Content available at: https://www.ipinnovative.com/open-access-journals

IP Indian Journal of Orthodontics and Dentofacial Research

Journal homepage: https://www.ijodr.com

Review Article

Orthodontic softwares – A detailed review

Nausheer Ahmed[1], Anbumuhil TR[1], Abrar Younus A[1]*, Anusha PG[1], K Shrin Fathima[1]

[1]Dept. of Orthodontics, Government Dental College and Research Institute, Bangalore, Karnataka, India

Abstract

Orthodontic treatment planning software has significantly transformed the orthodontics landscape by offering sophisticated tools for diagnosis, treatment simulation, and appliance design. This article evaluates various software applications, focusing on their features, advantages, and limitations. These digital solutions have notably enhanced the efficiency and precision of orthodontic treatment planning, providing clinicians with essential resources to improve patient care. The review underscores various software available for model analysis, cephalometric analysis, treatment planning and how integrating these software applications into orthodontic practice has modernized traditional methods and fostered advancements in the field.

Keywords: Orthodontic Software's, Digiceph, Nemoceph, Maestro 3d, 3shape, Arch form, Dolphin

Received: 09-05-2025; **Accepted:** 10-06-2025; **Available Online**: 28-06-2025

1. Introduction

Digital technology has ushered in a wave of innovations that have profoundly influenced daily life, particularly in the fields of dentistry and orthodontics. The advent of computer-aided design software, 3D printing, and advanced scanning technologies has become essential for orthodontists, enhancing appliance design, diagnosis, and treatment planning.[1] Orthodontics is one of the most intricate areas of dentistry, requiring careful analysis of extensive data to ensure accurate diagnoses and effective treatment strategies. The integration of digital models, cone beam computed tomography (CBCT), and 3D facial imaging has revolutionized this field, allowing for precise treatment simulations and improved patient communication.[2]

In recent years, the impact of digital technology on orthodontic practices has expanded beyond simple record-keeping. Virtual treatment planning has become standard, enabling orthodontists to seamlessly translate plans into actionable treatment protocols through digitally manufactured appliances. Techniques such as computer-aided design and manufacture (CAD/CAM) have facilitated the creation of custom brackets, indirect bonding trays, and robotically bent wires, while remote monitoring capabilities offer new avenues for patient management.[3]

Overall, the digital transformation in orthodontics not only enhances the precision and efficiency of treatment but also significantly improves patient experience. By streamlining workflows and fostering better communication between practitioners and patients, these advancements are reshaping the landscape of orthodontic care, leading to more predictable outcomes and tailored treatment approaches that prioritize patient comfort and satisfaction.

2. Discussion

2.1. Types of orthodontic software

2.1.1. Model analysis

Orthodontic model analysis is an important and fundamental aspect of orthodontic diagnosis and treatment planning. Traditionally, orthodontists used physical plaster models of patient's dentition to measure and analyse the dental and skeletal relationships. With technological advancements, digital models have largely replaced and substituted the plaster models, providing greater accuracy, convenience, and functionality.

*Corresponding author: Abrar Younus A
Email: abraryounus94@gmail.com

https://doi.org/10.18231/j.ijodr.2025.019

Digital model analysis involves creating a 3D digital representation of a patient's dental arches, which is derived from intraoral scans or scans of the impressions. This digital transformation allows for precise measurement, analysis, and simulation of orthodontic treatment.

Key components of orthodontic model analysis

1. Acquisition of data: It involves capturing accurate 3D images of the dental arches using intraoral scanners or by converting plaster models into digital formats using 3D scanning.
2. Creation of models: The acquired data is processed to create a diagnostic 3D digital model of the patient's dentition. This model can be manipulated and also examined and viewed from various angles.
3. Analysis and Measurement: Various Software tools provide functionalities to perform various orthodontic analyses, such as tooth size discrepancy (Bolton analysis), arch length and space analysis, and occlusal relationships.
4. Virtual Treatment Planning: Orthodontists can also simulate tooth movements and can visualize the final outcomes of different treatment approaches, enhancing precision in planning of treatment.
5. Patient Communication and Education: Visual representations help in explaining the treatment plan to the patients, aiding in improving understanding and compliance.

2.1.2. OrthoCAD

OrthoCAD™ was the pioneer in introducing a digital model service to the orthodontic market in early 1999. Operated by Cadent, Inc., based in Fairview, NJ, the company was founded by two CAD/CAM engineers who collaborated with dental professionals to develop an advanced 3D system. The OrthoCAD™ 3D browser software offers clinicians the ability to view models from five simultaneous perspectives, allowing for comprehensive evaluation of tooth positioning and precise measurements in any spatial plane. With capabilities for conducting Bolton analyses, Tanaka-Johnson analysis, and various point-to-point measurements, this software enhances diagnostic accuracy and treatment planning.[4]

2.1.3. emodels™

emodels™ by GeoDigm was founded in 1996 as Interactive Reflective Imaging System. It has since changed its name and has grown considerably. emodels™ became available to the profession at the American Association of Orthodontists (AAO) National Meeting in 2001.

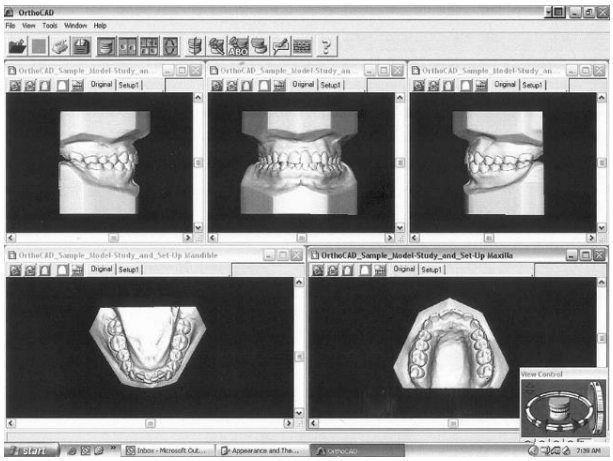


Figure 1: OrthoCAD software

The emodels™ software allows the models to be moved, rotated, or enlarged to evaluate tooth position and make measurements in any plane of space. Bolton analyses, tooth width, curve-length measurements, and any point-to point or point-to-plane measurements can be performed. emodels™ also feature a cross-sectioning tool that can slice the digital models in any vertical or horizontal plane to check symmetry, overjet, and overbite and to help measure any location.[4]

2.1.4. Ortho analyzer®

OrthoAnalyzer® allows for the creation of accurate 3D models from intraoral scans or digitized plaster models. These models can be manipulated and examined from various angles, providing a comprehensive view of the patient's dentition.

OrthoAnalyzer® is an advanced 3D analysis and measuring software package for orthodontists to facilitate fast and easy 3D analysis as well as advanced treatment planning from digital study models.[5]

The software provides tools for both 2D and 3D measurements, including Bolton analysis, arch length analysis, and space analysis. These measurements are crucial for diagnosing orthodontic issues and planning treatments.

OrthoAnalyz enables virtual simulations of dental movements, allowing orthodontists to predict treatment outcomes and make necessary adjustments before starting the actual treatment. This helps in optimizing treatment plans and improving patient outcomes.

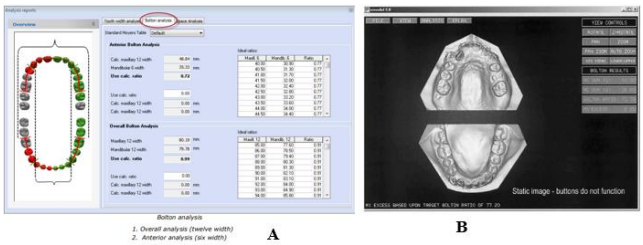


Figure 2: A: OrthoAnalyzer software; **B:** emodel software

Various software available for model analysis are

1. Digimodel®
2. O3DM®
3. Rapidform®
4. BibliocastCecile3®
5. OraMetrix®
6. AnatoModels®
7. Ivoris@Analyze3D®
8. MatLab®
9. Meshlab®
10. O3D®
11. Ortho3D®
12. OrthoInsight®
13. Pixform®

Mobile applications are now available to simplify model analysis, providing orthodontists with convenient tools to evaluate digital models on the go. These apps enhance accessibility and efficiency, allowing clinicians to perform assessments and make informed decisions from their smartphones or tablets. By integrating mobile technology into their practice, orthodontists can streamline workflows and improve patient care, making model analysis more efficient and user-friendly.

2.1.5. Imodelanalysis

This app was developed by Dr.Pavan Kumar Mamillapalli, Dr.Praveen Kumar Neela and Dr.Vasu Murthy Sesham

The app performs quick and accurate mathematical calculations for:

1. Bolton analysis
2. Tooth-size/arch-length discrepancies in the maxillary and mandibular arches
3. Howes analysis
4. Pont and Linder-Harth arch-width analyses
5. Tanaka-Johnston mixed-dentition analysis

It also functions as a pocket reference to these analyses, making it a tool for e-learning.[6]

2.3. Cephalometric analysis

Cephalometric radiography remains an indispensable diagnostic tool in clinical orthodontics, enabling precise evaluation of anatomical structures through standardized angular and linear measurements. Serial cephalometric radiographs play a pivotal role in analysing facial skeletal growth and development, offering invaluable insights for treatment planning. Furthermore, the comparison of pre-and post-treatment measurements provides a robust framework for assessing treatment outcomes. Traditionally, this analysis involved manual tracing of radiographic landmarks on acetate overlays and measuring values with a protractor—a method that, while widely used, is labour-intensive and susceptible to errors in landmark identification, tracing, and measurement.

The advent of advanced computer technologies has revolutionized cephalometric analysis, allowing tracings to be performed with digitizers or directly on digital images displayed on screens. This shift not only enhances efficiency but also significantly reduces operator fatigue and minimizes human error, ensuring standardized, accurate, and reproducible evaluations. Reproducibility remains a cornerstone of any analytical method's reliability, and computerized approaches have set a new benchmark for precision in orthodontic diagnostics.[7]

Today, a wide array of software systems has been developed for lateral cephalometric tracing, incorporating both 2D and 3D landmark identification and analysis. These innovations represent a paradigm shift in orthodontic practice, streamlining workflows while delivering superior diagnostic accuracy to support optimal treatment planning and evaluation.

2.3.1. AudaxCeph

AudaxCeph was developed by Audax software company which was found in 1994.It provides tools for calibration, automatic tracing, analysis, skull growth projection, Visual treatment objective and automatic superimposition

AudaxCeph®'s automated cephalometric tracing software is a good adjunctive tool to use when diagnosing and treatment planning orthodontic cases.[8]

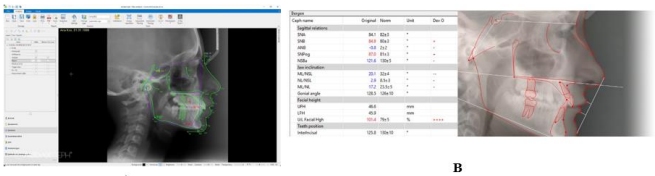


Figure 3: A: AudaxCeph software; **B:** Facad software

2.3.2. FACAD

Facad is a cephalometric analysis software which was developed by a Swedish company, Ilexis AB

Facad is a software that can be used for tracing with cephalometric analysis, superimpositions and for treatment simulation with soft tissue profile prediction.

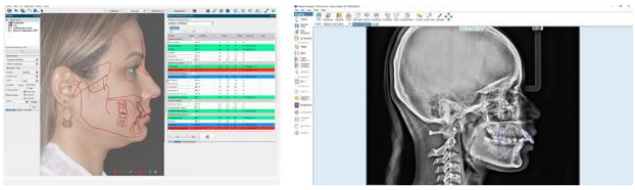
The accuracy of cephalometric analysis is important in the diagnosis of malocclusion and for treatment planning. The reliability and reproducibility of the measurements with the FACAD® and with the conventional method are highly correlated. The advantages of digital imaging such as enhancement, transmission, archiving and low radiation dosages makes the digitized method to be preferred over conventional method in daily use without the loss of quality.[9]

2.3.3. DOLPHIN

Dolphin cephalometric software was introduced by Dolphin imaging which was founded in 1988 by New York-based orthodontist Dr. Marc Lemchen. It provides tools for tracing, superimpositions and features for image enhancement.

2.3.4. NemoCeph

It is a cephalometric software found by Nemotec which was founded in 1992. It has features for tracing, superimpositions, VTO, STO, frontal and lateral morphing and automatic tracings integrated with AI.



A B

Figure 4: A: NemoCeph software; **B:** Dolphin software

Various software available for cephalometrics
1. Orisline
2. Cephsmile
3. dHAL viewbox 4 cephalometric software
4. Planmeca Romexis
5. Anatomage
6. OnyxCeph

Reproducibility of measurements is crucial for assessing the accuracy of any analytical method. The integration of computers in treatment planning is anticipated to minimize personal errors associated with operator fatigue, thereby providing standardized, rapid, and effective evaluations with a high degree of reproducibility. However, there remains no clear consensus on the preferred method for cephalometric analysis, as converting analog film to digital format involves several additional steps that can be both time-consuming and prone to magnification errors. This issue can be mitigated by utilizing direct digital imaging.

Research indicates that measurements obtained through direct digital imaging show low correlation with traditional hand-tracing methods, yet the differences are minimal and clinically acceptable. Consequently, computerized cephalometric measurement using direct digital imaging is inherently advantageous due to its user-friendly interface and time-saving capabilities. Software systems such as WebCeph and FACAD have demonstrated high reliability and accuracy in cephalometric measurements. The benefits of these online, AI-driven platforms include cloud-based storage, online archiving, rapid analysis, ease of access without specific installation requirements, and compatibility across various operating systems.[10]

The development of smartphones has provided new opportunities to integrate mobile technology into routine dental practice.

Subsequently, a countable number of software solutions for cephalometric analysis was developed as applications on smartphones. These applications allow orthodontists to perform analysis in a short duration and also transfer data in a jiffy to other devices.

The available mobile applications include
1. Oneceph
2. CephNinja
3. Cephalometric analysis
4. Orthonet
5. Cephalometria de Ricketts
6. Cephalometria de Steiner
7. EasyCeph
8. CEPHApp
9. WebCeph.[11]

2.4. Treatment planning

Orthodontic treatment planning is an important step to obtain effective and efficient outcomes for patients. Accurate treatment planning involves a detailed assessment of the patient's dental and facial structures to identify any misalignments, malocclusions, and other orthodontic issues. This initial stage is vital.

The treatment planning of an orthodontic patient must be preceded by three distinct steps:
1. Records, such as models, head films, etc., are obtained;
2. Data are collected from these records and directly from the patient; and
3. Data and/or secondarily derived data are compared with standards to establish a differential diagnosis for the patient.

Orthodontic treatment planning software has revolutionized the field of orthodontics by enhancing the precision, efficiency, and effectiveness of treatment plans. These digital tools are designed to assist orthodontists in diagnosing dental conditions, creating personalized treatment plans, and visualizing potential outcomes.

Advantages of a treatment planning software include
1. A more thorough data base that is integrated with the treatment plan.
2. A detailed treatment plan that has included all steps for examination
3. A graphic visualization of the projected treatment changes.
4. A simulation that allows changes to be made easily.
5. Control of the decisions by the orthodontic clinician.
6. Storage and retrieval of data as required for each step.

7. A time savings to the busy clinician since, when he sits down to do the treatment plan, the data are presented in an orderly and organized fashion.[13]

Some of the Treatment planning and simulation software are

2.4.1. 3Shape

They provide software for model analysis and treatment planning using digital setup offering intuitive diagnosis and treatment analysis tools. Digital setups are as effective and accurate as manual setups and consist of a tool for diagnosis and treatment planning that can be reliably reproduced in orthodontic treatments.[13]

2.5. In office aligner softwares

2.5.1. 3shape clear aligner studio

3Shape Clear Aligner Studio enables to design and produce clear aligners in own office or through 3Shape manufacturing partners.

2.5.2. Bluesky plan

ProviIt is an open-source software for 3D model analysis and treatment planning. It has an user friendly interface. It has an AI driven feature for aligner designing which can be used for Direct printed aligners.

2.5.3. Archform

It is a company based in Sunnyvale California, which provides software for orthodontic treatment planning and aligner designing, after which aligners can be manufactured in office by thermoforming or direct printing.

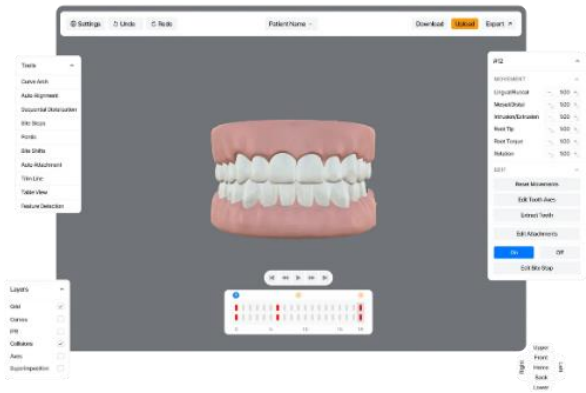


Figure 5: Archform software

2.5.4. uDesign®

It is provided by uLab systems, Treatment planning software automatically segments the teeth and with artificial intelligence uses preferences to create a baseline treatment plan after which the treatment plan can be altered according to the needs of the orthodontist.

2.5.5. CS model+

CS Model+ is a software program by Carestream Dental, primarily used for orthodontic treatment planning, which allows dentists to digitally manipulate and analyze 3D dental scans to design clear aligners by automatically segmenting teeth, simulating treatment outcomes, and creating precise digital models for fabrication, all within a user-friendly interface

2.5.6. dentOne

It is an open source aligner designing platform developed by Diorco

2.5.7. Deltaface

It is a effective 3d orthodontic cad software developed to create clear aligners. It was developed in 2010 by deltaface company based in France

2.6. Proprietary aligner software

2.6.1. ClinCheck

ClinCheck software is a proprietary treatment planning tool developed by Align Technology, primarily used by dental professionals to digitally design Invisalign treatment plans by simulating tooth movements and visualizing the final result on a patient's 3D model, allowing them to review and modify the plan before proceeding with the actual aligner fabrication.

2.6.2. ClearPilot™

ClearPilot is ClearCorrect's treatment planning tool, providing a visual simulation of the treatment process based on a setup created by a technician using the prescription, instructions, and patient records such as clinical photos, impressions/scans, and x-rays. This tool presents a sequential 3D animation illustrating the movement of teeth, aiding both you and your patient in visualizing the treatment goals.

A B

Figure 6: A: Clincheck software; **B:** ClearPilot software

2.6.3. Spark approver™

It is a proprietary software backing the spark aligner systems by Ormco. It also allows for meticulous planning of treatment.

2.6.4. Suresmile

Suresmile clear aligners, Dentsply Sirona uses Suresmile aligner software for planning each treatment sequence and design the clear aligner.

2.7. Surgical treatment planning

Virtual planning has transformed orthodontic-surgical treatment by enabling orthodontists to meticulously plan movements and anticipate both hard and soft tissue changes resulting from surgery. This innovative approach allows for the simulation of orthognathic surgery, enhancing communication among patients and surgeons, which in turn leads to greater precision during procedures, fewer complications, and reduced operative time. The synergy between virtual planning and 3D printing has streamlined the entire process from pre-surgery to post-surgery, with guiding templates and splints created through rapid prototyping techniques ensuring accurate control during operations. However, mastering the planning software and printer settings does involve a learning curve.[14]

2.7.1. Dolphin 3d surgery

3D Surgery is a comprehensive case planning and presentation tool that animates the patient's skeletal and facial changes in real time, and outputs to a precise surgical guide. The surgical planning tool of Dolphin 3d surgery is called Treat. It enables us to plan from lateral, front or submento-vertex (SMV) views. The Present tool uses the simulated treatment from Treat in an animated sequence of pre-/post-operation configurations in all three dimensions. Splint tool is used to select the width, thickness and other parameters of the splint based on the treatment plans. Dolphin Imaging software serves as a valuable tool for case presentations, patient education, and obtaining informed consent for two-jaw orthognathic surgical treatment plans.[15]

2.7.2. Planmeca eomexis® CMF surgery

The Planmeca Romexis® CMF Surgery module is an advanced orthognathic software for preparing virtual surgical treatment plans. It helps to plan osteotomy cuts virtually and also simulate the surgery and measure the distance between anatomical landmarks. After virtual surgical plan is complete, intermediate and final splints can easily be designed with the software and flexibly exported in STL file format for manufacturing.

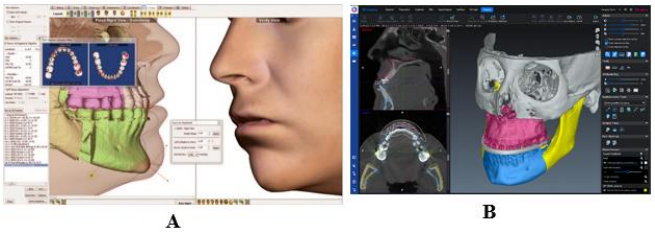


Figure 7: A: Dolphin 3D surgery; **B:** Planmeca romexis CMF surgery

2.7.3. OnyxCeph³™ OMS

This software is focussed on combined orthodontic & oral maxillofacial surgical treatment planning basing on digital models and volume Xray data. This program version integrates all functionality of program version 3D Pro including option Treatment Simulation 3D (Sim 3D), Wafer Creation.

2.8. Digital bonding softwares

The digital method of indirect bonding allows for more accurate bracket positioning that is achieved by scanning the patient's dentition directly without the need for recording impressions, for virtual positioning of the brackets in the desired position, and simulated orthodontic movement of teeth according to the bracket positions in real-time.[16] With the advance of digital technology in indirect bonding techniques, it is possible to fabricate the transfer tray efficiently and accurately with rapid prototyping, to optimize bracket position on software, as well as to facilitate communications among doctors, technicians, and patients.[17]

The software will have a library of brackets of various manufacturers and various prescriptions. According to the need of the case specific brackets can be selected for virtual placement. Some software also provides options for customized bracket 3d printing. Customization as a process should be mainly directed to achieve a better orthodontic treatment outcome, faster treatments, fewer patient visits, fewer problems for the orthodontic office, and, in conclusion, better orthodontic service for the patient.[18]

Various software available include

1. OrthoAnalyzer
2. Maestro 3D
3. Deltaface ubrackets customized bracket software
4. Ormco digital bonding

2.9. Customised bracket systems

2.9.1. Insignia

Dr. Craig Andreiko was the inventor of the Insignia® bracket design system. The Insignia® system is a reverse-engineered fixed appliance for comprehensive dentofacial orthopedic treatment. Custom brackets, wires and placement jigs are fabricated based on approved design using the Insignia approver software.

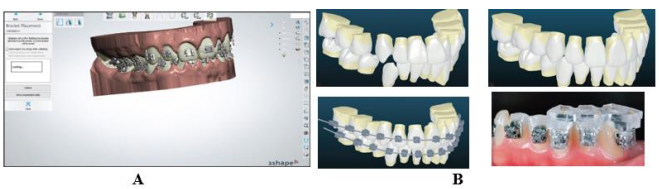


Figure 8: A: 3shape orthoanalyzer bracket positioning tool; **B:** Customised Insignia Bracket system

2.10. Incognito brackets

Incognito bracket developed by Dirk Wiechmann, which was on the market from 1996 and has been distributed by 3M-Unitek since 2010. Together with the pre-positioned

brackets, fully individualised lingual brackets always come with a set of precisely pre-bent wires.

2.11. Lightforce system

LightForce brackets are manufactured from 3D-printed polycrystalline alumina and are fully customized for all teeth, including the molars. The brackets come in three slot sizes, multiple bidimensional combinations, and two colors. LightPlan is a cloud-based software application that manages the digital design process. LightPlan cloud-based software enables individualized digital treatment planning: THE virtual setup of the dentition in LightPlan results in a fully customized bracket prescription for each patient.[19]

3. Conclusion

Orthodontic software has revolutionized treatment planning and execution, elevating precision, efficiency, and overall effectiveness in orthodontic care. However, these technological advancements are not a replacement for the expertise, clinical judgment, and personalized care that only skilled orthodontists can provide. Instead, they act as powerful tools that enhance the orthodontist's ability to deliver tailored and effective treatments. The true strength of modern orthodontics lies in the seamless integration of cutting-edge digital technology with the experience and artistry of the clinician. This harmonious blend ensures that patients benefit from both innovative solutions and compassionate, individualized care, setting a new benchmark for excellence in orthodontic practice.

4. Conflict of Interest

None.

5. Source of Funding

None.

References

1. Panayi NC, Efstathiou S, Christopoulou I, Kotantoula G, Tsolakis IA. Digital orthodontics: Present and future. *AJO-DO Clin Companion*. 2024;4(1):14–25.
2. Pandey R, Kamble R, Kanani H. Revolutionizing Smiles: Advancing Orthodontics Through Digital Innovation. Cureus. 2024;16(7):e64086.
3. Tarraf NE, Ali DM. Present and the future of digital orthodontics. *Semin Orthod*. 2018;24(4):376–85.
4. Peluso MJ, Josell SD, Levine SW, Lorei BJ. Digital models: An introduction. *Semin Orthod*. 2004;10(3):226–38.
5. OrthoAnalyzer 2012 User Manual. 2006. http://promed.ua/wp-content/uploads/2012/01/2012_OrthoAnalyzer_English.pdf
6. Pavan KM, Praveen KN. Model analysis on a smartphone. *J Clin Orthod*. 2012;46(6):356–8.
7. Celik E, Polat-Ozsoy O, Toygar Memikoglu TU. Comparison of cephalometric measurements with digital versus conventional cephalometric analysis. *Eur J Orthod*. 2009;31(3):241–6.
8. Ristau B, Coreil M, Chapple A, Armbruster P, Ballard R. Comparison of AudaxCeph®'s fully automated cephalometric tracing technology to a semi-automated approach by human examiners. *Int Orthod*. 2022;20(4):100691.
9. Farooq MU, Khan MA, Imran S, Sameera A, Qureshi A, Ahmed SA, et al. Assessing the Reliability of Digitalized Cephalometric Analysis in Comparison with Manual Cephalometric Analysis. *J Clin Diagn Res*. 2016;10(10):ZC20–3.
10. Katyal D, Balakrishnan N. Evaluation of the accuracy and reliability of WebCeph – An artificial intelligence-based online software. *APOS Trends Orthodon*. 2022;12(4):271–6.
11. N G, S N, HK V, Ramegowda S, AM S. Handy Gadget for Cephalometric Analysis: A Systematic Review. *J Indian Orthod Soc*. 2021;55(1):64–71.
12. Faber RD, Burstone CJ, Solon DJ. Computerized interactive orthodontic treatment planning. Am J Orthod. 1978;73(1):36-46.
13. Barreto MS, Faber J, Vogel CJ, Araujo TM. Reliability of digital orthodontic setups. Angle Orthod. 2016;86(2):255–9.
14. Sahim S, Quars F El. Virtual Planning versus Traditional Planning in Orthodontic-Surgical Treatment: A Review. *Open Access Lib J*. 2023;10(7):1–9.
15. Peterman RJ, Jiang S, Johe R, Mukherjee PM. Accuracy of Dolphin visual treatment objective (VTO) prediction software on class III patients treated with maxillary advancement and mandibular setback. *Prog Orthod*. 2016;17(1):19.
16. Park JH, Lee GH, Moon DN, Lee KC. A completely digital indirect bonding technique using a customized virtual orthodontic bracket setup and 3-dimensional printing technology. *AJO-DO Clin Companion*. 2021;1(3):198–206.
17. Xue C, Xu H, Guo Y, Xu L, Dhami Y, Wang H, et al. Accurate bracket placement using a computer-aided design and computer-aided manufacturing–guided bonding device: An in vivo study. *Am J Orthod Dentofac Orthop*. 2020;157(2):269–77.
18. Panayi NC. In-house three-dimensional designing and printing customized brackets. *J World Fed Orthod*. 2022;11(6):190–6.
19. Waldman A, Moshiri M, Bonebreak-Jackson C. Introduction to lightforce. *J Clin Orthod.* 2023;57(9):500–10.

Cite this article: Ahmed N, Anbumuhil TR, Younus AA, Anusha PG, K Fathima S. Orthodontic softwares – A detailed review. *IP Indian J Orthod Dentofacial Res*. 2025;11(2):97-103.