

## Effect of Personalized Wrist Orthosis for Wrist Pain with 3D Scanning and Printing Technique.

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### Objective

Use of video display terminals (VDT) are increasing every year and it is linked with increasing likelihood of work-related musculoskeletal disorders (WMSDs). Wrist pain, one of the WMSDs, is caused by overuse and treated with wearing of a wrist orthosis. Mass produced, ready-made orthoses are of lower quality and are bulky, and uncomfortable to wear compared to custom-made wrist orthoses. However, custom-made wrist orthoses are more expensive than ready-made and take a long time to produce. Three-dimensional (3D) printer technology can overcome these problems by producing personalized medical products with low cost and reduced time. In this study we developed a personalized wrist orthosis using a 3D scanner and 3D printer for patients with wrist pain and compared its efficacy with ready-made conventional wrist orthosis.

### Methods

Twenty-two patients with wrist pain were randomly assigned to the control and experimental groups. The control group wore a ready-made cock-up orthosis and the experimental group wore a 3D printed wrist orthosis for one week. The Patient Rated Wrist Evaluation (PRWE), Jebsen Hand Function Test (JHFT), and Orthotics and Prosthetics User Survey (OPUS) were checked before and one week after the application. A Mann-Whitney U test was performed to analyze the difference in the continuous variables between the control and experimental groups and a chi-square test for the categorical and ordinal scale variables.

### Results

The PRWE showed significant pain relief in both groups. The experimental group spent significantly more time wearing the device than the control group. Two items of the 28 OPUS questions, 'Put toothpaste on brush and brush teeth' and 'Dial a touch tone phone', showed high satisfaction scores, with statistically significant difference in the experimental group (P=0.036 and 0.004).

### Conclusions

The 3D printed wrist orthosis was superior to the cock-up orthosis for two items of the OPUS. Higher user satisfaction was observed in the group with the 3D printed wrist orthosis and showed longer wearing time. Moreover, the 3D printed wrist orthosis was as effective as ready-made orthosis in relieving wrist pain. Considering the same cost and efficacy of the 3D printed wrist orthosis as the conventional wrist orthosis, our study shows the possibility of 3D printed wrist orthosis as a substitute for conventional ready-made wrist orthoses for patients with wrist pain.

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