

In vivo repeatability study for gingival thickness measurement using a new ultrasonic system

Aim

This study evaluated the repeatability and reproducibility (R&R) of assessing gingival thickness (GT) measurement using Pirop® Ultrasonic Biometer obtained from newly defined locations.

Material and methods

In 10 periodontally healthy subjects, the thickness of the gingiva of maxillary central and lateral incisors and canines were examined by an ultrasound device- Pirop® Ultrasonic Biometer A-Scan (Echo-Son S.A., Poland). The measurement points were located in the middle of keratinized tissue (GT1), 2 mm apical from muco-gingival junction (GT2) and at proposed new points - Free GT (1mm coronal than clinical attachment level - CAL), Supracrestal GT (1mm apical than CAL), Crestal GT (1 mm coronal than muco-gingival junction) and Mucosal GT or Movable Mucosa Thickness (1mm apical than mucogingival junction). 1.7 mm head diameter was located in an examined region, touching the mucosa without pressure in 90 degrees angulation to the bone or tooth base. In each measurement procedure during a period of 1-2 seconds 10 automatically measurements were done and an average value of GT and SD was determined. When SD value was higher than 0.05 mm, remeasurement was done. Repeatability of results obtained after 10-fold measurement GT each test point.

Repeatability and reproducibility (R&R) was assessed by calculating the percentage of variation (%R&R) to check whether Pirop® is acceptable and reliable device. Measurement System Analysis was used with the acceptance criteria of the measuring device, as follows:

- % R & R ≤ 10% - the measuring system is acceptable
- 30% ≤ % R & R < 10% - measuring system is conditionally acceptable
- % R & R > 30% - measuring system is unacceptable



Results

At all measurement points obtained satisfactory repeatability, the best in points SGT (R&R=3.63%) and FGT (R&R<4.71%), the smallest in the GT2 (R&R=8.56%) and MGT (R&R=9.78%). The average SGT was equal 1,24±0,23 mm and CGT was equal 0,75±0,19 mm with statistical significant difference (p<0,0001).

Measurement point	N	Mean	Mean SE	SD	
SGT	60	1,2399	0,03023	0,2342	p<0,0001
CGT	60	0,7466	0,02406	0,1864	
Differences	60	0,4934	0,03143	0,2434	

Measurement points	Central incisors (N=20)	Lateral incisors (N=20)	Canines (N=20)	All teeth (N=60)
FGT	5.20	4.10	4,50	4.71
SGT	3.21	4.35	2,90	3.63
CGT	7.85	9.05	7,35	7,90
MGT	9.05	10.75	10.40	9.78
GT1	6.70	7.40	5,42	6.41
GT2	6.25	7.45	9.30	8.56

Values of %R&R in gingival thickness measurement points using ultrasonic system Pirop® (Echo-Son S.A., Poland)

The comparison between average SGT and CGT results, after 100 times of measurement

Conclusion

- Consider the limitation of this study, the Ultrasonic Pirop® Biometer should be regarded as a acceptable device
- The new measurement points more precisely evaluate the gingival thickness compared to GT1 i GT2
- Average value of the Supracrestal GT was higher in comparison with average value of the Crestal GT what may be helpful to indicate biological width and edge of alveolar crest in non-invasive way.

