

Editorial Commentary: Early Postoperative Knee Joint Space Width Change Is Attributable to Change in the Joint Line Convergence Angle After High Tibial Osteotomy and May Not Reflect Cartilage Regeneration



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Abstract: Realignment of the weightbearing axis by high tibial osteotomy (HTO) can alter the forces acting on the articular cartilage within the knee, reducing the load on the medial compartment. This unloading effect is thought to allow the repair of the articular cartilage of the affected compartment. It is important to evaluate the serial changes of joint space width (JSW) after HTO for assessing the state of the cartilage and the unloading effect by HTO. However, early postoperative knee JSW change is attributable to change in the joint line convergence angle after HTO and may not reflect cartilage regeneration. In addition, the soft tissue laxity of the knee and changes in joint line convergence angle after HTO should be considered for assessing these early postoperative JSW changes.

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Realignment of the weightbearing axis by high tibial osteotomy (HTO) can alter the forces acting on the articular cartilage within the knee, reducing the load on the medial compartment. This unloading effect is thought to allow the repair of the articular cartilage or arrest further cartilage degeneration.^{1,2} The joint space width (JSW) on radiographs is an indirect indicator of the joint cartilage stage.³ However, very few studies have analyzed the serial changes in the JSW after HTO.^{3,4}

The study “Joint Space Width Increases Medially and Decreases Laterally at Different Time Points After Medial Open-Wedge High Tibial Osteotomy” by Lee, Bin, Kim, Lee, Suh, and Song⁵ retrospectively assessed the serial changes in the JSW of the medial and lateral compartments after open-wedge high tibial osteotomy (OWHTO) and its associated factors. In this study, the authors examined 71 knees and concluded that medial JSW increased 3 months postoperatively, and the

lateral JSW decreased immediately after OWHTO. Furthermore, the preoperative and postoperative joint line convergence angle (JLCA) and the medial femur and tibial cartilage grades were associated with changes in the medial JSW. It has been reported that the increased medial JSW after HTO can be explained either by the formation of the repaired cartilage or by the mechanical effect of transferring the weightbearing alignment of the limb to the lateral compartment or combination of both.⁴ In the present study, authors surmised that the increased medial JSW was caused by changes in the intra-articular pressure, which resulted from the recovery of the medial compartment cartilage after translation of the weightbearing alignment of the limb to the lateral compartment and from the tension effects of the soft tissue following changes in the JLCA. However, does this early postoperative change of the medial JSW indicate cartilage regeneration? I think that this could indicate only the change in the JLCA after OWHTO, not the cartilage regeneration. One of the recent topics in HTO is that lower limb alignment is affected by soft tissue balance, as well as the bony correction angle. Therefore, there have been many studies regarding the change in the JLCA after OWHTO.⁶⁻⁹ Preoperative large JLCA, the degree of varus alignment, and preoperative osteoarthritis grade

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have been reported as the factors associated with the change in the JLCA after OWHTO,⁹ consistent with the factors influencing the changes of medial JSW in this study. Therefore, I think that this early postoperative JSW change is attributable to the change in the JLCA after OWHTO.

In this study, the medial JSW increased 3 months postoperatively and the lateral JSW decreased immediately after OWHTO. However, the authors did not clarify why the medial and lateral JSW changes occurred at different time points after the surgery. Kumagai et al.⁹ evaluated the serial changes in the JLCA after OWHTO and reported that the JLCA changed 2 days postoperatively, indicating increased medial JSW and decreased lateral JSW. Therefore, I believe that the change in the medial and lateral JSW occurs at the same time after OWHTO. The change of the lateral JSW was only 0.5 mm in the present study; this may have been a measurement error in the radiograph. In addition, the accuracy of the postoperative weightbearing radiograph is questionable. According to their reports, weightbearing was gradually introduced from toe touching during the first 2 weeks to full weightbearing at 6 to 8 weeks postoperatively. Therefore, the loading condition of the knee in the postoperative radiograph taken within 2 weeks was not constant in this study, which may affect the changes of the JSW. Moreover, based on their results of decreased lateral JSW after OWHTO, the authors mentioned the possibility of overloading the lateral compartment and the progression of cartilage degeneration. However, they did not directly evaluate the status of the joint cartilage with second-look arthroscopy or magnetic resonance imaging (MRI). I believe that this early postoperative lateral JSW change is attributable to the JLCA change after HTO, not indicating the overloading of the lateral compartment. Ziegler et al.¹⁰ reported that OWHTO does not cause significant macroscopic and microscopic articular cartilage changes in the lateral compartment even during overcorrection (9.5° of valgus) in the animal study on adult sheep. In addition, we have reported that shifting the weightbearing line to the lateral compartment did not increase the postoperative bone tracer uptake after OWHTO using quantitative bone scintigraphy.¹

It is important to evaluate the serial changes in the JSW after OWHTO for assessing the state of the cartilage and unloading effect by HTO. However, early postoperative knee JSW change is attributable to change in the JLCA after HTO and may not reflect cartilage regeneration. In addition, the soft tissue laxity

of the knee and changes in JLCA after HTO should be considered for assessing these early postoperative JSW changes. I expect further long-term follow-up studies that evaluate the state of the cartilage using MRI in addition to radiographs and determine whether medial JSW improvement is a predictor of long-term clinical success in OWHTO.

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