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Impact of gastrointestinal tract diseases on the oral cavity manifestations

Katarzyna Szczeklik[1], Patryk Kałuża[1], Dagmara Darczuk[2]

[1] Department of Integrated Dentistry, Institute of Dentistry, Jagiellonian University Medical College, Kraków, Polska
[2] Department of Periodontology, Prophylaxis and Oral Medicine, Institute of Dentistry, Jagiellonian University Medical College, Kraków, Polska

Corresponding author: Katarzyna Szczeklik, D.D.S., Ph.D., D.Sc.
Department of Integrated Dentistry, Institute of Dentistry, Jagiellonian University Medical College
ul. Montelupich 4, 31-255 Kraków, Polska
Phone: +48 12 424 54 65; E-mail: k.szczeklik@uj.edu.pl

Abstract: Gastrointestinal diseases often manifest in the oral cavity, sometimes preceding systemic symptoms and serving as early indicators of underlying conditions. This review explores the oral manifestations associated with various gastrointestinal disorders, emphasizing their diagnostic significance and the importance of interdisciplinary collaboration. Diseases such as Crohn's disease, ulcerative colitis, celiac disease, gastritis, peptic ulcer disease, gastroesophageal reflux disease (GERD), and rare syndromes like Peutz-Jeghers, Gardner's, Cowden, and Plummer-Vinson are discussed in terms of their oral presentations. These include specific lesions such as lip swelling, mucositis, enamel defects, and pigmentation, as well as non-specific symptoms like aphthae, glossitis, dry mouth, and halitosis. Early recognition of oral symptoms can facilitate timely diagnosis and treatment, improving patient outcomes. Despite growing interest, further research is needed to clearly define oral manifestations across gastrointestinal diseases and enhance diagnostic protocols.

Keywords: Crohn's disease, ulcerative colitis, celiac disease, oral manifestations, gastrointestinal disorders, enamel defects, interdisciplinary diagnosis.

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Gastrointestinal diseases can significantly affect oral health, and their symptoms are often the first signs of systemic disorders, appearing even before typical digestive system manifestations. Lesions within the oral cavity and its surrounding areas can represent manifestations of an underlying disease or result from a deterioration in general health. These lesions can involve both soft and hard tissues and affect their morphology and function. Their early recognition can be crucial in differential diagnosis and quicker identification of gastrointestinal diseases.

The oral cavity shares a common embryological origin with other parts of the gastrointestinal tract, often reflecting pathological changes occurring within it [1]. As a result, diseases can manifest themselves in the oral cavity at various progression stages, even before systemic symptoms, concurrently with them, or after they subside [2]. These symptoms can result from the direct effect

of pathogenic factors on the mucosa, malabsorption of nutrients, deficiencies in micro- and macroelements, as well as adverse effects of pharmacological therapy [3, 4]. There is a strong relationship between gastrointestinal health and the condition of the oral cavity, referred to as the oral-gut microbiome axis. Any disorders in one of these systems can affect the others through changes in the microbiome, nutritional deficiencies, and inflammatory processes [5].

Oral cavity lesions can be either painful and impair function, or painless, with the patient being unaware of their presence. A detailed medical history and thorough clinical examination of the oral cavity are key in diagnosing diseases. Lesions located in this area can be the first sign of illness and are easily detectable during a comprehensive dental examination, highlighting the important role of dentists in early diagnosis and interdisciplinary patient care [3, 6].

The following review of the literature presents gastrointestinal diseases that can manifest within the oral cavity:

Crohn's Disease

Crohn's disease (CD), along with ulcerative colitis, is an inflammatory bowel disease (IBD). Crohn's is a chronic disease characterized by periods of symptom exacerbation and remission, occurs in both children and adults, and has seen increasing incidence in recent years. The inflammatory process in CD can affect any part of the gastrointestinal tract, from the oral cavity to the anus, although it most commonly occurs in the ileocecal region [7]. The exact cause of the disease remains unknown, with genetic, immunological, and environmental factors, such as stress, smoking, diet, and gut microbiota disorders being considered [5]. Patients with CD typically report abdominal pain, diarrhoea, fever, and weight loss. Extraintestinal manifestations can also be present and can involve the liver, joints, skin, eyes, and oral cavity, as well as complications such as fistulas, strictures, intestinal perforations, intra-abdominal abscesses, and consequences of nutritional deficiencies [7, 8].

Oral manifestations in CD are common and occur in approximately 20–50% of patients and can be the first sign of the disease or accompany its active phase [8–13]. In a single patient, various types of lesions can be concomitant [10, 12–14], and are classified as specific or non-specific lesions [3, 11, 15].

Specific lesions include: lip swelling (Fig. 1) with chronic enlargement and the presence of vertical fissures along the vermilion border; oral angioedema involving swelling of the lips and cheeks (known as cheilitis granulomatosa); mucositis, and gingival hypertrophy, which can be confirmed by histopathological examination (biopsy) [3, 4]. Additionally, linear furrows on the buccal mucosa surrounded by mucosal hypertrophy create a characteristic cobblestone-like appearance (Fig. 2) [3, 6, 12].

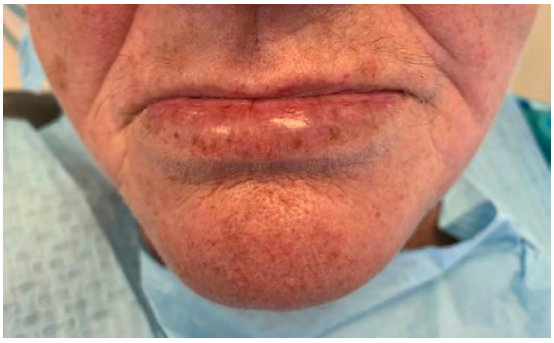

Fig. 1. Clinical symptom: lip swelling.

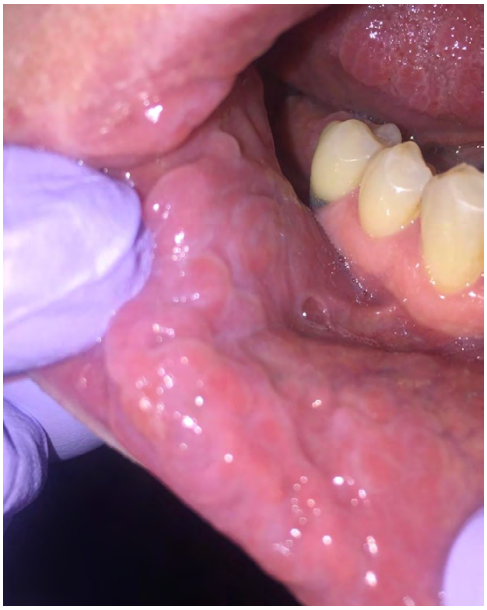

Fig. 2. Clinical symptom: cobblestone-like appearance of the oral mucosa.

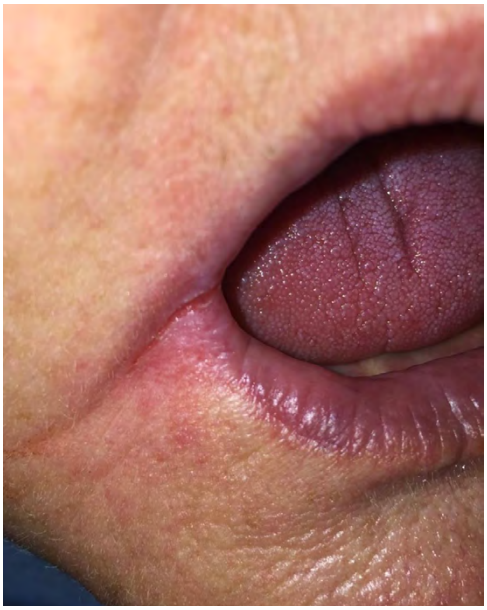

Fig. 3. Clinical symptom: angular cheilitis.

Nonspecific oral symptoms in CD include ulcerations, aphthous stomatitis, and angular cheilitis (Fig. 3). Aphthae are often recurrent and resemble typical recurrent aphthous stomatitis, and appear as multiple, round or oval lesions surrounded by an erythematous halo. Angular cheilitis is associated with Candida infection and is among the most common extraintestinal manifestations [12, 15, 16]. Moreover, periodontitis is frequently also found in these patients [17].

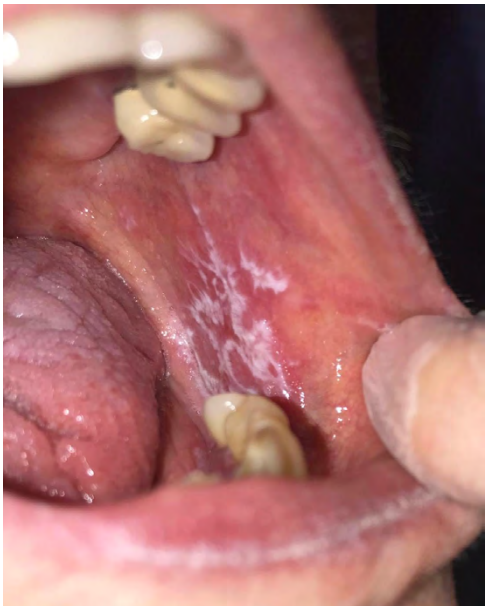

Fig. 4. Clinical symptom: oral lichen planus.

Other non-specific oral symptoms in CD include enlargement of submandibular lymph nodes, dry mouth, dental caries, halitosis, oral lichen planus (Fig. 4), taste disturbances, glossitis, mucosal discoloration, and mild enlargement of salivary glands [3, 10, 11, 13]. Therefore, oral manifestations are an important clinical aspect of CD, potentially appearing before any intestinal symptoms or coexisting with them. They may serve as early indicators of the disease and are crucial for diagnosis and treatment [6, 13].

The dynamic development of research on gastrointestinal microbiota has led to increased interest in its relationship with its location in the oral cavity and introduced the concept of the oral-gut

microbiome axis, which refers to the interdependence between oral and gut microbiota. In recent years, many authors have emphasized the need to improve oral health in patients with IBD [18].

Ulcerative Colitis

Ulcerative colitis (UC) is classified as an inflammatory bowel disease (IBD). While its etiopathogenesis is not fully understood, significant roles are played by interactions between genetic, microbiological, and environmental factors, as well as disturbances in immune response [19]. UC is characterized by chronic, diffuse inflammation of the rectum and colon mucosa, with periods of symptom exacerbation and remission. Bloody diarrhoea, abdominal pain, anaemia, and weight loss occur during flare-ups, and occasionally also extraintestinal manifestations, such as arthritis, liver damage, skin lesions, and other issues [19–21].

Oral manifestations in UC are less common than in Crohn's disease, but they are often similar [11, 13]. The most frequent include painful ulcerations and recurrent aphthae caused by chronic inflammation and immune dysfunction, glossitis with accompanying papillary atrophy (Fig. 5), smooth tongue surface and burning sensation, cheilitis, stomatitis, gingivitis, and angular cheilitis [2, 3, 9, 19, 20]. These are often due to nutritional deficiencies, primarily iron, folic acid, and vitamin B12, and as a consequence of chronic intestinal inflammation. However, the lesions can also result from the adverse effects of the medication used in UC therapy [20].

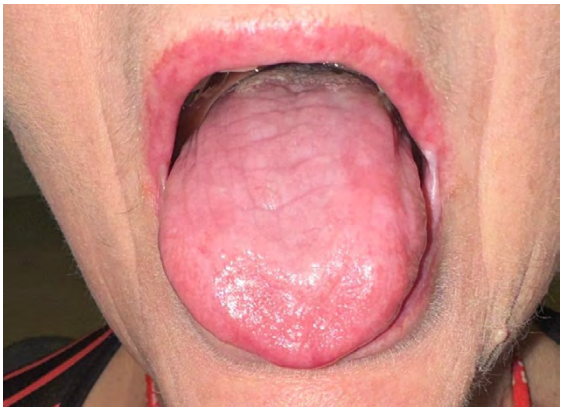

Fig. 5. Clinical symptom: glossitis with papillary atrophy.

A characteristic, though rare, oral lesion in UC patients is pyostomatitis vegetans, which is considered to be a specific marker of disease activity [20, 21]. Pyostomatitis vegetans manifests as numerous pustules (intra- and subepithelial abscesses), with white and yellow content on an erythematous and oedematous base, which can rupture or coalesce, leading to ulcerations on the buccal mucosa, tongue, palate, and lips. Pyostomatitis vegetans tends to recur and can be painful. Moreover, patients can experience general symptoms such as fever, tenderness, and enlargement of the submandibular lymph nodes [21]. UC patients might also complain about symptoms such as burning tongue, dry mouth, or halitosis, which significantly reduce their quality of life [20, 21]. Patients may also develop temporomandibular joint arthritis associated with IBD [4].

As such, oral manifestations are an important component of the UC clinical picture and their early diagnosis can contribute to more effective disease management and improved quality of life for patients.

Gastritis and Ulcer Disease

Chronic gastritis is most commonly caused by *Helicobacter pylori* infection. It can also be triggered by various medications, especially nonsteroidal anti-inflammatory drugs (NSAIDs), alcohol, and less frequently, immunological factors [6, 22]. Chronic gastritis's most common symptoms include dyspeptic complaints, such as postprandial epigastric pain, early satiety, bloating, nausea, and loss of appetite [22]. Additionally, on the inflamed gastric or duodenal mucosa, deep lesions known as peptic ulcers can develop, accompanied by dyspeptic symptoms, often-severe postprandial epigastric pain, and many other issues. Peptic ulcers develop as a result of an imbalance between aggressive factors such as hydrochloric acid, *Helicobacter pylori* and NSAIDs. Relevant mucosal defence mechanisms primarily include proper blood supply, regeneration of mucosal cells, and local secretion of prostaglandins and other protective substances [22, 23].

Ulcer disease can lead to complications such as gastrointestinal bleeding, perforation of the digestive tract wall, and pyloric stenosis. *Helicobacter pylori*-induced gastric mucosal infection most often causes chronic inflammation, is frequently associated with duodenal ulcers, and less commonly, with gastric ulcers, gastric cancer, and other conditions [23, 24].

Oral lesions associated with gastritis, ulcer disease, and *H. pylori* infection can result from iron or vitamin deficiencies, particularly of vitamin B12, as well as from the adverse effects of the medication used in the treatment of these conditions. Painful ulcerations of the oral mucosa can appear, most commonly on the buccal mucosa or the floor of the mouth, along with glossitis accompanied by a burning sensation, which can make eating difficult [6]. Some patients can develop burning mouth syndrome (BMS). Patients may also complain of dry mouth (Fig. 6), particularly when taking commonly used proton pump inhibitors [25]. A link between periodontitis and peptic ulcer disease has been demonstrated [26].

For years, the role of *Helicobacter pylori* colonization in the oral cavity has been discussed as a potential source of recurrent gastric mucosal infection [6].

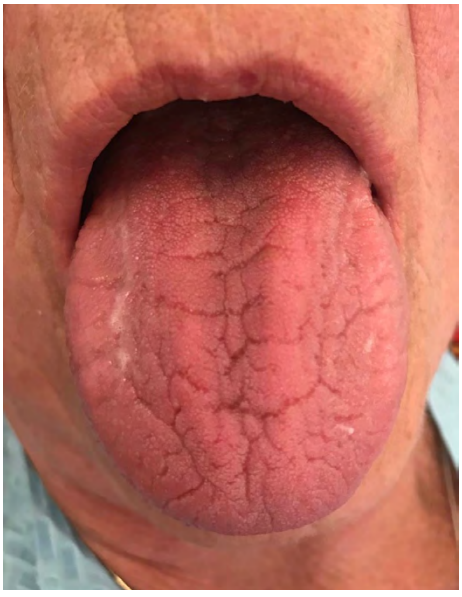

Fig. 6. Clinical symptom: dry mouth.

Celiac Disease

Celiac disease is an autoimmune condition with a genetic predisposition, in which an abnormal immune response to the gluten contained in cereals such as wheat, rye, and barley leads to mucositis and damage to the villi of the small intestine, resulting in malabsorption. This is a common disease, affecting approximately 1% of the global population [27]. Its clinical picture varies and can manifest in the form of typical gastrointestinal symptoms such as diarrhoea, bloating, abdominal pain, weight loss, and signs of malnutrition, or in atypical manifestations with extraintestinal symptoms such as within the oral cavity, iron-deficiency, anaemia, osteoporosis, neurological disorders, and skin lesions [4, 6]. Celiac disease has also two forms: silent, and latent. The silent form, without clear clinical symptoms, is manifested by the presence of antibodies against tissue transglutaminase, endomysium, and gliadin, along with histological lesions in the small intestinal mucosa. In the latent (potential) form, there are positive serological test results but no histological lesions in the intestine [3].

Oral manifestations are diagnostically significant in celiac disease, even more so because in approximately 50% of patients, particularly in children, the disease initially does not cause any gastrointestinal complaints [3, 28]. Symptoms in the oral cavity result from both the direct effects of the disease and nutritional deficiencies caused by impaired absorption. The most common oral changes include enamel hypoplasia and defects, delayed tooth development and eruption with malocclusion (especially in children), dental caries, recurrent aphthae, dry mouth, atrophic glossitis, and a tendency to bleeding [27, 29, 30].

Enamel defects are typically described using the Aine *et al.* classification, which is widely used in dentistry [29]. In the mildest form, the enamel shows slight discoloration (white or yellowish) without any shape abnormalities. In more advanced stages, discoloration becomes more pronounced (yellow-brown), and small indentations or linear defects can appear. Further progression leads to extensive discoloration, clear structural damage, and a rough, uneven enamel surface. In the most severe cases, enamel damage is widespread, with crown deformation and significant loss of hard tissue. These changes are symmetrical, usually affecting the same teeth in both arches, and are observed in both primary and permanent dentition, most commonly in the incisors and molars of the maxilla and mandible [31].

In celiac disease, several small and painful aphthae may appear on the buccal mucosa, tongue, or lips, along with angular cheilitis. Deficiencies in B vitamins, especially vitamin B12 and iron, can lead to glossitis, including Hunter's glossitis (glossitis Hunteri) [3, 27, 30]. Dry mouth can also be a manifestation of coexisting autoimmune conditions, such as Sjögren's syndrome, whereas reduced salivary secretion combined with impaired enamel mineralization promotes the development of caries and gingival inflammations [3].

Oral manifestations associated with celiac disease are chronic and recurrent, and when accompanied by systemic symptoms or nutritional deficiencies, should prompt doctors towards further diagnostics for celiac disease.

Gastroesophageal Reflux Disease (GERD)

Gastroesophageal reflux refers to the backward flow of gastric content (known as refluxate) into the oesophageal lumen. Frequent reflux episodes can lead to clinical symptoms and also damage to the oesophageal mucosa, which is defined as gastroesophageal reflux disease (GERD). GERD is

one of the most common gastrointestinal disorders, affecting 10–20% of the population in Western countries [6, 32]. GERD results from dysfunction of the mechanisms responsible for maintaining the anti-reflux barrier, impaired oesophageal motility, incompetence of the lower oesophageal sphincter (LES), reduced salivary secretion and flow, as well as swallowing disorders. Repeated exposure of the oesophageal mucosa to refluxate promotes the progression of inflammatory lesions and can lead to complications such as Barrett's oesophagus, or oesophageal strictures [3, 33].

In some patients with GERD, the refluxate reaches the pharynx and oral cavity, causing symptoms not only within the oesophagus (oesophageal syndrome) but also beyond it (extraoesophageal syndrome). Typical symptoms of GERD include heartburn, sour taste in the mouth, regurgitation, and chest pain [32, 33]. In extraoesophageal syndrome, typical GERD symptoms include sore throat, hoarseness, cough, sensation of a foreign body in the throat, oral discomfort, and less commonly, difficulty and pain during swallowing [6, 32, 34]. GERD is commonly diagnosed based on medical history and endoscopic examination. In some cases, 24-hour oesophageal pH monitoring and oesophageal manometry are also performed [34].

The most frequent oral manifestation of GERD is erosive lesions to the hard dental tissues, found in over 40% of patients. These lesions are typically located symmetrically on the palatal surfaces of the upper incisors and the occlusal surfaces of the molars [34, 35]. Acidic refluxate causes chemical damage to enamel and dentin, which develops slowly and often goes unnoticed for a long time [35].

The severity of these changes depends on the composition and pH of the refluxate, the frequency of the reflux episodes, the properties of the saliva, including its flow rate and buffering capacity, as well as the patient's oral hygiene practices, such as tooth brushing [35]. As the process progresses, dentin becomes exposed, leading to increased sensitivity to thermal and tactile stimuli [36].

Other oral complaints in GERD include dry mouth, which can result from both pharmacological treatment, especially with proton pump inhibitors, and reduced salivary secretion [6, 25, 35]. In addition, halitosis is also found, caused by the reflux of gases and gastric content into the oesophagus, leading to an unpleasant odour from the mouth [36].

Refluxate contact with the oral mucosa can cause redness of the oral mucosa, particularly on the palate and uvula, accompanied by a burning sensation or pain [6, 35]. More frequent occurrences of mucosal ulcerations (Fig. 7), sour taste sensation, burning in the mouth, and hypersensitivity of oral tissues to tactile stimuli have also been described [3, 35].

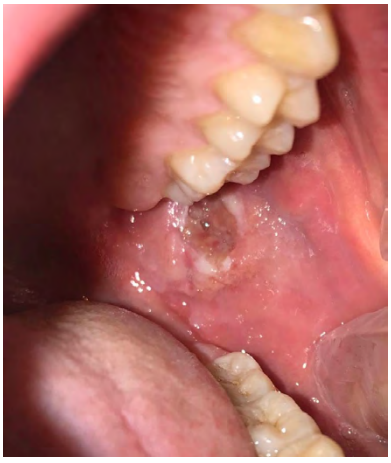

Fig. 7. Clinical symptom: mucosal ulceration.

Oesophageal Achalasia

Oesophageal achalasia is a primary motility disorder of the oesophagus, characterized by the failure of the lower oesophageal sphincter (LES) to properly relax during swallowing [37]. The pathogenesis of the condition is associated with degeneration of the Auerbach's nerve plexus in the oesophageal wall, resulting in an inability to relax in response to swallowing, which impairs the passage of food into the stomach [37].

The retained food content undergoes fermentation, leading to the development of a characteristic unpleasant odour in the mouth. Regurgitation of food and oesophageal contents into the oral cavity promotes a range of secondary changes within the masticatory system, causing enamel erosion and dentin hypersensitivity [38]. In addition, disruption of the microbial balance in the oral cavity creates favourable conditions for the colonization of cariogenic bacteria, increasing the risk of dental caries. Furthermore, the regurgitated oesophageal contents can lead to inflammatory changes in the oral mucosa, due to chronic exposure to irritating factors [38].

Plummer-Vinson Syndrome

Plummer-Vinson syndrome is a rare condition primarily caused by chronic iron deficiency, with changes in the mucosa of the upper gastrointestinal tract, symptoms of dysphagia (difficulty swallowing), mucosal atrophy of the oesophagus, and an increased risk of oesophageal cancer [39]. Iron deficiency impairs mucosal regeneration and causes glossitis, accompanied by atrophy of the fungiform and filiform papillae, smooth tongue surface, burning sensations and pain. Pallor of the oral mucosa is also observed, due to anaemia and impaired tissue perfusion [39, 40].

Other manifestations include burning, dryness, and discomfort in the oral cavity, which can interfere with food intake and speech. Painful aphthae (Fig. 8) and angular cheilitis are commonly seen, with fissures, redness, and irritation of the skin around the corners of the mouth. Oral lesions in Plummer-Vinson syndrome are a significant component of the clinical picture and can serve as valuable indicators for diagnosing iron deficiency [39]. Early recognition and initiation of iron supplementation is crucial because it not only alleviates symptoms, but also helps prevent complications, such as oesophageal and pharyngeal cancer [40].

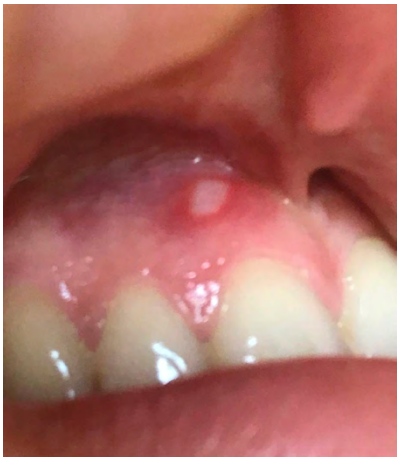

Fig. 8. Clinical symptom: aphtha.

Peutz-Jeghers Syndrome

Peutz-Jeghers Syndrome is a rare hereditary genetic disorder characterized by multiple hamartomatous polyps present in the gastrointestinal tract and distinctive pigmentation on the skin and mucous membranes [41]. Peutz-Jeghers is inherited in an autosomal dominant manner and is associated with mutations in the *STK11* gene [42]. The syndrome is associated with an increased risk of developing malignant tumours in various organs [41].

Oral lesions are among the most characteristic symptoms of Peutz-Jeghers syndrome and can appear as early as in childhood. The most common manifestations include brownish discoloration of the mucosa, and painless, dark brown macules located on the lips, buccal mucosa, tongue, and around the mouth that tend to persist throughout life [41]. These pigmentations are typically symmetrical, vary in size, often appear in multiple locations, and do not cause discomfort, yet they represent an important diagnostic hallmark of the disease [42].

Therefore, pigmentary changes in the oral cavity are a key diagnostic manifestation of this syndrome, and their early recognition enables timely diagnostic evaluation and monitoring of patients for potential cancer-related complications [42].

Gardner's Syndrome

Gardner's syndrome is a rare condition classified under familial adenomatous polyposis (FAP), characterized by the presence of numerous colorectal adenomatous polyps along with mesodermal tumours such as osteomas, desmoid tumours, epidermoid cysts, and hypertrophy of the retinal pigment epithelium [43]. It is inherited in an autosomal dominant manner and can be identified by findings present in the oral cavity and craniofacial region, which often serve as early indicators prompting further diagnostic evaluation.

The most common manifestations include osteomas, typically multiple, benign bony growths located in the mandible, maxilla, and other craniofacial bones which can lead to facial deformities and asymmetry [44]. Supernumerary teeth are also frequently found and are potentially interfering with the normal eruption of permanent teeth and even causing impaction [45]. Additionally, hypercementosis, characterized by excessive deposition of root cementum, can complicate endodontic treatment and tooth extraction. Other manifestations include odontomas, which are benign tumours that can disrupt normal tooth alignment and often require surgical intervention [46].

Therefore, oral manifestations in patients with Gardner's syndrome represent a significant component of its early diagnosis, especially in families with a history of FAP. Early detection of these symptoms enables timely monitoring and treatment, which is crucial in preventing serious complications.

Cowden Syndrome

Cowden syndrome is a rare autosomal dominant disorder classified among the PTEN hamartoma tumour syndromes [47]. Cowden syndrome is caused by a mutation in the *PTEN* gene, which under normal conditions inhibits excessive cell growth and division. Damage to this gene disrupts regulatory mechanisms, promoting the development of hamartomas (benign tumours) located on the skin and within the oral cavity mucosa [48]. The disease can also be accompanied by lesions in the thyroid and breasts, as well as polyps occurring in the gastrointestinal tract.

In the oral cavity, papular lesions are found on the buccal mucosa, palate, tongue, gingiva, and lips. In some cases, macroglossia can occur [48]. Developmental anomalies such as hypoplasia of the maxilla and mandible or hypodontia can also be present [49].

Conclusions

A thorough examination of the oral cavity and analysis of symptoms can aid the early detection of gastrointestinal diseases. Although oral manifestations vary depending on the type of disease and are often non-specific, they can precede other symptoms of underlying diseases, and so accurate diagnosis is crucial. Collaboration between dentists and gastroenterologists is essential for comprehensive patient care. As such, interdisciplinary education plays a crucial role in improving effective diagnosis of diseases and tailoring treatment to individual needs.

However, despite numerous publications on this topic, the literature is lacking on clearly defined disorders in the oral cavity in patients with specific gastrointestinal diseases. Therefore, further clinical research should focus on analysing the relationships between various gastrointestinal conditions and their associated oral manifestations.

Conflict of interest

None declared.

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