



# **Intraoral scan accuracy of dental implants in the edentulous arch: Will a universal scan aid be beneficial?**

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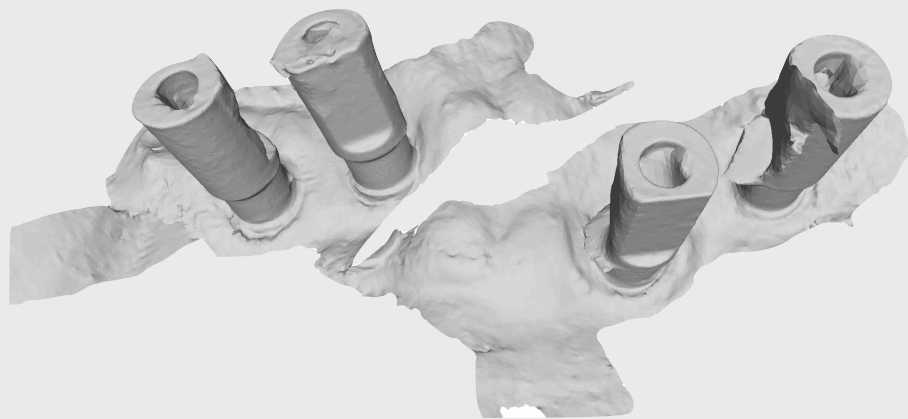
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## Introduction

### The challenge

- Wide range of scanning accuracy in vitro of implants in the edentulous arch: 31-344  $\mu\text{m}$ <sup>1</sup>
- Absence of surface morphology between the implant scan bodies challenges intraoral scanning devices<sup>2</sup>



Example of unacceptable scan due to incorrect stitching process

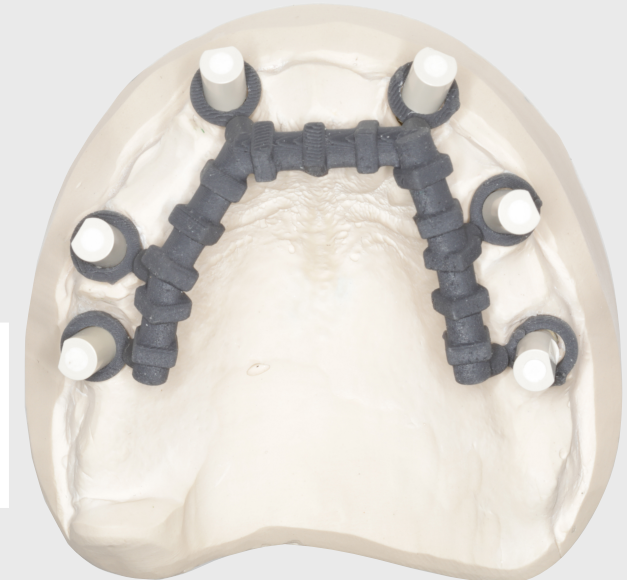
### The aim

To evaluate the scan accuracy *in vivo* using a newly developed scan aid on dental implants in the edentulous arch.

This novel scan aid fulfilling criteria such as simple handling, prefabrication and universal use operates as an “optical bridge” in between the implant scan bodies.



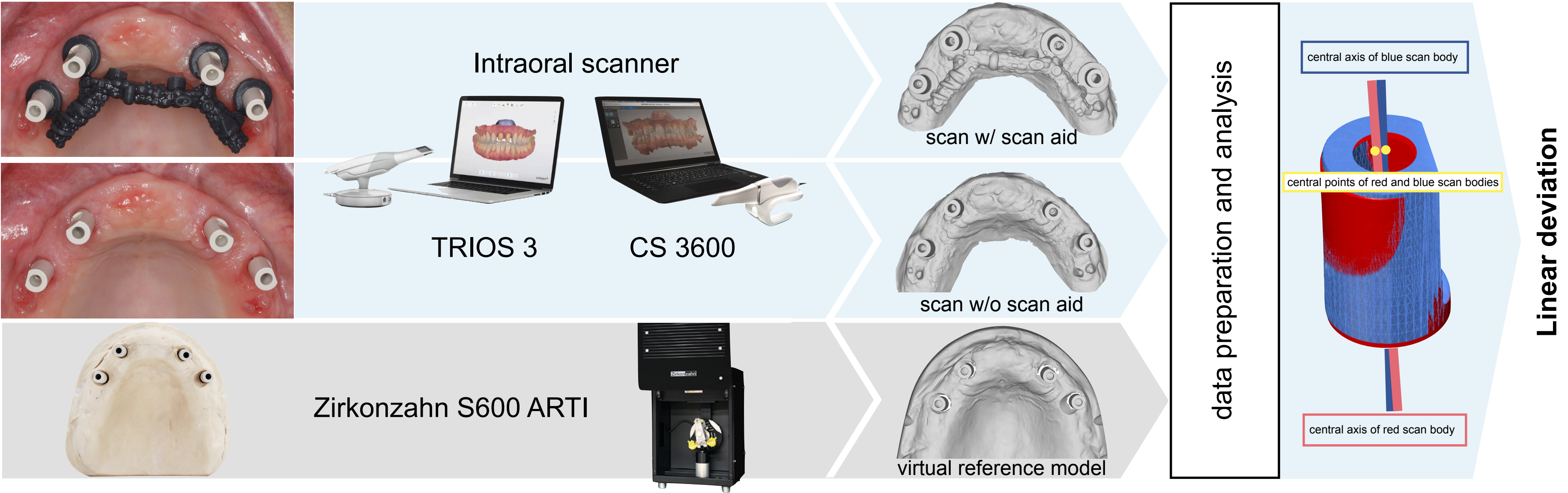
Previous *in vitro* evaluation of the scan aid published here



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## Materials & Methods





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## Results

### 176 intraoral scans in 22 patients with 87 implants

#### Scan Aid vs. No Scan Aid

Failure rate of registration of the scan body (ISB) by the software

|                     | failed registration of ISB |
|---------------------|----------------------------|
| CS3600 w/ scan aid  | 17%                        |
| CS3600 w/o scan aid | 30%                        |
| Trios3 w/ scan aid  | 4%                         |
| Trios3 w/o scan aid | 14%                        |

#### Manufacturer's scan body designs

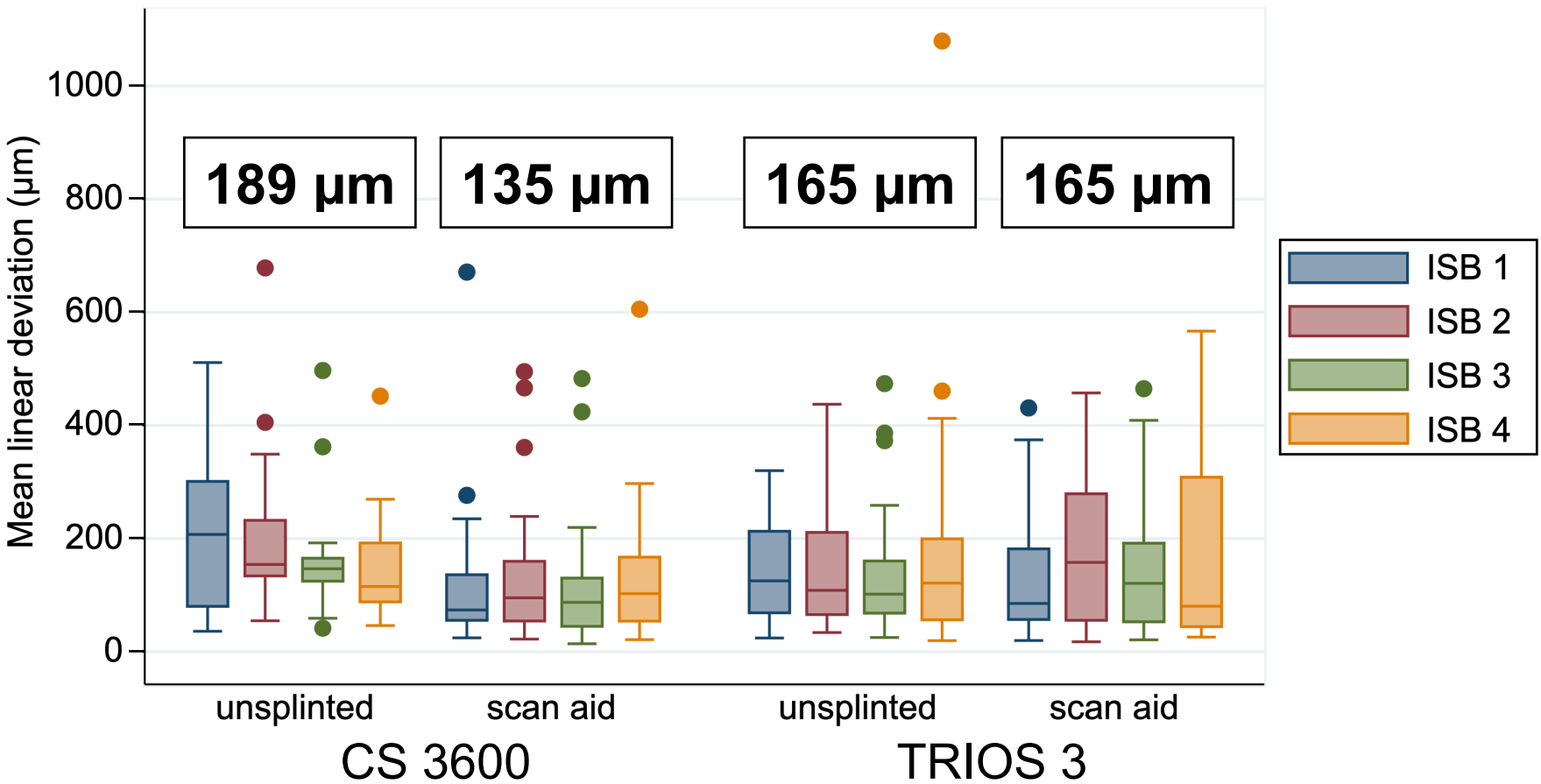
Failure rate of recognition of the scan body by the software

| implant manufacturer | scanned ISB | unrecognized scanbodies |
|----------------------|-------------|-------------------------|
| Camlog (ScrewLine)   | 600         | 119 (20%)               |
| SIC Invent (SiCace)  | 64          | 5 (8%)                  |
| Straumann (TL SP)    | 32          | 8 (25%)                 |

### Boxplot: Linear deviation of the scan aid compared to unsplinted scan bodies.

Each ISB is listed separately for both IOS systems (CS and TR).

Values in bold: Total mean linear deviation for each group.





## Conclusion

- The scan aid improved linear accuracy for the CS3600 (from 189 to 135  $\mu\text{m}$ ), but not for the TR group (165  $\mu\text{m}$ ).
- The linear accuracy is comparable to previous clinical studies.<sup>1</sup>
- Active triangulation (CS3600) vs. confocal microscopy (Trios3): It can be hypothesized that active triangulation, with its necessity to move around the object (scan body), is more prone to errors in the edentulous arch (when scanning with a limited depth of field highly located scan bodies and lower situated edentulous areas). In contrast, with its acquisition of multiple images from selected depths, confocal microscopy may cope better with the differences in height.<sup>2</sup>

## Clinical implication & Conclusion

- The scan aid improved the recognition of the scan bodies for both intraoral scanners.
- What level of accuracy is clinically needed in the edentulous arch? Is 100  $\mu\text{m}$  defined by Andriessen in 2014 sufficient? <sup>2</sup>