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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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THE RELEVANCE OF THE ENDOCYTOSCOPY IN MODERN ENDOSCOPY

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Abstract.

Early detection of gastric cancer remains a critical objective in modern gastrointestinal endoscopy, as diagnosis at an early stage significantly improves therapeutic outcomes and patient survival. Endoscopic examination represents the cornerstone of gastric cancer diagnosis and incorporates both conventional and advanced imaging techniques to enhance lesion detection and characterization.

White light endoscopy (WLE) is the primary and most widely used diagnostic modality; however, its sensitivity for identifying early neoplastic changes is limited. Advanced techniques such as chromoendoscopy and narrow-band imaging (NBI) improve mucosal visualization by enhancing surface patterns and microvascular architecture, thereby increasing the detection rate of suspicious lesions. Endocytoscopy, a high-magnification endoscopic technique, enables real-time in vivo visualization of cellular and subcellular structures, allowing optical biopsy and more accurate differentiation between neoplastic and non-neoplastic gastric lesions.

The aim of this article is to compare the diagnostic performance of WLE, chromoendoscopy/NBI, and endocytoscopy in the detection of early gastric cancer, and to evaluate the clinical value of endocytoscopy as an adjunctive tool in modern endoscopic practice. The integration of endocytoscopy into routine diagnostic algorithms may improve diagnostic accuracy and contribute to more precise and timely management of patients with early gastric cancer.

Key words. Endocytoscopy, gastroscopy, high-resolution endoscopy, endoscopic imaging, cancer detection.

Introduction.

The primary goal of endoscopic evaluation is the timely detection of pathological changes within the gastrointestinal tract, along with accurate determination of their localization, structural characteristics, and stage. Advances in modern endoscopic technologies have significantly transformed diagnostic strategies, shifting preference toward methods that provide visualization approaching histological assessment without the need for biopsy.

Endocytoscopy represents one of the most advanced and promising technological modalities, allowing real-time visualization of the mucosal surface at a cellular level. Its principal objective is to generate images of such high resolution and diagnostic precision that they closely correspond to histopathological findings.

This approach is particularly crucial for the identification of early gastric cancer and precancerous conditions, where precise recognition of morphological alterations plays a determinative role. Accurate assessment of epithelial architecture and cytological abnormalities is essential for early diagnosis, and endocytoscopy greatly enhances the clinician's ability to evaluate these subtle yet clinically significant changes [1].

Main Body.

White-Light Endoscopy (WLE):

White-light endoscopy (WLE) is one of the most widely used techniques for detecting early gastric cancer and precancerous alterations of the mucosa, including intestinal-type epithelial hyperplasia and atypical dysplasia. Despite its broad clinical application, the identification of certain early or small microscopic lesions remains challenging under standard white-light visualization.

According to recent meta-analyses, the diagnostic performance of WLE demonstrates the following values:

- **Sensitivity:** 0.59 (59%; 95% CI: 0.49–0.69)
- **Specificity:** 0.77 (77%; 95% CI: 0.65–0.86)
- **Area Under the Curve (AUC):** 0.71 (95% CI: 0.67–0.75)

These findings highlight the limitations of WLE for the detection of subtle mucosal abnormalities and underscore the need for complementary imaging modalities to enhance the accuracy of early gastric cancer diagnosis [2-4].

White Light Endoscopy (WLE):

White Light Endoscopy (WLE) is the basic and most widely used method of gastrointestinal endoscopic examination and forms the foundation of all modern endoscopic investigations.

1. Indications:

White light endoscopy is used as a primary diagnostic method during endoscopic evaluation and includes:

- Routine examination of the gastrointestinal tract
- Assessment of dyspepsia, dysphagia, heartburn, and abdominal pain
- Identification of the source of upper and lower gastrointestinal bleeding
- Diagnosis of inflammatory diseases (gastritis, colitis)
- Screening and initial detection of neoplasms
- Selection of target sites for biopsy
- Pre-procedural assessment before therapeutic endoscopic interventions.

2. What White Light Endoscopy Visualizes:

This method provides macroscopic visualization of the mucosa, including:

- Mucosal color and tone
- Surface relief and structural features
- Erosions and ulcers
- Hyperemia and edema
- Polyps and mass lesions
- Signs of active or previous bleeding.

White light endoscopy is limited in the detailed identification of microstructural changes and early neoplastic processes.

3. Advantages:

- Simple and rapid application
- Wide availability
- Broad real-time field of view
- High reliability in detecting obvious pathological changes
- A standard technique upon which advanced endoscopic imaging technologies are based
- Effective for screening and general diagnostic purposes.

4. Summary:

White light endoscopy is a fundamental method in endoscopic diagnostics, essential for the initial assessment of gastrointestinal mucosa and serves as the basis for the subsequent application of more advanced visualization technologies.

Chromoendoscopy.

Chromoendoscopy, or targeted mucosal staining performed during endoscopy, is a relatively older yet still widely utilized diagnostic method. Its use spans several decades and relies on the local application of dyes or pigments to enhance lesion localization, improve visual characterization, and increase diagnostic accuracy.

This technique represents an important adjunct to standard endoscopy. The contrast generated between normal and pathologically stained epithelium significantly facilitates the visualization of abnormal areas and ensures greater precision in obtaining targeted biopsies [5].

Chromoendoscopic methods differ from one another according to their mechanisms of action. The first group consists of absorptive dyes, with methylene blue being the most typical example. Methylene blue effectively stains the epithelium of the esophagus, stomach, small intestine, and colon, as well as areas of metaplastic transformation.

Chromoendoscopy using Lugol's iodine is based on a glycogen-dependent staining mechanism and is an effective diagnostic technique for the early detection of squamous cell carcinoma. Lugol's solution intensely stains glycogen-rich squamous epithelial cells, causing normal mucosa to appear brown due to the iodine–glycogen reaction.

In contrast, dysplastic or neoplastic areas, which typically exhibit reduced glycogen content and increased glycolytic activity, remain unstained or only faintly stained.

Such striking contrast significantly facilitates the visualization of pathological regions and improves the accuracy of targeted biopsy sampling [6,7].

Among contrast dyes, indigo carmine is the most widely used agent. Owing to its deep blue coloration, it provides clear delineation of mucosal surface patterns and enhances visualization of subtle relief irregularities. According to existing studies, the use of indigo carmine in combination with acetic acid significantly improves diagnostic accuracy and increases the sensitivity for detecting pathological mucosal changes [8,9].

Chromoendoscopy – Indications and Advantages.

Chromoendoscopy:

Chromoendoscopy is an endoscopic technique in which the mucosal surface is stained with special dyes. This method allows enhanced visualization of the mucosal architecture, surface patterns, and subtle structural changes that may remain undetected during conventional white light endoscopy.

Indications for Chromoendoscopy:

Chromoendoscopy is used in the following clinical situations:

- Detection of early neoplasia and cancer of the gastrointestinal tract
- Identification of dysplastic areas in Barrett's esophagus
- Surveillance of inflammatory bowel diseases (ulcerative colitis and Crohn's disease) for dysplasia
- Detailed evaluation of polyps, including their borders, surface structure, and morphology
- Performing targeted biopsies, especially from suspicious mucosal areas.

Commonly used dyes in chromoendoscopy include:

Indigo carmine – for enhancement of mucosal relief and surface patterns

Methylene blue – for assessment of epithelial absorption characteristics

Lugol's solution – mainly used in esophageal examinations.

Advantages of Chromoendoscopy:

Chromoendoscopy has several important advantages:

- High sensitivity for the detection of early and subtle lesions
- Detailed visualization of the mucosal surface and precise delineation of lesion margins
- Ability to perform targeted biopsies, increasing diagnostic accuracy
- Relatively low cost compared to advanced virtual chromoendoscopy technologies
- Wide availability, as it does not require specialized endoscopic equipment.

Conclusion:

Chromoendoscopy is an effective and valuable method for the detection of early pathological changes of the gastrointestinal mucosa. Its use is particularly recommended for the diagnosis and surveillance of dysplasia and early neoplastic lesions, as it significantly improves diagnostic accuracy.

Narrow-Band Imaging (NBI).

Optical Principle and Clinical Significance:

Narrow-band imaging (NBI) is a modern endoscopic technology that provides high-quality visualization of the mucosal surface and microvascular architecture. The technique is based on the use of special optical filters which, instead of standard white light, employ two specific narrow wavelengths—blue light (approximately 415 nm) and green light (approximately

540 nm). These wavelengths are selected to optimize the visualization of the vascular network, as hemoglobin strongly absorbs light within this range.

As a result, capillary structures appear markedly more contrasted and sharply defined in NBI mode compared with conventional white-light endoscopy [10].

NBI allows for precise assessment of the shape, branching patterns, thickness, and regularity of capillaries. Irregular, dilated, or asymmetric microvessels are frequently associated with dysplasia and early neoplasia [11].

Evaluation of the superficial mucosal microstructure—including epithelial surface irregularity, loss of structural organization, and deformation—also provides important diagnostic clues and may indicate the presence of pathological changes [12].

NBI technology is particularly valuable for the screening of esophageal squamous cell carcinoma, for the differentiation of gastric cancer and superficially altered pathological tissues, and for guiding post-treatment surveillance and management strategies [13,14].

Narrow Band Imaging (NBI).

Narrow Band Imaging (NBI) is an advanced endoscopic imaging technique that uses narrow-spectrum light to enhance visualization of the mucosal surface and vascular structures.

1. What Narrow Band Imaging (NBI) Visualizes:

NBI provides enhanced visualization of mucosal microvascular and microstructural details, including:

- Clear depiction of the superficial capillary network (intrapapillary capillary loops)
- Alterations in microvascular architecture
- Mucosal surface micropatterns
- Sharp contrast between normal and pathological areas
- Visual delineation of dysplastic and neoplastic lesions
- Irregular vascular patterns characteristic of early cancer

NBI is particularly effective in the detection of early neoplastic changes that may be subtle or invisible under white light endoscopy.

2. Advantages:

- Improves detection of early neoplasia and dysplasia
- Provides high-contrast visualization of mucosal and vascular structures
- Increases diagnostic accuracy for targeted biopsy selection
- Reduces the need for random biopsies
- Allows real-time assessment without the use of dyes
- Easily integrated into routine endoscopic practice (one-button activation)
- Especially effective in the diagnosis of Barrett's esophagus and early gastric and colorectal cancers.

3. Summary:

Narrow Band Imaging is an important adjunct to white light endoscopy, significantly enhancing the detection of mucosal microstructural and vascular abnormalities and playing a crucial role in the early diagnosis of gastrointestinal neoplasia.

Endocytoscopy.

Endocytoscopy is an advanced, ultra-high-magnification endoscopic technique that enables detailed, high-resolution in vivo evaluation of pathological areas within the gastrointestinal tract. The method employs intraprocedural contrast staining, allowing the endoscopist to visualize mucosal microstructural alterations at the cellular level and accurately assess the nature of the cells as well as the degree of their abnormality [15].

Since the introduction of the first-generation endocytoscope in 2003, the technology has undergone substantial evolution. Modern endocytoscopes now provide significantly refined imaging quality and enhanced diagnostic capabilities. The latest-generation devices incorporate a single integrated lens system that allows continuous zoom-focusing with magnification up to 500×. The instrument offers a 670 μm × 500 μm observation field and an external diameter of 9.7 mm, making it more compact and maneuverable compared with standard diagnostic endoscopes [15].

Role of Endocytoscopy in Detecting Early Gastric Neoplasia.

Early-stage gastric cancer often presents as a subtle, flat, or slightly elevated lesion, the identification of which remains challenging with conventional endoscopy. Endocytoscopy provides the capability to detect these early mucosal abnormalities by enabling real-time visualization of epithelial and cellular features that may not be apparent under standard magnification.

Endocytoscopic evaluation allows for detailed real-time assessment of multiple cellular and structural features, including:

- Morphological atypia, such as alterations in nuclear size, shape, and overall cellular architecture.
- Visualization of intercellular borders and precise determination of the nuclear-to-cytoplasmic ratio.
- Identification of dysplastic changes and features suggestive of adenocarcinoma directly during the procedure.

This modality is particularly valuable when accurate differentiation between neoplastic and non-neoplastic alterations is essential. Such capability helps minimize the need for unnecessary or excessive biopsies and enhances targeted sampling accuracy.

Localization of Pathological Changes.

During the procedure, the application of contrast stains—such as methylene blue or crystal violet—provides clear visualization of nuclear structures. This enhanced staining is particularly useful in identifying the following pathological conditions:

- Intestinal metaplasia
- Atrophic gastritis
- Low- and high-grade dysplasia
- Early adenocarcinoma.

Role of Endocytoscopy in the Evaluation of Gastric Neoplastic Lesions.

The first in vivo endocytoscopic study was conducted by Eberl and colleagues, who assessed neoplastic changes in the gastric mucosa using endocytoscopy with methylene blue staining. A total of 23 gastric mucosal specimens were evaluated. Their findings demonstrated a sensitivity of 56% and a specificity of 89% for detecting neoplastic lesions [16,17].

A subsequent study was performed at Nagoya University Hospital in Japan, where endocytoscopic evaluation was

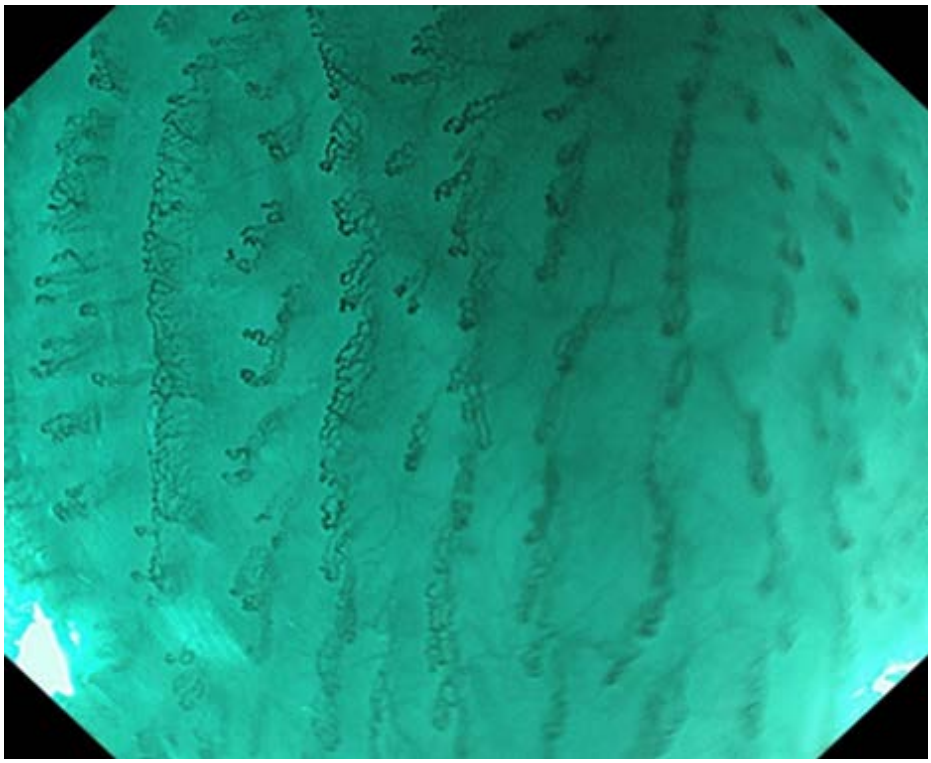

Figure 1. *The mucosa exhibits a pale greenish hue. A fine, regular, and evenly distributed branching capillary network is visible on the surface. The capillaries form an orderly, glandular pattern consistent with the normal microarchitecture of the gastric mucosa. No demarcation line, elevated areas, or surface irregularities are observed.*

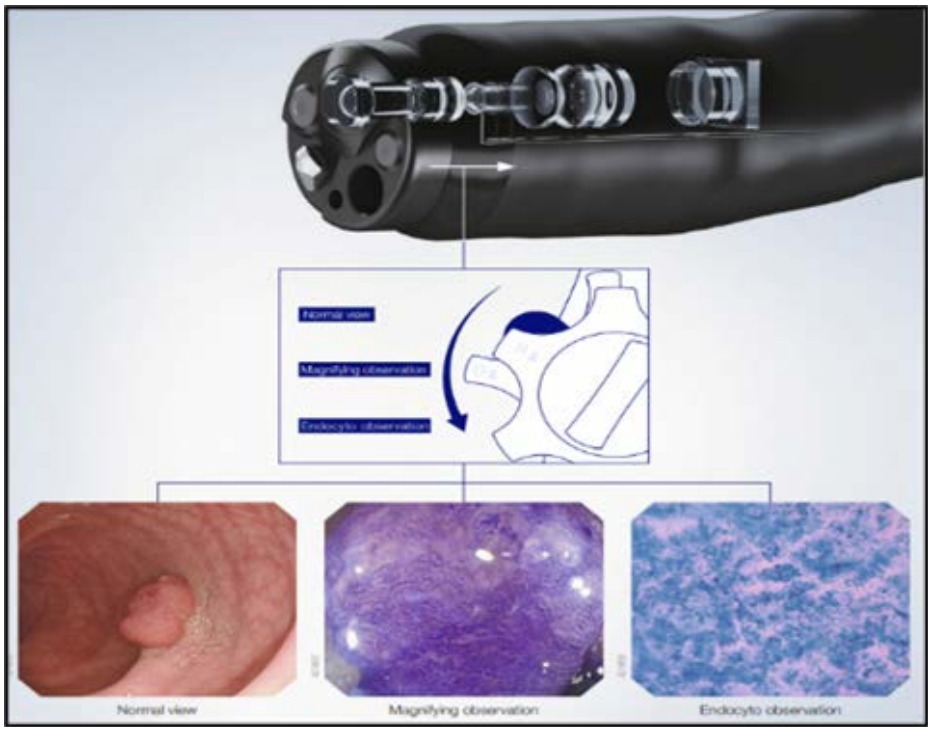

Figure 2. *The image demonstrates an endoscopic view in which the mucosa appears brownish-reddish in tone. A well-demarcated, slightly elevated mucosal area is observed. On its surface, there is disruption of the microvascular architecture, characterized by dilated and irregular capillaries. The surface pattern is irregular, with a centrally distinct structural configuration, indicating uneven epithelial arrangement. These features may correspond to adenomatous changes or early gastric cancer.*

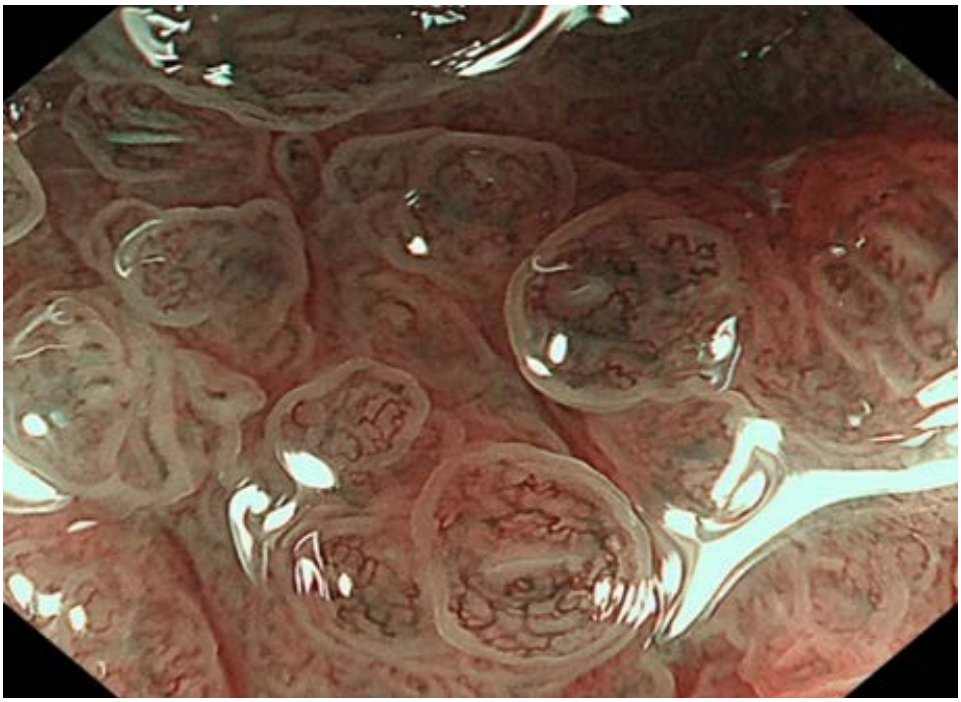

Figure 3. *The mucosa appears prominently swollen with regular circular crypts. Each crypt demonstrates a well-defined border and a dark internal reticular pattern, corresponding to the crypt structures and the interpapiIlary capillary network. The capillary architecture is regular, with uniform diameter and branching. The mucosal surface is smooth and even, with preserved sheen, indicating non-infiltrative and non-malignant characteristics.*

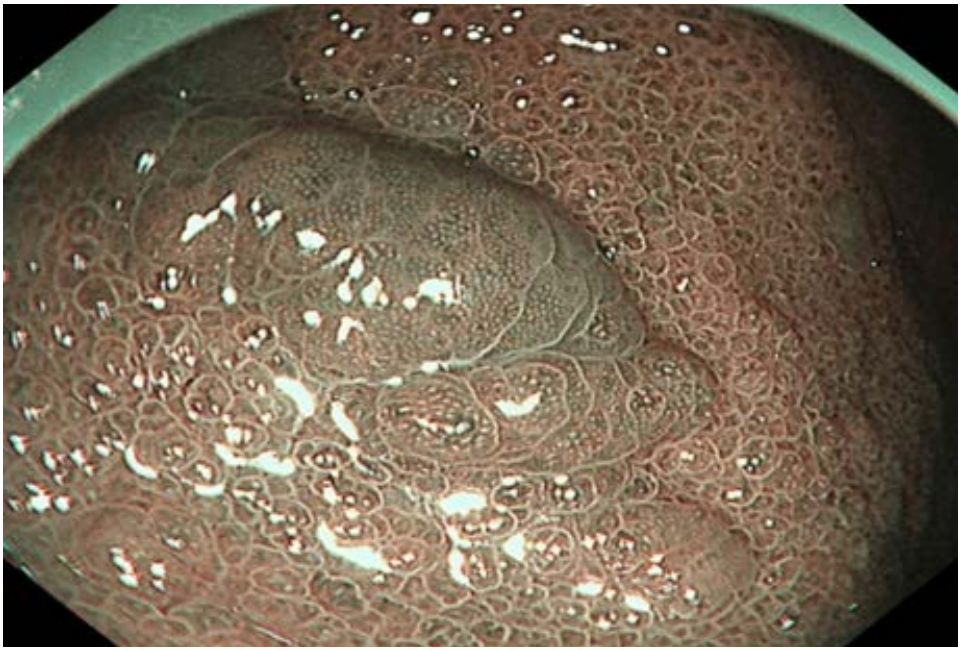

Figure 4. *The mucosa is markedly disrupted, with loss of the normal regular crypt architecture. An irregular, diffuse dark reticular and dotted pattern is observed, reflecting pathologically dilated and uneven vascular networks. The surface appears coarse, with loss of smoothness, and demonstrates areas of prominent depression as well as elevated regions. The coloration is heterogeneous, with focal areas of darker pigmentation, suggestive of characteristic vascular proliferation.*

conducted on 30 patients with early gastric cancer. Among these, 26 cases were diagnosed as differentiated adenocarcinoma, while 4 cases represented undifferentiated adenocarcinoma, including one signet-ring cell carcinoma.

Following dual staining with 0.05% crystal violet and 0.1% methylene blue, both neoplastic and non-neoplastic areas were examined. The resulting endocytoscopic images were independently evaluated by an expert endoscopist and an expert pathologist, after which the endocytoscopic diagnoses were compared with histopathological findings.

Endocytoscopic Findings.

- In differentiated adenocarcinoma, the mucosal epithelium exhibited irregular, branching glands, variable gland lumen diameters, irregular epithelial arrangement, and distinctly stained nuclei.
- In undifferentiated adenocarcinoma, glandular architecture appeared effaced or absent, while the nuclei showed heterogeneous morphology and intense staining.

A characteristic feature observed in both differentiated and undifferentiated types was the "enhanced nuclear sign," which represents a key cytological marker in the early diagnosis of gastric cancer.

Diagnostic Performance.

The correlation between endocytoscopic findings and histopathological results was 90%, underscoring the high diagnostic potential of endocytoscopy. According to the study, the sensitivity for detecting early gastric cancer was 92%, while the overall diagnostic accuracy reached 85% [18].

Endocytoscopy (EC).

Endocytoscopy (EC) is an ultra-high magnification endoscopic technique that allows real-time, in vivo evaluation of the gastrointestinal mucosa at the cellular and subcellular level.

1. What Endocytoscopy Visualizes:

Endocytoscopy provides so-called optical biopsy, enabling microscopic assessment of the mucosa with a level of detail close to histopathology. It allows visualization of:

- Epithelial cell morphology and arrangement
- Cellular size variation and pleomorphism
- Nuclear shape, size, and staining characteristics
- Nuclear-to-cytoplasmic ratio
- Glandular architecture
- Cytological features characteristic of dysplasia and early carcinoma

Endocytoscopy is particularly valuable for differentiating dysplastic and neoplastic lesions when macroscopic changes are minimal or absent.

2. Advantages:

- Real-time evaluation of the mucosa at the cellular level
- Visualization closely comparable to histological examination (optical biopsy)
- High diagnostic accuracy for the detection of early neoplasia
- Precise selection of targeted biopsy sites
- Reduction in unnecessary biopsies
- Rapid clinical decision-making during endoscopy
- Especially effective for assessment of the esophageal, gastric, and colorectal mucosa.

3. Summary:

Endocytoscopy represents the highest level of endoscopic imaging, complementing white light endoscopy and narrow band imaging by enabling real-time cellular-level assessment of the gastrointestinal mucosa.

Recommendation.

For the effective diagnosis of early gastric cancer, a multimodal endoscopic approach is recommended. White light endoscopy should be used as the initial screening method, while narrow band imaging and/or chromoendoscopy should be applied for detailed assessment of suspicious mucosal areas. Endocytoscopy may be used in selected cases to achieve high diagnostic accuracy at the cellular level.

Key Recommendations.

The European Society of Gastrointestinal Endoscopy (ESGE), the European Helicobacter and Microbiota Study Group (EHMSG), and the European Society of Pathology (ESP) recommend population-based endoscopic screening for gastric cancer and precancerous conditions in high-risk regions, where the age-standardized incidence rate (ASR) exceeds 20 per 100,000 population per year. In such settings, screening every 2–3 years is considered appropriate. In moderate-risk regions (ASR 10–20 per 100,000 per year), screening is recommended at 5-year intervals. However, for low-risk regions (ASR <10 per 100,000 per year), routine endoscopic screening is not recommended [19].

Conclusion.

Gastric cancer remains one of the most significant oncological challenges worldwide, and its early diagnosis is crucial for improving patient survival. Advances in modern endoscopic technologies have substantially transformed the detection capabilities for gastrointestinal tract pathologies, enabling a shift toward higher-resolution and more precise visualization.

The introduction of chromoendoscopy and narrow-band imaging (NBI) has facilitated detailed assessment of mucosal topography and microvascular patterns, thereby increasing the accuracy of early neoplasia detection. At the cellular diagnostic level, endocytoscopy has emerged as an innovative and promising modality. Its high sensitivity and specificity confirm its value in identifying early gastric cancer and dysplastic lesions. Particularly noteworthy is the "enhanced nuclear sign," which serves as an important morphological indicator in distinguishing differentiated from undifferentiated adenocarcinoma.

Studies demonstrate that endocytoscopic evaluation corresponds closely with histopathological diagnosis in the majority of cases, further reinforcing its clinical utility.

In summary, the effectiveness of early gastric cancer diagnosis is strongly dependent on advanced endoscopic technologies. The integration of modern screening and enhanced visualization techniques into clinical practice represents a vital step toward improving early detection, enabling more accurate therapeutic planning, and ultimately enhancing patient outcomes.

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АННОТАЦИЯ

Рак желудка является одной из наиболее серьёзных проблем в системе мирового здравоохранения. По сравнению с другими злокачественными новообразованиями, он относится к числу наиболее часто диагностируемых онкологических патологий и характеризуется высокой летальностью. Географическое распределение заболеваемости существенно варьирует, при этом наиболее высокие показатели отмечаются в ряде регионов Азии.

В развитии рака желудка решающую роль играют многочисленные факторы риска, включая инфекцию **Helicobacter pylori**, нездоровые пищевые привычки, генетическую предрасположенность и пожилой возраст. Заболевание нередко выявляется на поздних стадиях вследствие позднего появления клинических симптомов, что снижает ожидаемую продолжительность жизни и уменьшает показатели выживаемости.

Основой диагностической оценки является эндоскопическое исследование. Эндоскопический скрининг представляет собой эффективный метод выявления рака желудка и включает в себя несколько технологий, таких как эндоскопия в белом свете (WLE), хромоэндоскопия и эндоцитоскопия.