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Guest Editorial

Automation, AI, and the orthodontic viewpoint: Complementary or competent?

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Orthodontists are facing both exciting opportunities and challenging moral dilemmas as the field enters a phase that is increasingly influenced by automation and artificial intelligence (AI). The growing relationship between machine intelligence and orthodontic knowledge is examined in this editorial, which raises questions about whether AI is a real ally in accuracy or a potential threat to professional autonomy. It pushes the orthodontic community to consider how we use technology not just as consumers but also as accountable stewards of patient-centered care and evidence-based advancement.

1. The Digital Transition from Manual to Machine

Digital cephalometric tracing was introduced in the 1980s, marking the integration of computer-aided diagnosis in orthodontics. Since then, intraoral scanners for real-time digital impressions, cloud-based aligner planning systems—many of which use machine learning to automate tooth movement and staging—and AI-driven treatment simulation platforms like DentalMonitoring, CephX, and 3DSmile have all rapidly gained traction. These technologies have significantly improved diagnostic consistency, workflow efficiency, and patient communication.[1]

Workflow efficiency and diagnostic consistency have increased thanks to these technologies. However, they raise an important question: Is there a possibility that automation will simplify the complex process of making orthodontic decisions?

2. The Role of the Orthodontist: Moving from Mechanic to Metacognitive

AI systems can analyse big data sets, predict treatment results, and spot patterns. However, they lack the sophisticated clinical judgement, ethical reasoning, and patient context awareness that characterise a skilled orthodontist.[1-2]

Only a clinician can assess patient-specific factors such as compliance potential, skeletal discrepancies, or face aesthetics, even though an algorithm may optimise arch coordination in line with idealised dental standards. AI can categorise roots for virtual configurations, but it cannot assess socioeconomic factors that affect psychological preparedness or treatment viability.

In the modern era, Today's orthodontists must transition from appliance specialists to clinical strategists—experts who assess data critically, apply it wisely, and tailor plans to the unique circumstances of each patient.

3. Friend: Empowering the Clinician

When applied properly and sensibly, AI can be a very useful ally. It can improve patient satisfaction by speeding up diagnosis and cutting down on chairside time. It makes

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remote monitoring possible, increasing accessibility for underserved and rural communities. It facilitates consent and treatment visualisation, enhancing patient communication.[2-3]

By simplifying treatment visualisation and consent, it enhances patient communication. Programmes like GPT-4 and Elicit facilitate scientific research, including the synthesis of literature.[4] It is important to view AI as an auxiliary intelligence rather than a replacement intelligence.

4. Foe: Ethical and Clinical Pitfalls

4.1. Left unchecked, automation can undermine clinical integrity

1. Algorithmic bias – Western-sourced datasets are used to build the majority of AI systems. Inaccurate results could result from applying them to Indian or Asian phenotypes[5-6]
2. Diminution of critical thinking - Clinical reasoning may be jeopardised by excessive software use, particularly by trainees.[4]
3. Commercial overreach – Direct-to-consumer AI-driven aligner platforms are upending the conventional orthodontist-patient relationship.
4. Data privacy concerns – Cloud-based solutions must abide by laws like HIPAA – *Health Insurance Portability and Accountability Act* (United States, 1996)
   or GDPR – *General Data Protection Regulation* (European Union, 2016) to guarantee the secure handling of sensitive patient data. As a result, academic institutions and regulatory bodies need to establish guidelines for clinical accountability, ethical safeguards, and AI validation.[7]

5. India's Contribution to the Confluence of AI and Orthodontics

India's Position at the Intersection of AI and Orthodontics; India's vast clinical experience and technological know-how put it in a strong position to spearhead the AI revolution in orthodontics. Concrete steps may include:

1. One workable strategy to lessen bias in global AI models may be to create datasets that are ethnically representative.[5-6]
2. Working together with organisations like IITs and AIIMS to develop and validate orthodontic AI tools.
3. Creating data-sharing hubs for multiple centres under the Indian Orthodontic Society's (IOS) auspices.
4. Including digital literacy and AI ethics in postgraduate programmes to create clinicians who are prepared for the future.[4]
5. Encouraging startups in aligner tech and diagnostic AI to pursue rigorous academic validation before clinical deployment.

To conclude, artificial intelligence is a tool that depends on our participation as orthodontists; it is neither intrinsically beneficial nor detrimental. The future of our speciality depends on directing technology in a way that is inclusive, rational, and morally sound rather than caving in to it. It is our duty as editors, instructors, and medical professionals to make sure that the scientifically supported, patient-centered, and technologically sophisticated orthodontic point of view is given first priority. Possibility of conformance. AI can split roots for virtual setups, but it cannot identify socioeconomic factors that influence psychological readiness or treatment viability.

Current orthodontists need to transform themselves from appliance specialists into clinical strategists who thoroughly evaluate data, properly apply it, and customise treatment regimens to each patient's specific needs.

6. Conflict of Interest

None.

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