially prevents collapse of the lacunae and catastrophic destruction of the cartilage in rheumatoid arthritis. Under pathological conditions,

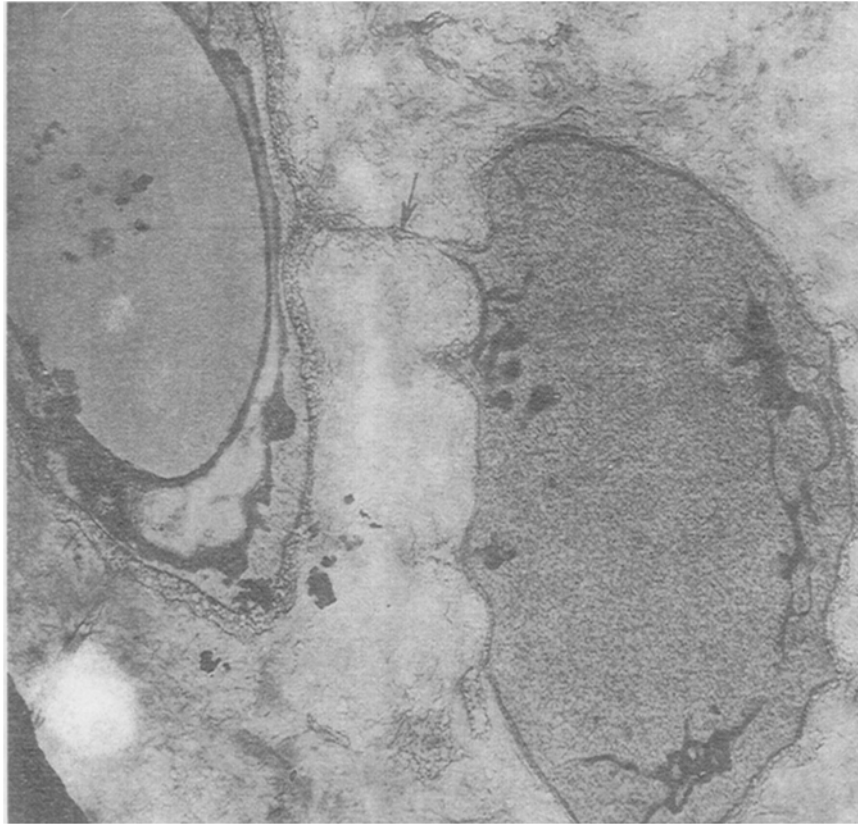


Fig. 3. Intralacunar UC (↑); 50,000 ×.

the oriented microcirculation in cartilage tissue may evidently be effected through the manifestation of normally hidden UC.

#### LITERATURE CITED

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