

## 5. Summary

### Possibilities of photometric cast analysis in orthodontics

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#### Aims

The orthodontic cast analysis is an important diagnostic medium in Orthodontics. In this context distances have to be measured. Currently the measurement on dental gypsum casts with vernier calliper is the gold standard. This study will discuss the possibility to create reliable results for cast analysis with photometric methods with a minimum of complexity.

The following questions have to be answered:

1. Is it possible to produce repeatable and true to scale pictures of plaster models with a standardized photographic method using a digital SLS camera.
2. Is it possible to produce alike good true to scale pictures of plaster models with a commercial flat bed scanner.
3. Is it possible to analyse these repeatable photographs with the commercial image editing software program Adobe-Photoshop CS3 Extended in terms of a cast analysis.
4. Are the performance data obtained with the software comparable to the results obtained with the golden standard method with vernier calliper.
5. Is it reasonable to integrate a digital method of measurement to the software used in a dental office.
6. Which advantages has the digital processing compared with the conventional method.

#### Material and methods

On 28 pairs of dental casts cast analysis both with golden standard with vernier calliper and with photometric methods were made. The photometric measurements were made by means of mugged and scanned pictures with the software Adobe-Photoshop CS3 Extended. The measurements of these three methods were compared and statistically evaluated. To verify the test results 5 pairs of dental cast have been randomised selected and have been evaluated a second time by the first rater and by a second rater both using the gold standard.

Following measurements have been performed: Anterior Bolton Index (ABI)

Moyers E-space

measurement of the transversal arch width

#### Results

On 56 cast pictures photometric measurements have been made using a SLR-camera. They did not show any statistic difference to the measurements made with the gold standard method: the vernier calliper. The statistic spread of those values and the golden standard is not different to the spread of golden standard and a second measurement using the gold standard method.

The photometric measurements of the 54 scanned cast pictures show significant lower values in the tooth-size compared to the golden standard measurements. The measurements of the Moyers E-space and measurements of the transversal arch width are comparable with the measurements made by SLR-camera. Similar to the camera-produced pictures the statistical spread of the photometric measurements of the scanned pictures did not differ from the spread between golden standard and a second measurement using the gold standard method.

#### Conclusions

1. It was demonstrated that it is possible to generate reliable true to scale pictures of dental casts using a SLR-Camera with standardized methods.
2. It is also possible to create true to scale pictures using a commercial flat bed scanner. The accuracy of these pictures is inferior to the pictures made with the camera. This seems to be the reason for the significant lower measurements of the tooth-size made with this method. If it is possible to minimize these inaccuracies with practical experience so there is no more clinical relevance should be clarified in further studies.
3. The commercial software Adobe-Photoshop CS3 Extended is well-suited for recording orthodontic cast analysis measurement data.
4. The recorded data with this software show related results to the current golden standard method, the measurement with vernier calliper. Precondition for this are true to scale and detail-accurate pictures of plaster models.
5. It is useful to integrate this measurement method in orthodontic software.
6. The digital storage of the data is the main advantage of the photometric method. With this storage-method data is available more quickly and needs less space than the storage of the plaster casts.

**Key words**

Orthodontics, cast analysis, measurement, digital, photometric, Adobe Photoshop CS3 Extended