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Is the Navigation System Accurate Enough to Predict The Correction Angle During a High Tibial Osteotomy?

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Summary:

There is no discrepancy between the change of mechanical axis angle by navigation system and the bony correction angle by 3D-CT scan. But there is a discrepancy between the result of navigation and correction angle in standing X-ray.

Abstract:

Background:

During navigation assisted high tibial osteotomy (HTO) surgery, we sometimes encounter an unpredicted overcorrection of the mechanical axis, even under the guidance of the navigation system. It is not clear whether the erroneous overcorrection stems from the navigation system itself or from other causes.

Purpose:

The aim of this study was to clarify whether the origin of the discrepancy of the correction angle comes from the navigation system itself or from other possible causes. This study compared the change of the femoro-tibial angle provided by the navigation system with the bony correction angle of the proximal tibia by 3D-CT scan/change of mechanical femoro-tibial alignment by standing whole leg X-ray.

Study Design:

Cross-sectional study

Method:

In total, sixteen knees underwent navigation assisted HTO, and their alignment data was obtained at pre- and postcorrection. For comparison, pre-operative and follow-up whole lower extremity antero-posterior radiographs in standing, lateral knee radiographs, and pre- and post-operative 3D-CT were taken. The medial proximal tibial angle (MPTA), posterior tibial slope, and mechanical femoro-tibial angle (mFTA) were measured in these images. The 3 coronal and 3 sagittal correction angles were compared to each other.

Results:

In the coronal plane, the mean correction angle of the navigation system was valgus $9.3^{\circ}\pm2.0$ (range 6-13), and the mean MPTA of the 3D-CT increased $9.7^{\circ}\pm2.0$ (range 6.7-13.8) after correction. The mean correction angle of the mFTA in the standing radiograph was valgus $11.9^{\circ}\pm3.2$ (range 6.9-16.5). There was no statistical significance between the navigation and 3D-CT (p=0.187), but there was a statistically significant difference between the navigation and standing radiograph (p=0.001). Furthermore, the results of the correction angle in the sagittal plane were similar to those in the coronal plane.



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Conclusion:

The correction of the femoro-tibial angle by the navigation system was not different from the bony correction angle by the 3D-CT scan. There was a discrepancy between the correction angle of the navigation system and that of the standing X-ray.