Knee laxity after staircase exercise predicts radiographic disease progression in medial compartment knee osteoarthritis: an eight-year prospective observation

**Introduction:** Osteoarthritis (OA) of the knee is one of the major causes of joint dysfunction and physically disabling conditions in the elderly [1]. Joint laxity is considered one of the major factors involved in the progression as well as development of knee OA. Our group reported the increase of knee joint laxity after stair up down exercise in knee OA patients [2]. And we considered the knee joint laxity after exercise influences the progression of knee OA. The purpose of this study was to evaluate whether the knee joint laxity after staircase climbing produces the knee joint OA progression or not.

**Materials and Methods:** During 2001-2003, 84 participants with primary bilateral medial compartment knee joint OA managed at our Orthopaedic Unit were enrolled in this prospective study. Baseline data were collected by BMI, muscle power, joint space width, radiograph, mechanical axis on standing radiograph, antero-posterior (A-P) knee laxity before and after physical exercise. At the 8-year follow-up, all participants were again examined to assess radiographic changes (Fig 1). Radiographic disease progression was defined as more than one grade progression of Kellgren and Lawrence grade, or more than 0.1 mm decrease of the knee joint cartilage a year.

**Results:** Patients were divided into two groups based on radiographic outcome after 8-year follow-up. 46 subjects showed radiographic disease progression while no progression was seen in 38 subjects. Table 2 shows the clinical and demographic data of these subjects at the entry of the study. The proportion of men and women and the number of patients with each radiographic scale (K/L grade and joint space narrowing grade) were similar in two groups. However, there were some significant differences at entry between two groups. In the group with radiographic progression, body mass index was significant higher (p=0.04) and total change in A-P knee laxity before and after staircase exercise was more larger (p=0.05) and joint space width at the time of 8-year follow-up was significant narrower (p=0.002) than in the group without progression. Age, quadriceps muscle strength, mechanical axis, joint space width, A-P knee laxity before exercise at baseline were not statistically different between two groups. To compare the predictive value for radiographic progression, the cut off point of each baseline variable was determined using a receiver operating characteristic curve analysis (Fig 2). Logistic regression analysis was performed with radiographic disease progression as the dependent variable. Eight independent variables were entered into the analysis (age, gender, body mass index, quadriceps muscle strength, mechanical axis, joint space width, A-P knee laxity, total changes in A-P knee laxity). Of these, the variables found to be significant were total change in A-P knee laxity (before/after exercise) (p=0.046) and body mass index (p=0.018). The risk of progression of knee OA increased 4.15 times with a 1 mm increase in total changes of A-P knee laxity after exercise, and 1.24 times with one point increase in BMI. Considered all together, the results suggest that large changes in A-P knee laxity after staircase exercise, and BMI reflect the progression of the OA disease process. In our study, knee laxity before exercise was not significant different between OA progression group and without OA progression group, but total change in A-P knee laxity after staircase climbing exercise had significant correlation with OA progression. In daily life, knee joint was continued moving (e.g. squatting, walking, standing, climbing stairs etc) and knee OA was progression through knee movement. When evaluate the knee OA progression, it was important to evaluate the knee joint kinematics and state and stability through the activities. In this study we measured knee laxity just after staircase climbing to evaluate the similar condition of the daily activities.

**Significance:** Our results suggest the development of knee laxity during repetitive physical exercise and BMI play a significant role in the etiology and progression of knee OA.

**References:**

**Fig. 1.** Knee examination and staircase climbing exercise protocol

**Fig. 2.** Receiver operating characteristic curves of the baseline BMI, A-P knee laxity, Δ change knee laxity, muscle power, mechanical axis, and joint space width for discriminating radiographic disease progression in medial compartment knee osteoarthritis

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