Implant impressions: The ultimate challenge for intraoral scanners

ALBERTO ALVAREZ GARCIA-PUMARINO, 3M ESPE, MADRID, SPAIN

Dr. Beatriz Giménez González, ITI Scholar at the Academic Center for Dentistry Amsterdam (ACTA), the Netherlands, informs us about the actual state of development and future potential of intraoral scanners. With her recent research on intraoral scanners, she has won the IADR Arthur Frechette Award in Prosthodontics in 2014.

Dr. Giménez, why did you choose intraoral scanners as a research topic?

Intraoral scanners first caught my attention in 2009 when I was looking for suitable topics for my PhD research. I tested a device and was immediately amazed by the technology, its functioning and its enormous potential. Therefore, I decided to initiate several studies. The present one investigates the suitability of different intraoral scanners for full-arch implant impressions.

What is the clinical relevance of this study?

Taking an impression of a complete edentulous arch with several implants is probably the most challenging task for intraoral scanners. The distance between the abutments is comparatively large and with increasing space, more errors will occur due to the necessity of matching a greater number of partial scans. If a device succeeds in scanning this situation with high accuracy, it will be suitable for other indications as well.

Please describe the experimental setup.

We created a model with six implants and soft tissue. On top of each implant, we placed a cylindrical scan body (Createch Medical) made of PEEK. Implants nº 15 and nº 25 (FDI notation) were angulated around 30º to the mesial and distal respectively. Implant nº 12 was placed 2 mm and implant nº 22 4 mm subgingivally. The CMM (reference) values of the implant positions in the model were compared with the digital impressions.

What were the most important results?

Significant differences were found for the angle and distance errors for the six scanners analyzed. The 3M™ True Definition Scanner presented the smallest and most consistent distance and angle errors of all six scanners. Moreover, an accumulative error resulting from stitching through the full-arch scan was confirmed: The greatest variability (average three times higher) was found in the quadrant that was scanned last.

What is the significance of these results for the dental practitioner?

It is shown that the True Definition Scanner seems to be more suitable for challenging indications than the other devices tested. However, the obtained results have yet to be confirmed in vivo, where the conditions are clearly more challenging due to the influence of saliva and the mobility of the soft tissue. Therefore, we have initiated a clinical study at the ACTA, initial tests in patients show promising results.

Do you have any concluding remark?

Intraoral scanners are not only likely to replace conventional processes in the future, but they have the potential to transform dentistry into a more predictable discipline. In combination with other digital tools, they will allow us to visualize the result of a treatment before it begins and predict possible challenges of that treatment. I really look forward to exploring these opportunities in the near future!

CONTACT

Dr. Beatriz Giménez González
b.gimenez@acta.nl