**SUBSTANTIAL SUPERIORITY OF SEMI-FLEXED (MTP) IN KNEE OA: COMPARATIVE RADIOGRAPHIC STUDY, WITHOUT FLUOROSCOPY, OF EXTENDED, MTP AND TUNNEL VIEWS**

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**Introduction** Joint space narrowing is considered the most reliable marker for assessing osteoarthritis (OA) progression (1) and its assessment over years is the primary criterion in drug trials (2). Conventional radiographs of the tibio-femoral joint have been the principal method for its evaluation. The Osteoarthritis Research Society guidelines (3) recommend radiographic procedures requiring the use of specialized fluoroscopic techniques for precise joint positioning with respect to x-ray beam alignment. Further reliable methods for measuring a metal ball to determine radiographic magnification were needed. Such facilities are not universally available restricting these x-ray techniques to specialists. To overcome these limitations, using only a standard x-ray tube and film-screen system, we have determined which of 3 simple radiographic methods could provide reproducible positioning for the joint and precise joint space width (JSW) measurement in the medial tibio-femoral compartment, necessary for quantitative JSW assessment in Structure Modifying Osteoarthritis Drug (SMOAD) trials.

**Methods** 74 patients [women 59: men 15] had a mean [95%CI] age 65.7 [63.3, 68.0] yrs and median disease duration 10.2 [7.3, 13.5] yrs with knee pain, JSW loss and/or osteophyte were recruited with the study knee having a tibial femorofemal JSW ≤ 2 mm. The 3 radiographic views were: 1) antero-posterior standing extended knee (SEK) view, x-ray beam horizontal, back of knees in contact with film cassette; 2) posteroanterior standing tunnel (TUN) or schuss view, weight-bearing, both knees flexed ~20°, knees in contact with film cassette and 1st toe-tip in line with front of cassette, x-ray beam angled 5° downward; 3) postero-anterior standing semi-flexed (MTP) view, knees flexed ~7°, front of knees in contact with film cassette, 1st MTP metatarsalphalangeal joint in line with front of cassette, x-ray beam horizontal [Fig.1]. For all 3 views accuracy in the radioanatomic positioning of the tibio-femoral compartment with respect to x-ray beam alignment [ie degree to which the anterior and posterior tibial plateau rims were superimposed] was determined from the difference in height measured between the rims of the medial tibial plateau. Reproducibility in joint repositioning was determined from the difference between 2 examinations repeated within 2 hrs. For all 3 views computerized minimum JSW measurements (5) were obtained at the medial compartment of all knees and reproducibility in JSW was determined from the difference between 2 repeat examinations.

**Results** The median [95%CI] mean difference between the anterior and posterior rims in the medial tibial compartment was 3.05 [2.35, 4.04]mm in MTP, 5.01 [4.03, 6.58]mm in TUN and 6.88 [7.62, 10.03]mm in SEK views. Thus with respect to x-ray beam alignment knees in the MTP view were significantly more accurately positioned [P< 0.0005] than in the TUN which was better [P< 0.014] than in the SEK view. For reproducibility in joint repositioning, the median [95%CI] for intra-patient variability was 0.69 [0.42, 0.74]mm in MTP, 0.89 [0.75, 1.33]mm in SEK and 1.44 [1.37, 1.65]mm in TUN views. Thus joint repositioning was significantly more reproducible in the MTP (P< 0.0001) than in the SEK which was better (P< 0.013) than in the TUN position. For reproducibility in JSW measurement the median [95%CI] for coefficient of variation was 1.58 [1.29, 2.07]% in MTP, 2.31 [1.80, 3.18]% in TUN and 3.72 [2.0, 5.09]% in SEK views. Thus JSW measurement was significantly more reproducible in the MTP (P= 0.014) than both TUN and SEK positions, which were not significantly different from each other.

**Discussion** The MTP view of OA knees with the joint radiographed in a semi-flexed position permits reproducible radioanatomical repositioning of the joint as well as reproducible JSW measurement. The results for this knee view were significantly better than for those obtained with the same knees radiographed in either the standing fully extended position or in the tunnel / schuss view of the knee. The advantage of the MTP view is that it employs simple radiographic procedures applicable wherever there is a standard radiographic facility. This represents for the radiographers/x-ray technicians a considerable advantage over existing methods, recommended by clinical trial guidelines (3), employing more advanced imaging techniques of fluoroscopy and magnification correction. Reproducibly repositioning the joint radioanatomically, relative to the x-ray beam, affects the reproducibility of JSW measurements required in SMOAD trials. With the alignment of the medial tibial plateau with the central ray of the x-ray beam, such that the anterior and posterior plateau rims appear superimposed, the JSW measurement is taken in the tibio-femoral compartment’s central or mid-coronal plane from the tibial floor to femoral condyle [Fig.2]. Most knees were in this position in the MTP view. Patients were able to reposition their knees far more reproducibly in this view; it was least reproducible in the TUN view due to joint laxity and patient’s discomfort. Using the MTP method significantly fewer knees would be required to detect significant JSW changes in a structure modifying drug trial compared to the schuss and the extended knee positions.


**Fig 1. Shows the position of the knee in the MTP view**

**Fig 2. Diagram of plane of JSW measurement in the MTP view which corresponds with the region of load transmission (arrowheads).**

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