Early disruption of the brain-immune system-joint communication and adrenal insufficiency during experimental arthritis in rats

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Zielsetzung
Disruption of brain-immune system-joint communication (BISJC disruption) has been demonstrated in rheumatoid arthritis. In this study, BISJC was experimentally disrupted in rats before immunization and the influence on collagen type II arthritis (CIA) was studied. It was also part of this project to analyze the behavior of adrenal cortex because one feature of BISJC disruption is inadequate corticosterone secretion.

Methodik
Arthritis was induced in rats by injection of collagen type II in incomplete Freund’s adjuvant. Noradrenergic and serotonergic neurons in the brain were depleted with 6-hydroxydopamine and 5,7-dihydroxytryptamine fourteen days before immunization. Plasma corticosterone was evaluated by RIA, adrenal cholesterol was quantitatively studied by Sudan-III staining, scavenger receptor class BI (SR-BI) by immunohistochemistry, and joint innervation by immunofluorescence.

Ergebnisse
Depletion of hypothalamic noradrenergic neurons had anti-inflammatory effects during a short time window between day 15 and day 24, which is interpreted as a progressive BISJC disruption during this period. Interestingly, serotonin depletion demonstrated a longer lasting anti-inflammatory effect. Both initially increased plasma corticosterone levels and SR-BI expression in the adrenal cortex were reduced to baseline or lower levels in the later phase of arthritis (day 28 onwards). Cholesterol in the adrenal cortex was only slightly increased at the start of overt arthritis and remained stable. Sympathetic nerve fibers in the joint area were rapidly diminished already on day 28.

Schlussfolgerung
This study demonstrated that BISJC disruption happens shortly after the manifestation of symptomatic disease between day 15 and day 28. Disruption is visible in form of adrenal insufficiency and loss of sympathetic nerve fibers in the joint.