Degenerative Changes in Knee Joints and Joint Pain in Surgically and Chemically Induced Rat Models of Osteoarthritis

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Introduction
Several experimental animal models have been developed for human osteoarthritis (OA) and used to study the preclinical efficacy of disease and symptom modifying OA drugs in candidates in various species.1,2,3 In these studies, the preclinical efficacy has been determined by various microscopic scoring systems and joint pain assessments. Recently, the histopathology initiative of Osteoarthritis Research Society International (OARSI) has presented recommendations for histological OA assessment in different species in order to standardize preclinical efficacy studies. In this study, we performed a systematic histological characterization of knee joints in rat OA models by OARSI rat scoring system and assessed pain in their knee joints.1,2

Aim of the Study
The objective of this study was to characterize OA changes by OARSI rat scoring system and to assess pain in knee joints in four rat OA models. The models were induced by intra-articular monoiodoacetate (MIA) injection and by the following surgical operations: anterior cruciate ligament transection (ACLT); ACLT combined with partial meniscal excision (ACLT+MIA); and meniscal meniscal tear combined with collateral collateral ligament transection (MMT+MALT).

Materials and Methods
Animal experimental: The study was conducted using male rats (Lafayette, weight range 210 to 240 grams). All animals were housed in an environment with a 12-h light/dark cycle and temperature 22±2°C; relative humidity 55±5%. Male Sprague-Dawley rats were purchased from Taconic Laboratories (New York, USA). Food and water were available ad libitum. All animal care was in accordance with the Animal Welfare Act and the Guide for the Care and Use of Laboratory Animals,8th edition, published by the National Institutes of Health. The study was approved by the Local Animal Ethics Committee of the University of Turku, Finland.

Histological assessment: OA changes in knee joints were determined following the histological assessment methods presented by the OARSI initiative.6 The following parameters were assessed: cartilage degeneration width (mm); articular cartilage surface (mm²); synovial membrane inflammation and synovial thickness (mm); meniscal tear, meniscal degeneration and meniscal tears and synovial thickness (mm); and periarticular bone

Study Design

Figure 1.

Rat MIA Model

Rat MIA + pMMx Model

Rat ACLT Model

Study Design

Body Weight

Joint Pain

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

References