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Artificial Intelligence Performance for Detection of Elongated Styloid Process: A Systematic Review

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ADMINISTRATIVE INFORMATION

Support - KKU.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202650123

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 22 May 2026 and was last updated on 22 May 2026.

INTRODUCTION

Review question / Objective What is the diagnostic performance of AI in the detection of elongated styloid processes?

Rationale To evaluate the performance of AI.

Condition being studied The styloid process elongation detection.

METHODS

Search strategy A systematic search will be conducted in PubMed/MEDLINE, Scopus, and Web of Science from database inception to the final search date. The search strategy will combine three main concepts: elongated styloid process/stylohyoid chain ossification, artificial intelligence/machine learning/deep learning, and radiographic/maxillofacial imaging. No restriction on publication year will be applied.

The main search terms will include the following combinations:

Concept 1: elongated styloid process / stylohyoid chain
"elongated styloid process" OR "styloid process elongation" OR "styloid process" OR "styloid elongation" OR "stylohyoid ligament"

Concept 2: artificial intelligence
"artificial intelligence" OR "machine learning" OR "deep learning" OR "neural network" OR "convolutional neural network" OR CNN OR "segmentation"

Concept 3: imaging
radiograph OR radiography OR "panoramic radiograph" OR OPG OR "cone-beam computed tomography" OR CBCT OR "computed tomography" OR CT OR "dental imaging" OR "maxillofacial imaging"

The search will be adapted to each database.

Participant or population Patients with oral potentially malignant lesions.

Intervention AI.

Comparator Human experts.

Study designs to be included The review will include original primary studies that evaluate the performance of artificial intelligence, machine learning, or deep learning models for detecting, classifying, segmenting, or measuring elongated styloid process, stylohyoid ligament calcification, or stylohyoid chain ossification on radiographic or maxillofacial imaging.

Eligible study designs will include diagnostic accuracy studies, retrospective observational studies, prospective observational studies, cross-sectional studies, external validation studies, comparative diagnostic studies, and AI model-development or validation studies that report test-set performance metrics.

Randomized or prospective comparative studies will also be eligible if they evaluate an AI-based index test for elongated styloid process detection or classification and report diagnostic or classification performance.

Review articles, editorials, letters, case reports, case series without AI performance evaluation, non-human studies, phantom-only studies, technical papers without clinical image-based validation, and studies not reporting relevant performance outcomes will be excluded.

Eligibility criteria Studies using different models of AI to identify the elongated styloid process.

Information sources The information sources will include electronic database searches of PubMed/MEDLINE, Scopus, and Web of Science. Additional sources will include manual screening of reference lists of included studies and relevant review articles, citation tracking of eligible studies, and searches of Google Scholar for potentially missed records. If necessary, study authors will be contacted for missing diagnostic accuracy or test-set performance data.

Main outcome(s) AI performance.

Quality assessment / Risk of bias analysis The risk of bias and applicability concerns for each study included in this review were evaluated using the QUADAS-2 tool, which assesses four domains: Patient Selection, Index Test, Reference Standard,

and Flow/Timing. While completing the QUADAS-2 form, judgments were made based on one of three classifications (Low, High, or Unclear), taking into consideration factors specific to AI-based reviews (such as Spectrum Effects, selection of archival or web images, and selection of regions from lesions).

Strategy of data synthesis Data from the included studies were extracted using a pre-identified working table. The five authors divided the included articles for data extraction, and a consensus was reached through discussion when uncertainties arose.

The following information was extracted from each selected study: study design; imaging modality and acquisition context; AI architecture and training strategy (as reported in the original); reference standard; target condition and binary definition; unit of analysis; and test set sample sizes. Subsequently, 2×2 contingency tables (TP, FP, FN, TN) were extracted/reconstructed. If a study provided sensitivity and specificity along with explicit counts of the test-set classes for both positive and negative cases, we reconstructed TP/FN and TN/FP by dividing the counts by their respective denominators. As long as the denominator used to calculate the proportion is accurate and the original proportion is correctly rounded, the reconstructed integer counts should match the original numbers.

Subgroup analysis None.

Sensitivity analysis The Clopper-Pearson method was used to calculate sensitivity and specificity with 95% confidence intervals (CIs). The sensitivity and specificity for the screening/task (referral-worthy/suspicious vs. not referral-worthy/suspicious) were pooled using separate random-effects inverse-variance meta-analyses on the logit scale with DerSimonian-Laird estimation.¹⁰ The diagnostic odds ratio (DOR) was pooled using random-effects meta-analysis of $\log(\text{DOR})$. Due to the limited number of studies available for pooling, we conducted a sensitivity analysis (i.e., a case-control data set for OSCC vs. normal data sets) and focused on clinical heterogeneity during interpretation we conducted a meta-analysis of eligible studies to indicate the sensitivity of the.

Language restriction Only studies in English language.

Country(ies) involved Saudi Arabia.

Keywords Artificial intelligence, styloid process, styloid elongation, diagnostic imaging.

Contributions of each author

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