The Open Dentistry Journal
DOI: 10.2174/0118742106313426081007404, 2026, 20, e187421063134
ISSN: 1874-2106
1

SUPPLEMENTARY MATERIAL **OPEN ACCESS**

Utilizing Artificial Intelligence to Diagnose Temporomandibular Joint Osteoarthritis *via* Orthopantomographs

Thanh Manh Nguyen[1,*], Thanh Chi Nguyen[2], Hong Thu Thi Le[2], Huyen Thi Phung[3], Hung Trieu Dang[3], Nguyen Manh Truong[3], Quynh Thanh Thi Nguyen[4], Phuong Thu Thi Nguyen[1], Hanh My Bui[1], Anh Ngoc Thi Le[5] and Phong Hoang Nguyen[1]

[1]*Hanoi Medical University, Hanoi, Vietnam*
[2]*Le Quy Don Technical University, Hanoi, Vietnam*
[3]*Hanoi Medical University Hospital, Hanoi, Vietnam*
[4]*Align Dental Clinic, Hanoi, Vietnam*
[5]*Research Department, ClinGen A Chau Laboratory, Hanoi, Vietnam*

Abstract:

Introduction/Background: Temporomandibular Joint Osteoarthritis (TMJOA) is a common temporomandibular disorder that substantially impairs quality of life. Although cone-beam computed tomography is considered the gold standard for detecting osseous changes, its routine use is limited. Orthopantomographs are widely available but have reduced sensitivity for early TMJOA. This study aimed to evaluate the clinical utility of an artificial intelligence model for TMJOA diagnosis using panoramic images and to compare its performance with expert assessment.

Materials and Methods: A total of 651 participants with clinical symptoms suggestive of TMJOA were included. An automated deep learning framework based on YOLOv11 was developed to extract regions of interest encompassing the mandibular condyle, articular fossa, and articular eminence to classify joints as normal or osteoarthritic. Model performance was assessed using five-fold cross-validation, and diagnostic metrics evaluated included accuracy, sensitivity, specificity, area under the curve, Cohen's kappa, and McNemar's test.

Results: The AI model achieved a mean accuracy of 0.76, sensitivity of 0.63, specificity of 0.82, and an AUC of 0.72. Compared to experts, the AI demonstrated higher accuracy and sensitivity, while experts retained higher specificity (0.91 compared to 0.82). The agreement between the AI and expert diagnoses was moderate.

Discussion: The AI model achieved moderate diagnostic performance, consistent with prior dental AI literature, and outperformed expert assessment in sensitivity (0.63 vs. 0.51). Conversely, the expert retained higher specificity (0.91), consistent with a conservative interpretive threshold shaped by clinical experience. This sensitivity-specificity trade-off mirrors broader patterns observed in AI-versus-human diagnostic comparisons. These findings support AI as a complementary screening tool, particularly where access to CBCT or specialist expertise is limited.

Conclusion: The proposed AI model improves sensitivity for TMJOA detection on panoramic radiographs and performs comparably to expert clinicians. These findings support the potential role of AI as a cost-effective screening and decision-support tool in routine dental practice, particularly where access to CBCT is limited.

Keywords: Artificial intelligence, Temporomandibular joint osteoarthritis, Orthopantomograph, TMDs, TMJOA, AI.

*Address correspondence to this author at the Hanoi Medical University, Hanoi, Vietnam;
E-mail: manhthanh.hmu@gmail.com

Cite as: Nguyen T, Nguyen T, Le H, Phung H, Dang H, Truong N, Nguyen Q, Nguyen P, Bui H, Le A, Nguyen P. Utilizing Artificial Intelligence to Diagnose Temporomandibular Joint Osteoarthritis *via* Orthopantomographs. Open Dent J, 2026; 20: e187421063134. http://dx.doi.org/10.2174/0118742106313426081007404

Received: February 13, 2026
Revised: July 09, 2026
Accepted: July 20, 2026
Published: August 12, 2026

Table S1. Dataset characteristics of 5-fold validation.

	Dataset	Num of Files	Num of ROIs	Normal	OA
Fold1	Train	520	1040	727	313
	Test	131	262	198	64
	Total	651	1302	925	377
Fold2	Train	521	1042	734	308
	Test	130	260	191	69
	Total	651	1302	925	377
Fold3	Train	521	1042	740	302
	Test	130	260	185	75
	Total	651	1302	925	377
Fold4	Train	521	1042	754	288
	Test	130	260	171	89
	Total	651	1302	925	377
Fold5	Train	521	1042	745	297
	Test	130	260	180	80
	Total	651	1302	925	377