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How accurate is 3d dental scanning in measuring gum thickness compared to other common methods?

Submission date
17/07/2025

Recruitment status
No longer recruiting

Registration date
11/09/2025

Overall study status
Completed

Last Edited
02/10/2026

Condition category
Oral Health

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
This study aims to find out how accurately cone beam computed tomography (CBCT) - a 3D dental scanning technique - can measure gum thickness compared to other widely used methods like bone sounding, using an ultrasonic probe, or a digital caliper. Accurately measuring gum thickness is important for planning dental treatments such as implants, orthodontics, and gum surgery.

Who can participate?
Adults (18 years and older) who are scheduled for oral surgery (for example, root resection or dental implant therapy) at the University Clinic of Dentistry, Medical University of Vienna

What does the study involve?
Participants undergo gum thickness measurements at a specific point on their gum using four different techniques:
1. CBCT scan (while wearing a special mouth splint for accurate positioning)
2. Bone sounding (after local anesthesia, using a small probe)
3. Ultrasonic probe
4. Digital caliper (after a gum flap is lifted during surgery)
All measurements are taken under standardized conditions before planned surgery.

What are the possible benefits and risks of participating?
Participants may not directly benefit, but the study will help improve gum assessment methods for future dental treatments, making diagnosis and treatment planning easier and less invasive. All procedures (except the CBCT scan) are part of standard surgical care. The main additional procedure is the CBCT scan, which involves a small increase in radiation exposure, but this is minimized and within dental safety standards. Discomfort during standard gum measurements is minor and brief.

Where is the study run from?
Medical University of Vienna (Austria)

When is the study starting and how long is it expected to run for?
January 2012 to July 2012

Who is funding the study?
Medical University of Vienna (Austria)

Who is the main contact?
Prof. Gabriella Dvorak, gabriella.dvorak@meduniwien.ac.at

Contact information

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Public, Scientific

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Additional identifiers

Protocol serial number
EK Nr:1132/2011

Study information

Scientific Title
Accuracy of cone beam computed tomography in gingival thickness measurement

Study objectives
Although cone beam computed tomography (CBCT) is used to evaluate bone volume, it would be beneficial to also measure gingival thickness at the same time. The purpose of this research was to determine whether or not gingival thickness measurement carried out with CBCT is reliable.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 10/01/2012, Ethics Committee of the Medical University of Vienna (Borschkegasse 8b /6, Wien, 1090, Austria; +43 (0)1 40400 21470; ethik-kom@meduniwien.ac.at), ref: EK Nr: 1132 /2011

Primary study design
Observational

Study design
Single-center diagnostic accuracy study

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Gingival thickness measurement

Interventions
Gingival thickness at the buccal aspect was assessed using four methods:
1. Cone beam computed tomography
2. Bone sounding
3. Ultrasonic device
4. Digital caliper
Local anaesthesia was administered before all measurements.

Bone sounding was performed immediately after radiography using CBCT with the thermoplastic splint in situ. A thermoplastic splint was positioned in the mouth, hence a measurement point was tagged on the gingiva using a gingival marker pen. Bone sounding was performed to measure the distance to the bony surface.

The gingival thickness was measured immediately after elevation of a mucoperiosteal flap twice from two different investigators with a digital caliper on the marked position.

Within 15 minutes, all four measurement methods were evaluated in a standardized setting and in the order specified in the evaluation process.

Intervention Type
Other

Primary outcome(s)
Gingival (gum) thickness at the buccal aspect, measured in millimeters using:
1. Cone beam computed tomography (CBCT)
2. Bone sounding (gold standard/transgingival probing)
3. Ultrasonic probe
4. Digital caliper
All measurements are taken at a single timepoint during preoperative assessment (before any surgical intervention, after local anesthesia, within a 15-minute window per patient)

Key secondary outcome(s)
There are no secondary outcome measures

Completion date
30/07/2012

Eligibility

Key inclusion criteria
Consecutive patients requiring surgical dental procedures (e.g., root resection or implant placement) involving flap elevation

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 Years

Upper age limit
90 Years

Sex
All

Total final enrolment
41

Key exclusion criteria
1. Pregnant women
2. Lactating women
3. Patients below the age of 18 years

Date of first enrolment
01/02/2012

Date of final enrolment
15/07/2012

Locations

Countries of recruitment
Austria

Study participating centre
University Clinic of Dentistry, Medical University of Vienna
Sensengasse 2 A
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Sponsor information

Organisation
Medical University of Vienna

ROR
https://ror.org/05n3x4p02

Funder(s)

Funder type
Not defined

Funder Name
Medizinische Universität Wien

Alternative Name(s)
Medical University of Vienna, MediUni Wien

Funding Body Type
Government organisation

Funding Body Subtype
Local government

Location
Austria

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary

Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		02/09/2026	02/10/2026	Yes	No