

# Using artificial intelligence to improve patient understanding and acceptance of orthodontic treatment

<b>Submission date</b> 03/12/2025	<b>Recruitment status</b> No longer recruiting	<input checked="" type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
<b>Registration date</b> 10/12/2025	<b>Overall study status</b> Ongoing	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
<b>Last Edited</b> 12/05/2026	<b>Condition category</b> Oral Health	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

Plain English summary of protocol

## Contact information

### Type(s)

Principal investigator, Scientific, Public

### Contact name

Dr Zhwan Rashid

### ORCID ID

<https://orcid.org/0000-0003-2440-6833>

### Contact details

University of Sulaimani, College of Dentistry

Sulaimani

Iraq

46001

+964 7701544448

zhwan.rasheed@univsul.edu.iq

## Additional identifiers

## Study information

### Scientific Title

Effect of AI-enhanced visual simulations and explanations on patient understanding and acceptance of orthodontic treatment: a randomized controlled trial

**Acronym**

AIOPA

**Study objectives**

1. To determine whether AI-enhanced communication increases treatment acceptance within 14 days of consultation compared with standard consultation.
2. To assess differences in patient comprehension scores between AI-enhanced and standard consultations.
3. To compare decisional conflict, decisional regret, satisfaction, and trust in the clinician between groups.
4. To measure differences in consultation duration and clinician workload.
5. To explore whether demographic or clinical variables (age, sex, education, electronic health literacy (eHealth literacy), malocclusion severity, treatment type) modify the effect of AI-enhanced communication.

**Ethics approval required**

Ethics approval required

**Ethics approval(s)**

approved 04/11/2025, Ethics Committee of the College of Dentistry, University of Sulaimani (Old Campus – Madam Mitterrand Street, College of Dentistry, University of Sulaimani, Sulaimani, 46001, Iraq; +964 772 544 7528, +964 770 157 8705; dentistry.ethics@univsul.edu.iq), ref: CoD-EC-25-0104

**Primary study design**

Interventional

**Allocation**

Randomized controlled trial

**Masking**

Blinded (masking used)

**Control**

Active

**Assignment**

Parallel

**Purpose**

Health services research

**Study type(s)****Health condition(s) or problem(s) studied**

Patient understanding and acceptance of orthodontic treatment

**Interventions**

Participants will be allocated in a 1:1 ratio using a computer-generated randomisation sequence with concealed allocation via sealed opaque envelopes opened only at the time of consultation. Outcome assessors will remain blinded to group assignment.

**Control group (Standard consultation):** The orthodontist explains the patient's condition and treatment options using the diagnostic records (photos, radiographs, tracings, and models) together with a generic printed brochure about orthodontic treatment and appliance care.

**Intervention group (AI-enhanced consultation):** Patients receive all elements of the control consultation plus AI-generated visual simulations, plain-language explanations (Kurdish) and a digital take-home summary via QR code. Consultation duration is kept similar between groups.

#### **AI-Generated Visual Simulations**

Individualized treatment simulations will be generated using 3Shape OrthoAnalyzer™ software, version 2025.1 (3Shape A/S, Copenhagen, Denmark). The software integrates AI-based algorithms trained on extensive orthodontic datasets to simulate predicted outcomes of malocclusion correction.

Baseline diagnostic records, including intraoral and extraoral photographs, lateral cephalograms, and digital study models obtained via intraoral scanning, will serve as input data. The system produces:

- 2D before–after overlays superimposed on facial and intraoral photographs,
- 3D interactive digital models illustrating predicted tooth alignment and occlusal changes, and
- Animated treatment progression sequences that demonstrate key transitional stages and the anticipated final result.

To ensure consistency and reliability, all simulations will be generated following standardized parameters embedded in the software (e.g., correction of crowding, overjet reduction, arch coordination). Each simulation will be reviewed by the investigator for clinical plausibility prior to presentation. During the consultation, patients will view the simulation on a tablet, and a secure QR code will be provided to access the same materials at home.

The simulations are intended exclusively as decision-support and communication tools to enhance patient comprehension and confidence; they do not replace the orthodontist's diagnostic judgment or definitive treatment planning.

**Total duration of intervention:** Each participant receives a single orthodontic consultation session (with or without AI-enhanced communication depending on the allocation arm).

**Total duration of follow-up:** 14 days after the consultation, during which treatment acceptance and secondary outcomes are assessed.

#### **Intervention Type**

Behavioural

#### **Primary outcome(s)**

1. Treatment acceptance measured using Binary yes/no response questionnaire at 14 days post consultation

#### **Key secondary outcome(s)**

#### **Completion date**

31/05/2026

# Eligibility

## Key inclusion criteria

1. New patients attending for an initial comprehensive orthodontic consultation.
2. Age 18–40 years (representing the core orthodontic patient population who are legally capable of providing informed consent and making independent treatment decisions.)
3. Index of Orthodontic Treatment Need (IOTN-DHC  $\geq$  3, indicating moderate to severe need).
4. Ability to read and understand Kurdish (Sorani).
5. Able to provide informed consent.

## Healthy volunteers allowed

No

## Age group

Adult

## Lower age limit

18 years

## Upper age limit

40 years

## Sex

All

## Total final enrolment

0

## Key exclusion criteria

1. Previous comprehensive orthodontic treatment within the last 5 years.
2. Emergency cases requiring urgent pain or trauma management.
3. Patients with cognitive, hearing, or visual impairments that preclude participation in surveys or comprehension tests.
4. Patients who cannot complete follow-up (e.g., no phone or digital access for the 14-day follow-up survey).

## Date of first enrolment

15/12/2025

## Date of final enrolment

21/03/2026

# Locations

## Countries of recruitment

Iraq

# Sponsor information

## Organisation

University of Sulaimani

## ROR

<https://ror.org/00saanr69>

## Funder(s)

### Funder type

### Funder Name

Investigator initiated and funded

## Results and Publications

### Individual participant data (IPD) sharing plan

### IPD sharing plan summary

Not expected to be made available

### Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
<a href="#">Protocol file</a>		22/09/2025	12/05/2026	No	No