

3D Imaging Role in Orthognathic Surgery Planning and Outcome Assessment. A Systematic review and meta-analysis

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Saini, R¹; Altafuddin, S²; Masroor, K³; Binduhayyim, R⁴; Gurumurthy, V⁵; Vaddamanu, S⁶.**ADMINISTRATIVE INFORMATION****Support** - King Khalid University.**Review Stage at time of this submission** - Completed but not published.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202420014**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 04 February 2024 and was last updated on 04 February 2024.**INTRODUCTION**

Review question / Objective 1. 3D imaging achieves superior surgical precision and accuracy. 2. Which digital software is advantageous for 3D imaging. 3. Accuracy of TSP vs VSP in Orthodontic surgery.

Condition being studied Orthognathic surgery, necessary for treating jaw and face skeletal anomalies, has depended on traditional surgical planning (TSP), which entails several time-consuming stages. Notably, with the introduction of 3 dimensional (3D) virtual surgical planning (VSP), this discipline has been transformed, enabling unparalleled accuracy and customization of surgical techniques.

METHODS

Search strategy Different databases, including PubMed, Scopus, The Cochrane Library, Google

Scholar, and ScienceDirect, were searched for the relevant literature using PRISMA protocols.

Participant or population Adults requiring orthognathic surgery.

Intervention There was variation in the imaging techniques used in the included studies; however, most of the studies compare 2D and 3D (CBCT) for virtual planning. Most of the studies used Dolphin imaging software, followed by Maxilim software. Postoperative evaluation was done and reported in different studies, and the minimum time period was 1 week, and a maximum of 12 months. 3D cephalometric analysis was the most identified imaging dental arch. Furthermore, different surgical options are presented in other studies.

Comparator Orthognathic surgery.

Study designs to be included Clinical trial, Randomized Controlled Trial, observational study, cross sectional study, Prospective study.

Eligibility criteria Studies published in English.

Information sources Different databases, including PubMed, Scopus, The Cochrane Library, Google Scholar, and ScienceDirect, were searched for the relevant literature using PRISMA protocols.

Main outcome(s) The 3D VSP technique can be the best alternative for TSP in orthognathic surgery. Although the difference between both techniques was non-significant. Future studies should explore more representative and uniform variables in comparative manner for better understanding.

Data management Data was extracted on the selected studies matching the inclusion requirements in a predesigned data recording Excel sheet. Two reviewers independently record each study's characteristics (author ID, country, study design, sample size), participant's characteristics (age, gender, deformity type), intervention characteristics (imaging technique, imaging software, peri/postoperative scanning period, imaging of dental arches, surgery type), outcomes (accuracy, key findings, conclusion, limitations).

Quality assessment / Risk of bias analysis The Cochrane Collaboration tool was utilized for the quality assessment of RCTs using the web-based app Robvis [21]. Assessment was done in the domain of randomization, deviation from intended intervention, measurement of data, missing outcomes, and reporting. While for non-RCTs, ROBINS-I was used in the domain of confounding, selection of participants, intervention classification, deviation, missing outcome data, outcome measurement, and reporting outcomes.

Strategy of data synthesis The collected data was subjectively assessed for the included papers in the systematic review, and the PRISMA checklist was also used. Meanwhile, RevMan 5.4 was used for meta-analysis (subgroup analysis) to assess the pooled efficacy of accuracy of 3D imaging for VSP of orthognathic surgery and identify any potential sources of heterogeneity [23]. The random effects model was utilized, with a significance level of 0.01.

Subgroup analysis Meta-analysis was conducted with only four studies and 2 studies in each subgroup; the remaining studies were not included due to the variation in the data, which is incomparable. In the sub-group of Sella nasion point A (SNA) and Sella nasion point B (SNB), there was the non-significant difference ($p=0.85$ and

0.81). Moreover, the mean difference was 1.300 (95% CI: 0.33-2.27) and 1.350 (95% CI: 0.08-2.61) with 0% heterogeneity.

Sensitivity analysis Not available.

Language restriction Only articles in English.

Country(ies) involved Saudi Arabia.

Keywords 3D Orthognathic surgery, Surgical intervention, Three dimensional imaging, CBCT, virtual surgical planning, traditional surgical planning, dentofacial deformities.

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