



Accuracy of Intraoral Camera Sleeves Based on Decontamination and Calibration

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Background

- ◆ Utilization of CAD/CAM technology in dentistry
 - ◆ Reduces cost by 30% for fabrication of final prosthesis
 - ◆ Mangano et al. 2016
 - ◆ Reduces working time by up to 90%
 - ◆ Flugge et al. 2013
 - ◆ Optical impressions are more comfortable
 - ◆ Gallardo et al. 2018

Background

◆ Replacement of traditional PVS impression



Background

◆ Intraoral Scanning (IOS) Device

- ◆ PrimeScan AC by Dentsply Sirona
- ◆ Market leading accuracy
 - ◆ Kim et al. 2021
 - ◆ Skramstad 2019
 - ◆ Zimmerman et al. 2020
 - ◆ Gurpinar and Tak 2020



Scanner Sleeves



- Multi-use steel with sapphire glass
- High-level disinfection
 - Dry-heat sterilization

Utilized 20 sleeves in study



- Single-use plastic with plastic window
- Disposable
 - Inexpensive

Utilized 10 sleeves in study



- Multi-use steel with plastic window
- Autoclavable sleeve
 - Single-use window

Utilized 10 windows in study

Rationale for Study

- ◆ No research has been published evaluating the accuracy of IOS devices, namely PrimeScan AC, under various decontamination protocols of the scanner sleeve
- ◆ No research has been published evaluating the influence of calibration status on the accuracy of the scanning device

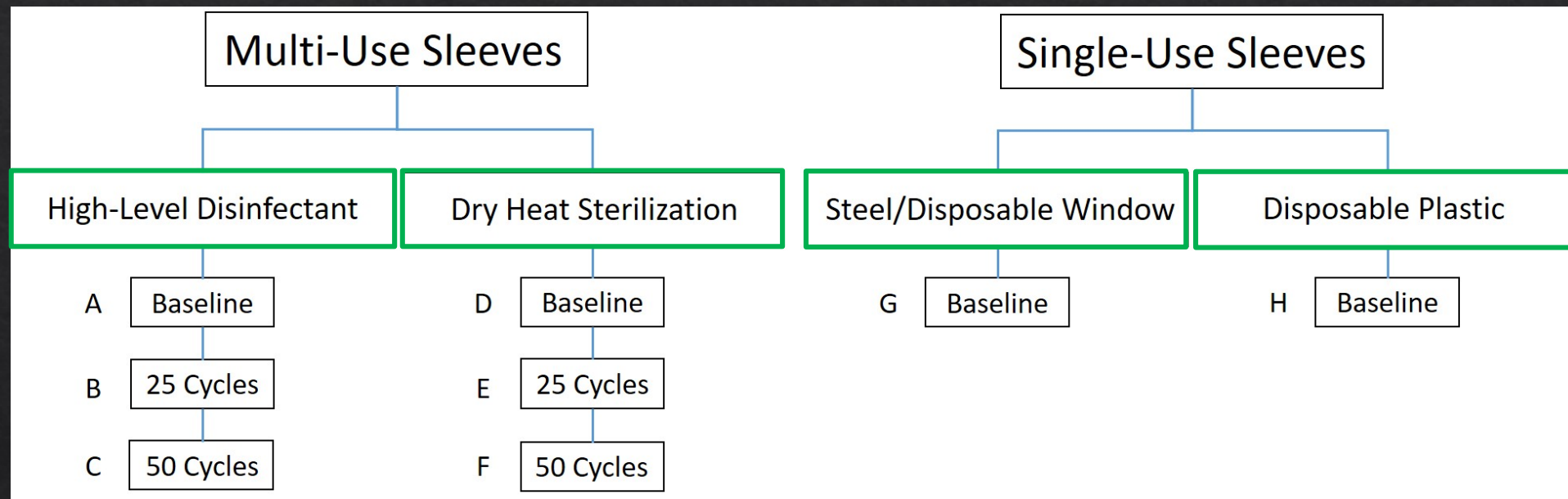
Objective

- ◆ The purpose of this study was to evaluate the effect of various decontamination protocols on the accuracy of the Primescan AC unit. This was accomplished using controls for calibration status of the Primescan AC unit.

Null Hypotheses

- ◇ There will be no difference in scanning accuracy between sleeves prior to decontamination
- ◇ There will be no difference in scanning accuracy between sleeves following multiple decontamination cycles
- ◇ There will be no difference in scanning accuracy between machines based on calibration status

Materials and Methods



Materials and Methods

- ◇ 40 camera sleeves
- ◇ Multi-use groups undergo various decontamination protocols
- ◇ PrimeScan AC units (calibrated and uncalibrated)
- ◇ COX Rapidheat Sterilizer
- ◇ Sirona HLD set, CIDEX OPA
- ◇ Custom arch of extracted teeth
- ◇ Sirona inEos X5 benchtop scanner



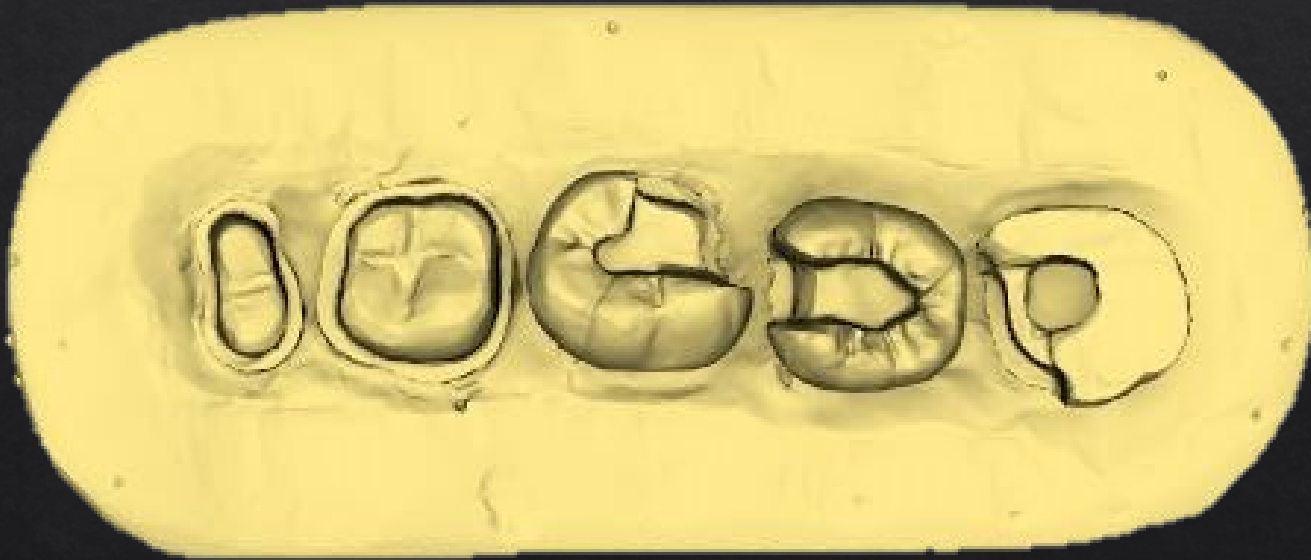
Materials and Methods

- ◆ Used benchtop scanner to create “baseline” STL model



Materials and Methods

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Materials and Methods

- ◆ Utilized PrimeScan AC unit to create optical impression with various sleeves
- ◆ One Primescan AC unit calibrated, one uncalibrated
- ◆ Generated STL files for 3-D linear analysis



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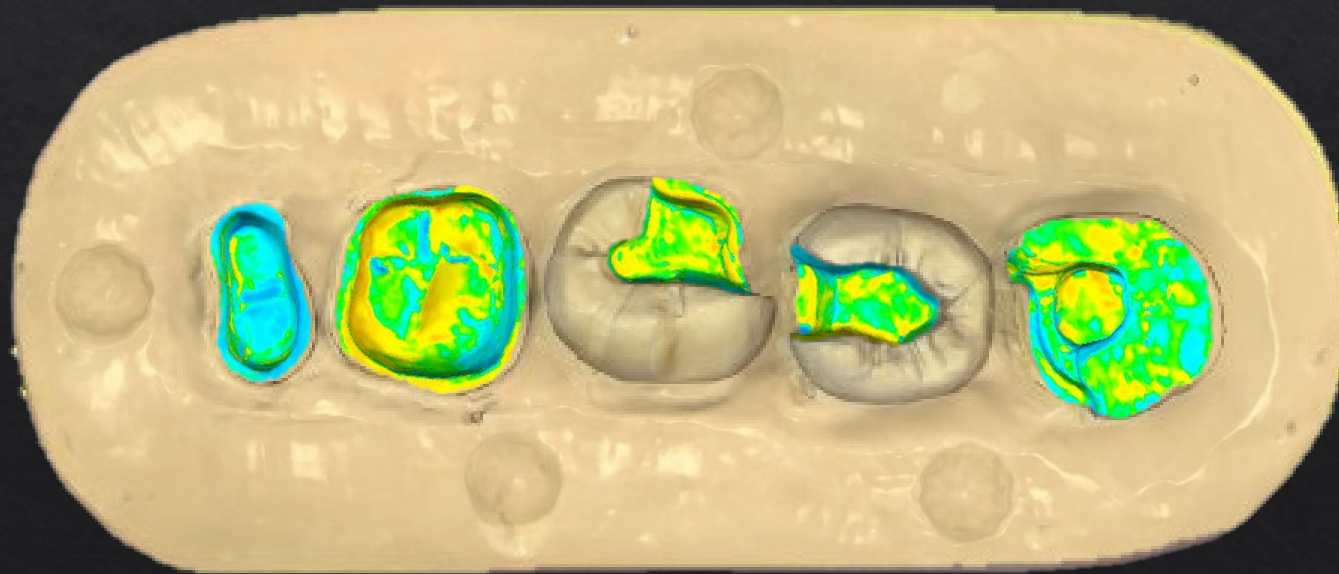
Materials and Methods

- ◆ Utilized each sleeve in each scanning set to fabricate optical impression
- ◆ One Primescan AC unit calibrated, one uncalibrated
- ◆ Generated STL files for 3-D linear analysis

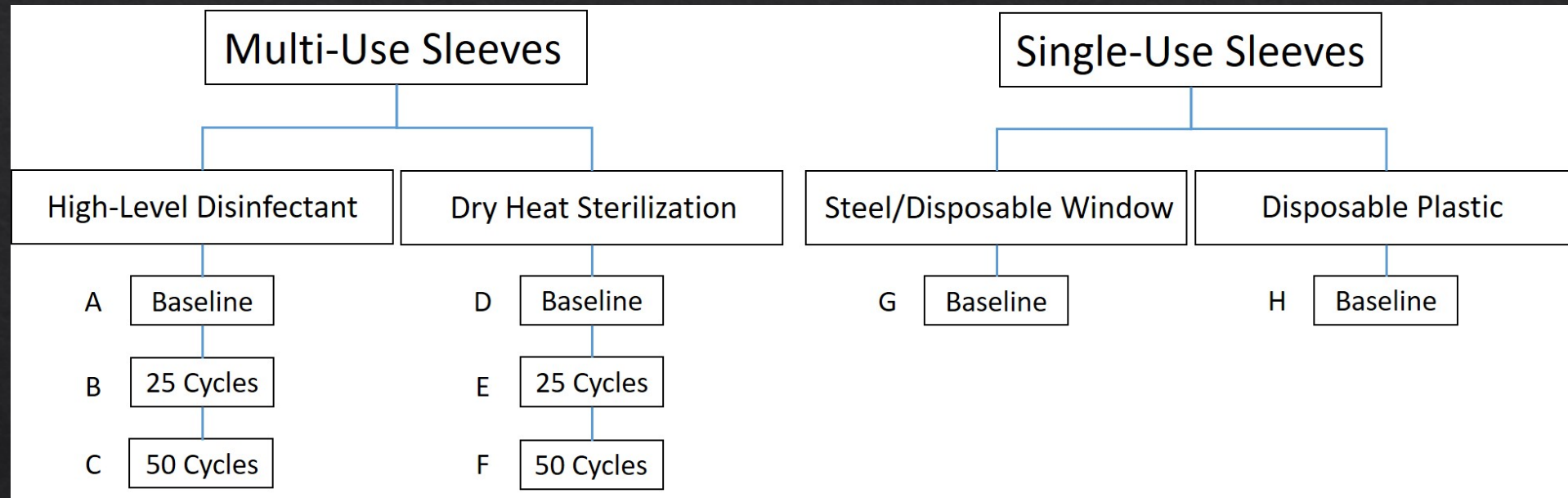


Materials and Methods

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Materials and Methods



10 samples per lettered group on a calibrated and uncalibrated unit
Total of 160 samples for comparison

Materials and Methods

- ◆ Dry-Heat Sterilization
 - ◆ Unwrapped
 - ◆ 190° Celsius for 6 minutes

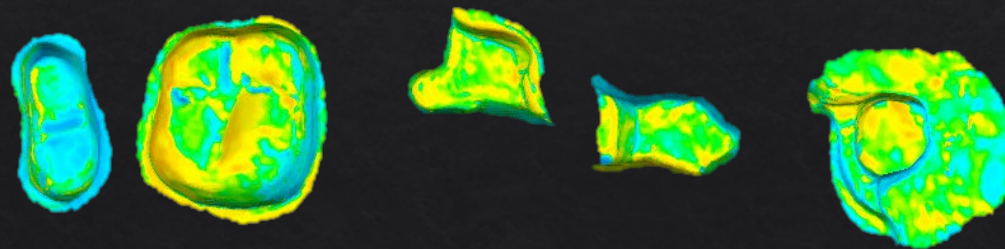


Materials and Methods

- ◇ High-Level Disinfectant
 - ◇ Utilized CIDEX[®] OPA for 12 minutes
 - ◇ Thorough rinsing for 30 seconds

Data Analysis

- ◆ STL files were layered using 3-dimensional best fit alignment method and 3-dimensional linear differences were calculated for each superimposition (GeoMagic 3D systems)
- ◆ Data were analyzed with a Shapiro-Wilk test and found not to be normally distributed. Data were subsequently evaluated with Kruskal-Wallis and Mann-Whitney U tests ($\alpha = 0.05$) using statistical analysis software (SPSS, Version 26, IBM)



Results

- ◆ No statistical difference was seen in median linear distance between any sleeve type, decontamination protocol or calibration status of the PrimeScan AC unit ($p>0.05$).

Group	Distance (microns) Median (IQR)
Stainless Steel	13.43 (17.80)
Dry Heat	14.00 (21.13)
High-Level Disinfectant	12.65 (7.66)
Calibrated	13.10 (17.89)
Uncalibrated	13.73 (17.78)
Autoclavable	11.90 (4.58)
Single-Use	11.78 (4.99)

Conclusions

Camera sleeve type, decontamination protocol and calibration status of the PrimeScan AC unit did not significantly impact the accuracy of the optical impressions.

We failed to reject any of our null hypotheses.

Conclusions

Any of the currently available camera sleeves used according to manufacturer's recommendations can provide similar accuracy in a clinical setting

