# #112 - DEVELOPMENT OF AN ARTIFICIAL INTELLIGENCE SYSTEM FOR DETECTING CHRONIC ATROPHIC GASTRITIS BASED ON ENDOSCOPIC IMAGES

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**Introduction:** Chronic atrophic gastritis (CAG) is a gastric preneoplastic condition. Endoscopic detection of CAG currently relies on gastric mapping biopsies and histopathologic grading to stratify gastric cancer risk. However, these biopsies involve risks (bleeding and perforation) and costs.

**Objective:** Todevelop an artificial intelligence (AI) system to evaluate endoscopic images and detect the presence of moderate to severe gastric atrophy.

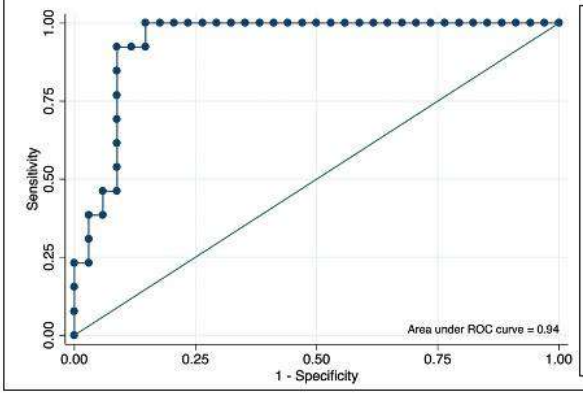
**Methodology:** We performed a prospective diagnostic test study. An AI algorithm was created to determine the degree of gastric atrophy on gastroscopy videos. In the first phase, we implemented a gastric segment recognition algorithm using trained convolutional neural network models. In the second phase, we trained deep learning models to classify segmented regions into absent/mild atrophy *vs.* moderate/severe atrophy, using histopathological diagnosis as the gold standard. Finally, validation was performed in 47 new consecutive videotaped endoscopies from patients and compared the AI prediction to the histopathological diagnosis.

**Results**: In the study's first phase, gastric segment recognition showed high sensitivity and specificity to determine the region of the endoscopic images (body, incisura angularis and antrum, Table). In the second phase, the AI system achieved satisfactory overall sensitivity and specificity in detecting moderate to severe gastric atrophy (Table). Finally, in the prospective validation phase, the AI system also outperformed the endoscopist in the diagnosis of moderate to severe gastric atrophy (OLGA II-IV) with a sensitivity and specificity of 92% and 91% *vs.* 85% and 75%, respectively (Table). This AI approach showed a negative predictive value of 97% and may help to avoid up to 68% of unnecessary gastric biopsies.

**Conclusion**: The development of this AI system for detecting gastric atrophy on endoscopic images demonstrates a high potential to improve the accuracy and efficiency of clinical diagnosis. However, further prospective external validation is required to confirm its effectiveness and safety.

| **First phase: Recognition of gastric segments** | | | | | |
|---|---|---|---|---|---|
| | **Sensitivity** | **Specificity** | | | |
| Antrum (%) | 93.5 | 98.5 | | | |
| Incisura angularis (%) | 97.3 | 97.8 | | | |
| Body (%) | 98 | 97.2 | | | |
| **Second phase: Recognition of moderate to severe atrophy*** | | | | | |
| | **Sensitivity** | **Specificity** | | | |
| Antrum (%) | 71.7 | 77.7 | | | |
| Incisura angularis (%) | 64.7 | 81.2 | | | |
| Body (%) | 74.2 | 68.9 | | | |
| **Third phase: Prospective validation of the model in consecutive endoscopies (n=47)** | | | | | |
| | **Sensitivity** | **Specificity** | **PPV** | **NPV** | **AUC** |
| Global (%)* | 92.3 | 91.2 | 80 | 96.9 | 0.94 |
| Antrum (%)+ | 66.7 | 59.1 | 10 | 96.3 | 0.61 |
| Incisura angularis (%)+ | 75 | 69.8 | 18.8 | 96.8 | 0.76 |
| Body (%)+ | 88.9 | 84.2 | 57.1 | 97 | 0.91 |

**Recognition of global score OLGA II-IV; +Recognition of moderate to severe atrophy established by OLGA segmental score 2 or 3; PPV: Positive predictive value; NPV: Negative predictive value; AUC: Area under the curve.*




***a.*** *Table of statistical parameters of different models to classification images vs. OLGA results by biopsy or classification of images vs Segment of Stomach.*

***b.*** *Receiving operative curve analysis for the diagnosis of OLGA II-IV by the AI system.*