The Effect of Angulation Sensors on Implant Placement

Brian Goodacre, DDS, Jason Mashni, DDS, John Yankee, DDS, Charles Goodacre, DDS, MSD, Jaime Lozada, DDS, John Won, DDS, MS

Purpose: To determine if the use of an angulation sensor could improve alignment accuracy when placing multiple dental implants.

Introduction: Accuracy in implant placement is crucial for the biomechanical and esthetic success of dental implants. One method of improving alignment accuracy has been the use of guided surgical templates, but they are costly and time consuming to plan and design.

Method: Twenty dental students in their third year of training and five experienced clinicians were involved in the study. Each participant completed a survey and perceptual ability test (PAT) scores were obtained for the student participants. Each individual created four osteotomies in a simulated mandible with and without the computer assisted angulation sensor. The difference in angulation of the osteotomies between the two groups was analyzed using cone beam computed tomography (CBCT) scans and 3D analysis software.

Results: Without the sensor, five students drilled at least one osteotomy that varied from the guide pin by more than 10 degrees with a maximum deviation from the guide pin of 13.5 degrees. With the sensor, only one student produced an osteotomy that varied from the guide pin by more than 10 degrees. The average error with the sensor was 4.1 degrees, and 62.5% of students showed improved accuracy when using the sensor-guided handpiece. Experienced clinicians did not show a significant difference in angulation with or without the use of the sensor. No statistical correlations were found between angulation accuracy and PAT scores. According to the survey, students reported improved confidence, while experienced faculty reported decreased confidence levels with the use of the sensor.

Conclusion: When using the angulation sensor, most students improved their accuracy when aligning multiple implant osteotomies. Experienced clinicians did not receive substantial benefit from using the sensor-guided handpiece.