

World Journal of *Clinical Cases*

World J Clin Cases 2023 June 26; 11(18): 4210-4457



REVIEW

- 4210 Should gastroenterologists prescribe cannabis? The highs, the lows and the unknowns
Samuel S, Michael M, Tadros M

MINIREVIEWS

- 4231 Application of artificial intelligence in trauma orthopedics: Limitation and prospects
Salimi M, Parry JA, Shahrokhi R, Mosalamiaghili S
- 4241 Weight loss maintenance after bariatric surgery
Cho YH, Lee Y, Choi JI, Lee SR, Lee SY
- 4251 Bicuspid aortic valve with associated aortopathy, significant left ventricular hypertrophy or concomitant hypertrophic cardiomyopathy: A diagnostic and therapeutic challenge
Sopek Merkaš I, Lakušić N, Predrijevac M, Štambuk K, Hrabak Paar M
- 4258 Application experience and research progress of different emerging technologies in plastic surgery
Yang B, Yang L, Huang WL, Zhou QZ, He J, Zhao X

ORIGINAL ARTICLE

Case Control Study

- 4267 Multimodal integrated intervention for children with attention-deficit/hyperactivity disorder
Lv YB, Cheng W, Wang MH, Wang XM, Hu YL, Lv LQ

Retrospective Study

- 4277 Portal vein computed tomography imaging characteristics and their relationship with bleeding risk in patients with liver cirrhosis undergoing interventional therapy
Song XJ, Liu JL, Jia SY, Zhang K

Observational Study

- 4287 Wrist-ankle acupuncture combined with pain nursing for the treatment of urinary calculi with acute pain
Wu LM, Liu Q, Yin XH, Yang LP, Yuan J, Zhang XQ, Wang YL

CASE REPORT

- 4295 Coexistence of diffuse large B-cell lymphoma, acute myeloid leukemia, and untreated lymphoplasmacytic lymphoma/waldenström macroglobulinemia in a same patient: A case report
Zhang LB, Zhang L, Xin HL, Wang Y, Bao HY, Meng QQ, Jiang SY, Han X, Chen WR, Wang JN, Shi XF
- 4306 Collagen fleece (Tachosil®) for treating testis torsion: A case report
Kim KM, Kim JH

- 4313** Morphological features and endovascular repair for type B multichanneled aortic dissection: A case report
Lu WF, Chen G, Wang LX
- 4318** Hepatic inflammatory myofibroblastic tumor: A case report
Tong M, Zhang BC, Jia FY, Wang J, Liu JH
- 4326** Endometriosis of the lung: A case report and review of literature
Yao J, Zheng H, Nie H, Li CF, Zhang W, Wang JJ
- 4334** Delayed dislocation of the radial head associated with malunion of distal radial fracture: A case report
Kim KB, Wang SI
- 4341** Synchronous endometrial and ovarian cancer: A case report
Žilovič D, Čiurlienė R, Šidlovská E, Vaicekauskaitė I, Sabaliauskaitė R, Jarmalaitė S
- 4350** Nivolumab-induced tumour-like gastritis: A case report
Cijauskaite E, Kazenaite E, Strainiene S, Sadauskaite G, Kurlinkus B
- 4360** Solitary thyroid gland metastasis from rectal cancer: A case report and review of the literature
Chen Y, Kang QS, Zheng Y, Li FB
- 4368** Anesthesia for extracorporeal membrane oxygenation-assisted thoracoscopic lower lobe subsegmental resection in a patient with a single left lung: A case report
Wang XF, Li ZY, Chen L, Chen LX, Xie F, Luo HQ
- 4377** Indium chloride bone marrow scintigraphy for hepatic myelolipoma: A case report
Sato A, Saito K, Abe K, Sugimoto K, Nagao T, Sukeda A, Yunaiyama D
- 4384** Fibromatosis-like metaplastic carcinoma of the breast: Two case reports
Bao WY, Zhou JH, Luo Y, Lu Y
- 4392** Perforating and ophthalmic artery variants from the anterior cerebral artery: Two case reports
Mo ZX, Li W, Wang DF
- 4397** Diagnostic use of superb microvascular imaging in evaluating septic arthritis of the manubriosternal joint: A case report
Seskute G, Kausaite D, Chalkovskaja A, Bulotaite E, Butrimiene I
- 4406** Primary prostate Burkitt's lymphoma resected with holmium laser enucleation of the prostate: A rare case report
Wu YF, Li X, Ma J, Ma DY, Zeng XM, Yu QW, Chen WG
- 4412** Pancreatitis, panniculitis and polyarthritides syndrome: A case report
Pichler H, Stumpner T, Schiller D, Bischofreiter M, Ortmaier R
- 4419** Acute neck tendonitis with dyspnea: A case report
Wu H, Liu W, Mi L, Liu Q

- 4425** Next-generation sequencing technology for the diagnosis of *Pneumocystis* pneumonia in an immunocompetent female: A case report
Huang JJ, Zhang SS, Liu ML, Yang EY, Pan Y, Wu J
- 4433** Superior laryngeal nerve block for treatment of throat pain and cough following laryngeal herpes zoster: A case report
Oh J, Park Y, Choi J, Jeon Y
- 4438** Removal of unexpected schwannoma with superficial parotidectomy using modified-Blair incision and superficial musculoaponeurotic system folding: A case report
Nam HJ, Choi HJ, Byeon JY, Wee SY
- 4446** Simultaneously metastatic cholangiocarcinoma and small intestine cancer from breast cancer misdiagnosed as primary cholangiocarcinoma: A case report
Jiao X, Zhai MM, Xing FZ, Wang XL

LETTER TO THE EDITOR

- 4454** Erroneous presentation of respiratory-hemodynamic disturbances and postsurgical inflammatory responses in patients having undergone abdominal cavity cancer surgery
Idrissov KS, Mynbaev OA

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Guoping Zheng, MD, PhD, Associate Professor, Faculty of Medicine and Health, Sydney Medical School-Westmead Clinical School, The University of Sydney, Sydney 2145, Australia. guoping.zheng@sydney.edu.au

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The WJCC is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Journal Citation Reports/Science Edition, Current Contents®/Clinical Medicine, PubMed, PubMed Central, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2022 Edition of Journal Citation Reports® cites the 2021 impact factor (IF) for WJCC as 1.534; IF without journal self cites: 1.491; 5-year IF: 1.599; Journal Citation Indicator: 0.28; Ranking: 135 among 172 journals in medicine, general and internal; and Quartile category: Q4.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Ying-Yi Yuan*; Production Department Director: *Xu Guo*; Editorial Office Director: *Jin-Lei Wang*.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

June 26, 2023

COPYRIGHT

© 2023 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

Nivolumab-induced tumour-like gastritis: A case report

Elena Cijauskaite, Edita Kazenaite, Sandra Strainiene, Goda Sadauskaite, Benediktas Kurlinkus

Specialty type: Gastroenterology and hepatology

Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): B
Grade C (Good): C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Paparoupa M, Germany; Rizzo A, Italy

Received: February 25, 2023

Peer-review started: February 25, 2023

First decision: April 11, 2023

Revised: April 23, 2023

Accepted: May 9, 2023

Article in press: May 9, 2023

Published online: June 26, 2023



Elena Cijauskaite, Faculty of Medicine, Vilnius University, Vilnius 01513, Lithuania

Edita Kazenaite, Goda Sadauskaite, Benediktas Kurlinkus, Clinic of Gastroenterology, Nephrourology and Surgery, Institute of Clinical Medicine, Faculty of Medicine, Vilnius University, Vilnius 01513, Lithuania

Edita Kazenaite, Goda Sadauskaite, Benediktas Kurlinkus, Vilnius University Hospital Santaros Clinics, Center of Hepatology, Gastroenterology and Dietology, Vilnius 08661, Lithuania

Sandra Strainiene, Department of Internal Medicine and Surgery, Antakalnis Clinic, Vilnius 10207, Lithuania

Corresponding author: Sandra Strainiene, MD, Attending Doctor, Department of Internal Medicine and Surgery, Antakalnis Clinic, Antakalnis Street 59, Vilnius 10207, Lithuania. sandra.strainiene@gmail.com

Abstract

BACKGROUND

Immune checkpoint inhibitors are one of the modern treatment methods for advanced malignancies. However, this group of medications is also associated with various immune-related adverse events, such as colitis or pneumonitis. Immune checkpoint inhibitor-induced gastritis is a less common adverse event.

CASE SUMMARY

We describe a 64-year-old woman presenting with diarrhea, nausea, and discomfort in the upper abdominal region. The patient had a history of metastatic lung cancer, which was treated with nivolumab. During the first endoscopy, an infiltrating gastric tumour was suspected. Later, based on endoscopic, histological and radiological findings, nivolumab-induced gastritis was diagnosed. The patient was successfully treated with three courses of omeprazole.

CONCLUSION

As a consequence of the increased use of immune checkpoint inhibitors, a growing number of reported immune-related adverse events could be expected. The diagnosis of immune checkpoint inhibitor-induced gastritis should be considered when assessing a patient treated with nivolumab with upper gastrointestinal distress.

Key Words: Nivolumab; Immune checkpoint inhibitors; Tumour-like gastritis; Proton pump inhibitors; Case report

Core Tip: Nivolumab-induced gastritis is a less common immune-related adverse event of nivolumab. The most common symptoms include nausea, pain, diarrhea, loss of appetite, and weight loss. Esophago-gastroduodenoscopy and biopsy are the most important diagnostic tools. In most cases, gastritis is treated with corticosteroids in combination with proton pump inhibitors. In our case, the patient was successfully treated with omeprazole monotherapy.

Citation: Cijauskaite E, Kazenaite E, Strainiene S, Sadauskaite G, Kurlinkus B. Nivolumab-induced tumour-like gastritis: A case report. *World J Clin Cases* 2023; 11(18): 4350-4359

URL: <https://www.wjgnet.com/2307-8960/full/v11/i18/4350.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v11.i18.4350>

INTRODUCTION

Immune checkpoint inhibitors (ICIs) are a novel treatment option for various types of cancer, including non-small cell lung carcinoma[1]. ICIs, such as cytotoxic T-lymphocyte-associated protein 4 (CTLA-4) and programmed cell death protein 1 (PD-1) inhibitors, facilitate cancer cell destruction through either CTLA-4 or PD-1 receptor pathway blockade, thus reversing cancer tolerance of the immune system. However, due to the ICIs mechanism of action, the toxicity of therapy is also immune-mediated[2,3].

We present a patient who developed ICI-induced gastritis after nivolumab immunotherapy and was successfully treated with proton pump inhibitor (PPI) monotherapy (Table 1). We also provide a short review of the literature that is similar to the cases already described by other authors (Table 2).

CASE PRESENTATION

Chief complaints

A 64-year-old Caucasian woman experiencing diarrhea, nausea, early satiety and discomfort in the upper abdominal region was referred for a gastroenterologist consultation by her pulmonologist.

History of present illness

The patient was diagnosed with poorly differentiated metastatic non-small cell lung carcinoma (G3) (T2aN1M1a) in 2018. She received chemotherapy with carboplatin, paclitaxel, and bevacizumab. After the initial good response, the oncological disease relapsed in 2019, and treatment with nivolumab was started. At first, the patient tolerated immunotherapy well, but after the seventh course of nivolumab, the patient was diagnosed with diabetes possibly caused by immunotherapy-associated beta cell destruction. Diabetes was managed with insulin therapy. In December 2020, after 64 courses of nivolumab therapy, the patient started experiencing diarrhea, nausea without vomiting, early satiety and upper abdominal discomfort. In February 2021, after performing an esophagogastroduodenoscopy (EGD) with biopsy, the patient was diagnosed with ICI-induced gastritis. Initial omeprazole treatment was effective and well tolerated, and thus continued. During the following years, several EGDs with biopsies and abdominal computed tomography (CT) scans were performed to evaluate the endoscopic, pathohistological, and radiological response to treatment and the natural course of the disease. The course of the disease and its treatment are presented in Table 1.

History of past illness

The patient denied any other chronic diseases or the concomitant use of other medications. She underwent conization of the cervix and tonsillectomy.

Personal and family history

The patient denied allergy to food or drugs. She developed a rash after the first course of chemotherapy. Her family history was insignificant.

Physical examination

The patient was slightly underweight (body mass index 18.22 kg/m²). No other significant changes were detected.

Table 1 Case report timeline

Date	Event	Findings
December 2017	Chest CT	Tumour in the left lung (S1/2) with pleural metastases
January 2018	Fibrobronchoscopy with biopsy	Pathology report: poorly differentiated (G3) non-small lung cell adenocarcinoma, EGFR (-)
February - June	Chemotherapy treatment (Carboplatin, Paclitaxel, Bevacizumab), 6 courses	
September	Chest CT	Reduction of target tumours by 16%. Stable oncologic disease
January 2019	Chest CT	Progression of the disease
January	Initiation of nivolumab treatment	
December 2020	Beginning of gastrointestinal symptoms	
February 2021	EGD with biopsy	EGD: Tumour-like endoscopic changes in the stomach; Histology: Chronic active (++) erosive gastritis with gland destruction and lymphoepithelial infiltration. Possible immune check-point inhibitor therapy-associated gastritis
March	Abdominal CT	Stomach changes related to chronic gastritis
March	EGD with biopsy	EGD: Progression of tumour-like endoscopic changes in the stomach; Histology: Chronic active (++) gastritis with erosions and intestinal metaplasia
March - April	First course of 20 mg/d of omeprazole	
July	EGD with biopsy	EGD: Decreased diffuse inflammatory/infiltrative changes in the stomach wall; Histology: Chronic active gastritis (++) associated with immunotherapy
July - August	Second course of omeprazole 20 mg/d	
September	COVID-19 infection; acute renal failure; cessation of nivolumab	
October	Third course of omeprazole 20 mg/d	
December	Chest CT	No progression of pulmonary disease
	Renal function improvement; Reintroduction of nivolumab	
January 2022	EGD with biopsy	EGD: Gastric mucosa atrophy with focal intestinal metaplasia, gastric polyp; Histology: Hyperplastic gastric polyp
March	Acute renal failure; kidney biopsy; cessation of nivolumab	Histology: Insignificant and non-specific renal changes
May	Renal function improvement; Initiation of Atezolizumab treatment	
October	Chest CT	No progression of pulmonary disease

CT: Computed tomography; EGD: Esophagogastroduodenoscopy; EGFR: Epidermal growth factor receptor.

Laboratory examinations

No remarkable abnormalities were observed in the patient's recent blood laboratory examination results.

Imaging examinations

To evaluate the possible origin of symptoms related to upper gastrointestinal tract dysfunction, an EGD with multiple biopsies was performed[1]. Colonoscopy was not performed due to typical upper gastrointestinal symptoms. Tumour-like endoscopic changes in the stomach were found. The stomach mucosa was covered with whitish plaques throughout the entire stomach, affecting the course of the gastric folds in the upper curve. However, following air insufflation, the folds were almost completely smoothed out. In the pre-papillary region, the mucosa was thicker (Figure 1A). An infiltrating stomach neoplasm was suspected; therefore, an abdominal CT scan was performed. The scan revealed stomach changes related to chronic gastritis: the wall of the pyloric part of the stomach was evenly thickened, and edematous, the mucosa clearly differentiated, diffusely and more intensively accumulated contrast

Table 2 Summary of nivolumab-induced gastritis case reports

Ref.	Main symptoms	Time of onset (in relation to nivolumab therapy)	Radiological findings	EGD findings	Pathology findings	Treatment	Outcomes
Johncilla <i>et al</i> [2], 2019	Nausea, vomiting, diarrhea	Two doses	-	Gastric erythema and erosions	Focal enhancing gastritis (pyloric antrum and body)	Prednisone, infliximab	Improved symptoms
Zhang <i>et al</i> [17], 2019	Diarrhea, nausea, vomiting	Avg. 8 doses	-	Erythema (with or without erosions) - 64% of patients, periglandular inflammation -20%, polyps - 2%	Periglandular inflammation, granuloma, diffuse inflammation, neutrophilic abscess	Steroids, infliximab	-
Placke <i>et al</i> [4], 2021	Weight loss, nausea, heartburn	118 d	-	Severe erythematous gastritis	Lymphoplasmocytic cells, granulocyte infiltration	Pantoprazole, prednisone	Improvement in symptoms (after circa 6 d)
Shi <i>et al</i> [3], 2017	Vomiting, nausea	17 cycles	PET/CT and MRI - unremarkable	Diffusely friable, erythematous, denuded gastric mucosa	Neutrophilic abscesses, expansion of the lamina propria with lymphocytes and plasma cells	Pantoprazole and ranitidine; cessation of nivolumab	No improvement after pantoprazole and ranitidine therapy; improvement after nivolumab cessation
Boike <i>et al</i> [10], 2017	Dysphagia, diarrhea	6 mo	PET/CT - FDG uptake in the esophagus and stomach wall	Gastric erythema, thick mucoid secretions	Lymphoplasmocytic infiltration in lamina propria and epithelium	Prednisone and PPI	Improved symptoms after 2 d
Alhateem <i>et al</i> [6], 2019	Loss of appetite, diarrhea, bloating	Few months	-	Barrett's esophagus, antral gastritis	Transmural inflammation, cryptitis, dysplasia	Prednisone; cessation of nivolumab for 6 wk	Improved symptoms; no recurrence after resuming nivolumab therapy
Woodford <i>et al</i> [5], 2021	Epigastric pain, intermittent anorexia and nausea	4 cycles (nivolumab and ipilimumab combination)	CT - stomach wall thickening	Erythema, friable gastric mucosa	Active chronic inflammation, distortion of glandular architecture	Pantoprazole; methylprednisone	Pain aggravation after 2 wk. Recurrent gastritis 12 mo later
Bazarbashi <i>et al</i> [14], 2020	Mild epigastric discomfort	4 doses of nivolumab monotherapy (16 wk) then switched to nivolumab and + ipilimumab combination (2 doses, 4 wk)	Abdominal and pelvic CT - unremarkable	Hemorrhagic and inflamed gastric mucosa with exudate	Active chronic inflammation, intraepithelial lymphocytosis, increased apoptotic activity	Prednisone	Improved symptoms. Continual endoscopically observed resolution of inflammation
Rovedatti <i>et al</i> [7], 2020	Epigastric pain, loss of appetite	12 cycles	-	Diffuse ulcerations covered with fibrin-like membranes, erythematous friable gastric mucosa	Lymphoplasmocytic and neutrophilic infiltration, microabscesses, apoptotic bodies, reactive epithelial cell atypia	Prednisone, pantoprazole, cessation of nivolumab	Improved symptoms. Endoscopic and histologic remission.
Vindum <i>et al</i> [8], 2020	Anorexia, vomiting, nausea, epigastric pain, weight loss	6 doses	PET/CT - FDG-uptake in the gastric wall	Erythematous gastric mucosa with fibrinous erosions	Chronic active pangastritis. Neutrophilic and lymphocytic epithelial infiltration, crypt abscesses, lymphoplasmacytic infiltration in lamina propria	1 st admission - low dose prednisone; 2 nd admission - high dose methylprednisone (80 mg), pantoprazole	Improved symptoms after 3 mo of treatment. Radiological and clinical remission
Mubder <i>et al</i> [15], 2020	Anorexia, nausea, vomiting, abdominal pain	3 mo	Abdominal and pelvic CT - unremarkable	Active gastritis	Severe acute gastritis with necro-inflammatory debris. Glandular destruction, lymphoplasmacytic infiltration	-	-

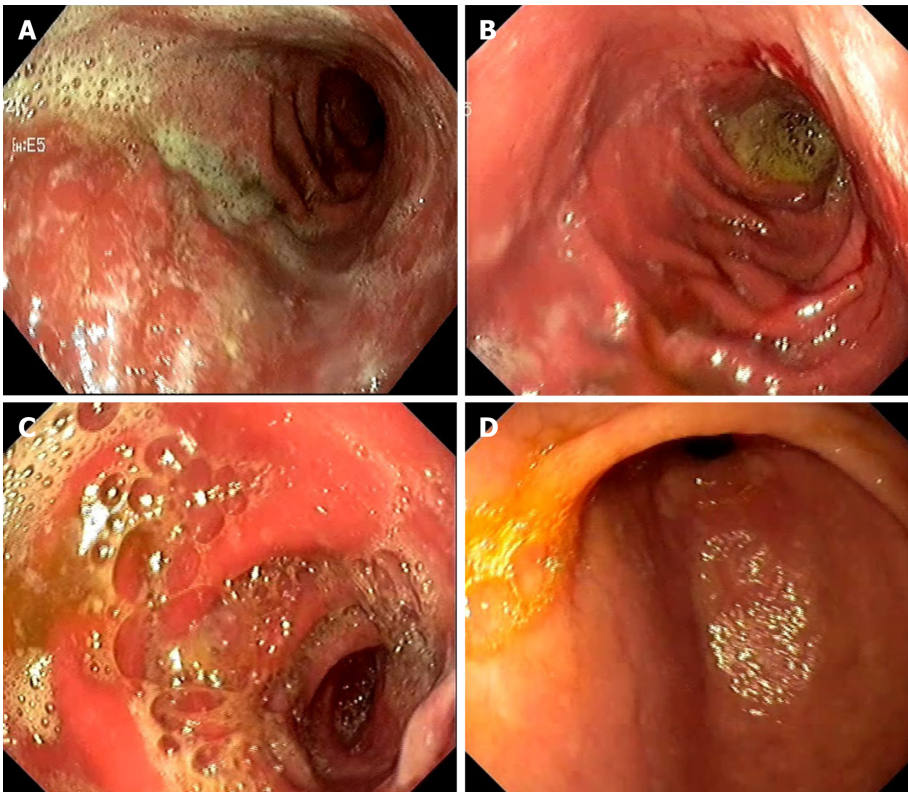
Martínez-Acitores de la Mata <i>et al</i> [16], 2020	Epigastric pain, hyporexia, vomiting	2.5 yr	Abdominal CT - unremarkable	Exudate, diffuse congestion, edema, erythema, friable mucosa in the stomach	Glandular destruction, crypt abscesses, inflammatory cell infiltration.	PPI, cessation of nivolumab	Improved symptoms
Ferrian <i>et al</i> [18], 2021	Epigastric pain, nausea, anorexia	32 mo	-	Erythema, friable gastric mucosa	Crypt destruction, erosions, neutrophilic, lymphoplasmacytic, and eosinophilic infiltration in the lamina propria	Prednisone, cessation of nivolumab	Improved symptoms. Radiological and clinical remission
Ebisutani <i>et al</i> [13], 2020	Left-sided epigastric pain, nausea, anorexia	7 mo	CT - thickening of the gastric wall	Erythema, edema, white membrane in the gastric mucosa	Lymphocytic and neutrophilic infiltration of the lamina propria and epithelium	Prednisone, cessation of nivolumab	Improved symptoms. Endoscopic and clinical remission
Kobayashi <i>et al</i> [9], 2017	Epigastric pain, hematemesis	10 cycles, 4 mo	-	Hemorrhagic gastritis, white membrane on mucosa	Lymphoplasmacytic and neutrophilic infiltration	Prednisone	Improved symptoms after few days. Clinical and endoscopic remission
Tomiyasu <i>et al</i> [11], 2021	Diarrhea, nausea, anorexia, weight loss	11 courses	PET/CT - diffuse FDG accumulation in stomach wall and duodenum	Multiple white granular elevations in the stomach	Eosinophilic infiltration of mucosa	Prednisone, cessation of nivolumab	Improved symptoms
Călugăreanu <i>et al</i> [12], 2019	Vomiting, epigastric pain, weight loss	26 courses	PET/CT - diffuse FDG uptake in the stomach wall	Ulcerative and hemorrhagic gastritis	Lymphoplasmacytic infiltration with scattered neutrophils and eosinophils	Methylprednisone and PPI, cessation of nivolumab	Resolved after 8 wk
Tsuji <i>et al</i> [20], 2022	Anorexia, epigastric discomfort, vomiting	10 mo	CT - diffuse thickening of the stomach wall; EUS - mucosal thickening	Mucosal edema, erosions	Inflammatory cell infiltration of the lamina propria	Prednisone, cessation of nivolumab	Improved symptoms. Radiological and endoscopic remission
Samonis <i>et al</i> [21], 2022	Anorexia, gastric discomfort and pain, vomiting	6 mo	PET/CT - intense metabolic uptake in the stomach	Erythematous gastritis, friable mucosa, edema, mucous exudate	Inflammatory cell infiltration of the lamina propria	Prednisone and PPI	Improved symptoms. Endoscopic remission

CT: Computed tomography; EGD: Esophagogastroduodenoscopy; EGFR: Epidermal growth factor receptor; EUS: Endoscopic ultrasound; FDG: Fluorodeoxyglucose; MRI: Magnetic resonance imaging; PET: Positron emission tomography; PPI: Proton pump inhibitor.

material, and clear masses were not differentiated. The stomach body wall was evenly stretched, not thickened (Figure 2).

PATHOLOGICAL FINDINGS

Pathohistological examination of biopsies from the first upper gastrointestinal endoscopy excluded the suspected gastric tumour. It showed active chronic gastritis with erosions, lymphatic follicles and lymphoepithelial lesions. The possibility of mucosa-associated lymphoid tissue lymphoma was excluded by immunohistochemical analysis. *Helicobacter pylori* infection was not reported.



DOI: 10.12998/wjcc.v11.i18.4350 Copyright ©The Author(s) 2023.

Figure 1 Esophagogastroduodenoscopy findings before and after treatment. A: First esophagogastroduodenoscopy before treatment (February 2021). Fibrinous debris on the mucosa, suspected infiltrating neoplasm; B: Second esophagogastroduodenoscopy before treatment (March 2021). Gastric mucosa prone to bleeding upon contact with mucous debris; C: Third esophagogastroduodenoscopy after the first course of omeprazole (July 2021). Diffuse erythematous gastropathy; D: Fourth esophagogastroduodenoscopy after the third course of omeprazole (January 2022). Atrophic mucosa with intestinal metaplasia.



DOI: 10.12998/wjcc.v11.i18.4350 Copyright ©The Author(s) 2023.

Figure 2 Abdominal computed tomography image (March 2021). No signs related to a gastric tumour (lymphadenopathy, infiltration of the surrounding tissues) are seen.

FINAL DIAGNOSIS

After evaluation of EGD, abdominal CT and pathohistological results, the patient was diagnosed with ICI-induced gastritis.

TREATMENT

Due to the mild symptoms experienced by the patient and the satisfactory results reported by other clinicians, the patient was treated with three courses of omeprazole: first – March-April 2021 (60 d, 20 mg/day), second – July-August 2021 (60 d, 20 mg/day), third – October 2021 (30 d, 20 mg/day). The first and second courses were prescribed by the gastroenterologist, and the third course was initiated by the patient herself whenever she felt the recurrence of related symptoms. The patient was also referred to a nutritionist for evaluation of possible malnutrition.

OUTCOME AND FOLLOW-UP

Several follow-up EGDs with multiple gastric mucosa biopsies were performed to evaluate the dynamics of stomach changes due to treatment and the general natural course of the disease.

The second EGD (March 2021) revealed negative endoscopic changes in the stomach – a progression of tumour-like changes (Figure 1B). New endoscopic abnormalities such as fragile and prone to bleeding mucosa were observed together with changes described previously. Biopsies showed active chronic gastritis with erosions and intestinal metaplasia, and immunohistochemical analysis rejected cytomegalovirus infection.

The third EGD (July 2021) showed a decrease in diffuse inflammation and infiltration of the stomach wall (Figure 1C). There was no bleeding at contact, erosions, or white plaques. Additionally, a polyp 0.5 cm in diameter was discovered. Biopsies revealed active chronic non-erosive gastritis with pyogenic granuloma and a hyperplastic polyp.

During the fourth EGD (January 2022) gastric mucosal atrophy was observed with some spots of intestinal metaplasia and a 1.0 cm polyp (Figure 1D). The histological report was compatible with a hyperplastic gastric polyp.

Treatment with omeprazole was effective, resulting in symptom relief after several weeks. The patient received three courses of omeprazole and is now in remission with no significant gastrointestinal symptoms or the need for an additional course of PPI. The complete patient's disease and treatment timeline are shown in Table 1.

DISCUSSION

As the use of ICIs rises, an increasing number of immune-related adverse events (irAEs) have been reported[1]. ICIs, namely nivolumab, the PD-1 receptor inhibitor, may cause irAEs in various organ systems, for example, the colon, skin, liver, and thyroid gland. The most common side effects of nivolumab are diarrhea (incidence rate approximately 10%-13%) that can be associated with ICI-induced colitis[4], skin rash and pruritus (approximately 2%), hypothyroidism (< 2%), hepatitis (< 2%), pneumonitis (approximately 3%), and renal failure (approximately 2%[5]. In contrast, nivolumab-induced gastritis is a less known adverse event.

An electronic search of the literature on nivolumab-induced gastritis was performed. Articles available in the PubMed, Medline, Cochrane, and Web of Science databases were reviewed up to December 1, 2022. The search terms used were “ICI-induced gastritis”, “nivolumab-induced gastritis”, “nivolumab and gastritis”. No time restrictions were used for the publications. A total of 30 articles and abstracts met the initial search criteria. The inclusion criteria were: Well-documented full-text articles written in English. We analysed a total of 19 case reports, which are summarised in Table 2.

In patients with nivolumab-induced gastritis, the most often reported symptoms include nausea, pain, diarrhea, loss of appetite, and weight loss[2-8]. Less commonly seen symptoms are hematemesis and dysphagia[9,10]. The onset of symptoms after the initiation of treatment varies considerably between a few weeks and 32 mo. In our case, the patient had diarrhea, nausea, epigastric discomfort, loss of appetite and mild weight loss – symptoms similar to other reported cases of nivolumab-induced gastritis. However, in our case, the symptoms manifested later than in most other cases – after 64 courses of nivolumab or, approximately, after 21 mo.

There are few case reports that provide the radiological findings, but the ones that do, show uptake of fluorodeoxyglucose in the stomach wall in positron emission tomography/CT scans[8,10-12]. Some of the published cases displayed stomach wall thickening seen in CT scans[5,13], as seen in our case, while others reported no significant findings on this investigation[3,14-16]. Thus, the importance of the CT

scan in diagnosing nivolumab-induced gastritis is not yet clear.

EGD and multiple biopsies play one of the most significant roles in the diagnostic process of ICI-induced gastritis. In most instances, EGD findings show erythema[2-5,7,8,10,13,16,17,18,19], friable mucosa[3,5,7,16,19], erosions[2,7,8,17,20], and white fibrin-like exudate on the mucosa[7-10,13-16]. These endoscopic changes were also observed in our patient.

Due to the rarity of ICI-induced gastritis, there are currently few recommendations on how to treat this irAE. Brahmer *et al*[19] advised treating this form of gastritis with corticosteroids and reserve tumour necrosis factor- α blockers for cases resistant to steroids (suggestions based on previous case studies). In most of the reviewed cases, patients received corticosteroids (17 out of 19 cases), most of which improved their symptoms. However, in our case, the nivolumab-induced gastritis was not managed with steroids. Instead, the patient was successfully treated with three courses of omeprazole monotherapy and remains in remission. PPIs were used alone or in combination with other therapies in 9 of the 19 cases we reviewed. One of the more commonly used PPIs was pantoprazole[4,5,7,8]. In some of the cases that reported improvement in symptoms, PPIs were used in combination with other medications, namely - prednisone, methylprednisolone[4,7,8,10,12,21] or infliximab[2,8].

Shi *et al*[3] reported that treatment with pantoprazole and ranitidine gave desirable results only after cessation of nivolumab. Similar results were observed in a case report by Martínez-Acitores de la Mata *et al*[16]; remission was achieved after PPI therapy and cessation of nivolumab. Overall, in 9 of the 19 reviewed cases, ICI-induced gastritis was managed in part by discontinuing nivolumab therapy. In our case, nivolumab was not terminated because the patient did not have significant gastroenterological symptoms after treatment and the benefit of tumour suppression outweighed the risk of associated irAE.

In recent years, ICIs have become an option for the treatment of various types of cancer, but not much is known about biomarkers that predict adverse immune reactions. To date, none of the suggested biomarkers have demonstrated sufficient precision in predicting or signaling irAEs to be useful in clinical practise and more high-quality studies are needed to establish a balance between the antitumour effects of ICI therapy and the irAEs it causes[22,23].

CONCLUSION

ICI-induced gastritis, as a complication of immunotherapy, is much less common among clinicians and, consequently, much less known. As immunotherapy evolves and becomes more widely used, the probability of irAEs, including ICI-induced gastritis, will grow. When assessing a patient on immunotherapy presenting with symptoms of upper gastrointestinal tract distress, this diagnosis should be taken into account to provide the patient with timely intervention. Controlled clinical trials are needed to establish guidelines for the management of ICI-induced gastritis.

ACKNOWLEDGEMENTS

We would like to thank the patient and Vilnius University Hospital Santaros Clinics for giving us consent and providing the data to report this case.

FOOTNOTES

Author contributions: Cijauskaite E wrote the original manuscript and reviewed the literature; Kurlinkus B was the gastroenterologist who followed-up the patient, obtained the patient's informed consent and performed data extraction; Kurlinkus B, Strainiene S reviewed and edited the manuscript; Kurlinkus B, Sadauskaite G and Kazenaite E revised the manuscript for important intellectual content; All authors have read and approved the final manuscript.

Informed consent statement: The patient signed the institution's standard document for informed consent to use her health data for the purpose of this clinical case report.

Conflict-of-interest statement: All the authors declare that they have no conflict of interest.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-

commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: Lithuania

ORCID number: Elena Cijauskaite 0000-0002-1601-4760; Edita Kazenaite 0000-0002-7127-1399; Sandra Strainiene 0000-0003-1884-1353; Benediktas Kurlinkus 0000-0001-9885-9347; Goda Sadauskaite 0000-0001-5470-6154.

S-Editor: Liu JH

L-Editor: Webster JR

P-Editor: Zhang YL

REFERENCES

- Ramos-Casals M, Brahmer JR, Callahan MK, Flores-Chávez A, Keegan N, Khamashta MA, Lambotte O, Mariette X, Prat A, Suárez-Almazor ME. Immune-related adverse events of checkpoint inhibitors. *Nat Rev Dis Primers* 2020; **6**: 38 [PMID: 32382051 DOI: 10.1038/s41572-020-0160-6]
- Johncilla M, Grover S, Zhang X, Jain D, Srivastava A. Morphological spectrum of immune check-point inhibitor therapy-associated gastritis. *Histopathology* 2020; **76**: 531-539 [PMID: 31692018 DOI: 10.1111/his.14029]
- Shi Y, Lin P, Ho EY, Nock CJ. Nivolumab-associated nausea and vomiting as an immune adverse event. *Eur J Cancer* 2017; **84**: 367-369 [PMID: 28827043 DOI: 10.1016/j.ejca.2017.07.029]
- Placke JM, Rawitzer J, Reis H, Rashidi-Alavijeh J, Livingstone E, Ugurel S, Hadaschik E, Griewank K, Schmid KW, Schadendorf D, Roesch A, Zimmer L. Apoptotic Gastritis in Melanoma Patients Treated With PD-1-Based Immune Checkpoint Inhibition - Clinical and Histopathological Findings Including the Diagnostic Value of Anti-Caspase-3 Immunohistochemistry. *Front Oncol* 2021; **11**: 725549 [PMID: 34458154 DOI: 10.3389/fonc.2021.725549]
- Woodford R, Briscoe K, Tustin R, Jain A. Immunotherapy-related gastritis: Two case reports and literature review. *Clin Med Insights Oncol* 2021; **15**: 11795549211028570 [PMID: 34290539 DOI: 10.1177/11795549211028570]
- Alhateem A, Patel K, Eriksen B, Bukhari S, Liu C. Nivolumab-Induced Concomitant Severe Upper and Lower Gastrointestinal Immune-Related Adverse Effects. *ACG Case Rep J* 2019; **6**: e00249 [PMID: 32309466 DOI: 10.14309/crj.0000000000000249]
- Rovedatti L, Lenti MV, Vanoli A, Feltri M, De Grazia F, Di Sabatino A. Nivolumab-associated active neutrophilic gastritis. *J Clin Pathol* 2020; **73**: 605-606 [PMID: 32161070 DOI: 10.1136/jclinpath-2020-206540]
- Vindum HH, Agnholt JS, Nielsen AWM, Nielsen MB, Schmidt H. Severe steroid refractory gastritis induced by Nivolumab: A case report. *World J Gastroenterol* 2020; **26**: 1971-1978 [PMID: 32390707 DOI: 10.3748/wjg.v26.i16.1971]
- Kobayashi M, Yamaguchi O, Nagata K, Nonaka K, Ryoza S. Acute hemorrhagic gastritis after nivolumab treatment. *Gastrointest Endosc* 2017; **86**: 915-916 [PMID: 28478027 DOI: 10.1016/j.gie.2017.04.033]
- Boike J, DeJulio T. Severe Esophagitis and Gastritis from Nivolumab Therapy. *ACG Case Rep J* 2017; **4**: e57 [PMID: 28459081 DOI: 10.14309/crj.2017.57]
- Tomiyasu H, Komori T, Ishida Y, Otsuka A, Kabashima K. Eosinophilic gastroenteritis in a melanoma patient treated with nivolumab. *J Dermatol* 2021; **48**: E486-E487 [PMID: 34151453 DOI: 10.1111/1346-8138.16036]
- Călugăreanu A, Romptaux P, Bohelay G, Goldfarb L, Barrau V, Cucherousset N, Heidelberger V, Nault JC, Zioli M, Caux F, Maubec E. Late onset of nivolumab-induced severe gastroduodenitis and cholangitis in a patient with stage IV melanoma. *Immunotherapy* 2019; **11**: 1005-1013 [PMID: 31304833 DOI: 10.2217/imt-2019-0077]
- Ebisutani N, Tozawa K, Matsuda I, Nakamura K, Tamura A, Hara K, Kondo T, Terada T, Tomita T, Oshima T, Fukui H, Hirota S, Miwa H. A Case of Severe Acute Gastritis as an Immune-Related Adverse Event After Nivolumab Treatment: Endoscopic and Pathological Findings in Nivolumab-Related Gastritis. *Dig Dis Sci* 2021; **66**: 2461-2465 [PMID: 32780186 DOI: 10.1007/s10620-020-06529-3]
- Bazarbashi AN, Dolan RD, Yang J, Perencevich ML. Combination Checkpoint Inhibitor-Induced Hemorrhagic Gastritis. *ACG Case Rep J* 2020; **7**: e00402 [PMID: 33062778 DOI: 10.14309/crj.0000000000000402]
- Mubder M, Bach L, Varshney N, Banerjee B. Nivolumab Induced Autoimmune Like Gastritis: A case report. *Am J Biomed Sci Res* 2020; **9** [DOI: 10.34297/AJBSR.2020.09.001358]
- Martínez-Acitores de la Mata D, Busto-Bea V, Cerezo-Aguirre C. Nivolumab-induced gastritis in a patient with metastatic melanoma. *Rev Gastroenterol Mex (Engl Ed)* 2021; **86**: 90-91 [PMID: 33309401 DOI: 10.1016/j.rgm.2020.07.012]
- Zhang ML, Neyaz A, Patil D, Chen J, Dougan M, Deshpande V. Immune-related adverse events in the gastrointestinal tract: diagnostic utility of upper gastrointestinal biopsies. *Histopathology* 2020; **76**: 233-243 [PMID: 31361907 DOI: 10.1111/his.13963]
- Ferrian S, Liu CC, McCaffrey EF, Kumar R, Nowicki TS, Dawson DW, Baranski A, Glaspy JA, Ribas A, Bendall SC, Angelo M. Multiplexed imaging reveals an IFN- γ -driven inflammatory state in nivolumab-associated gastritis. *Cell Rep Med* 2021; **2**: 100419 [PMID: 34755133 DOI: 10.1016/j.xcrm.2021.100419]
- Brahmer JR, Lacchetti C, Schneider BJ, Atkins MB, Brassil KJ, Caterino JM, Chau I, Ernstoff MS, Gardner JM, Ginex P, Hallmeyer S, Holter Chakrabarty J, Leighl NB, Mammen JS, McDermott DF, Naing A, Nastoupil LJ, Phillips T, Porter LD, Puzanov I, Reichner CA, Santomasso BD, Seigel C, Spira A, Suarez-Almazor ME, Wang Y, Weber JS, Wolchok JD, Thompson JA; National Comprehensive Cancer Network. Management of Immune-Related Adverse Events in Patients Treated With Immune Checkpoint Inhibitor Therapy: American Society of Clinical Oncology Clinical Practice Guideline. *J Clin Oncol* 2018; **36**: 1714-1768 [PMID: 29442540 DOI: 10.1200/JCO.2017.77.6385]

- 20 **Tsuji A**, Hiramatsu K, Namikawa S, Yamamoto A, Midori Y, Murata Y, Tanaka T, Nosaka T, Naito T, Takahashi K, Ofuji K, Matsuda H, Ohtani M, Imamura Y, Iino S, Hasegawa M, Nakamoto Y. A rare case of eosinophilic gastritis induced by nivolumab therapy for metastatic melanoma. *Clin J Gastroenterol* 2022; **15**: 876-880 [PMID: [35978213](#) DOI: [10.1007/s12328-022-01680-y](#)]
- 21 **Samonis G**, Bousmpoukea A, Molfeta A, Kalkinis AD, Petraki K, Koutserimpas C, Bafaloukos D. Severe Gastritis Due to Nivolumab Treatment of a Metastatic Melanoma Patient. *Diagnostics (Basel)* 2022; **12** [PMID: [36428923](#) DOI: [10.3390/diagnostics12112864](#)]
- 22 **Viscardi G**, Tralongo AC, Massari F, Lambertini M, Mollica V, Rizzo A, Comito F, Di Liello R, Alfieri S, Imbimbo M, Della Corte CM, Morgillo F, Simeon V, Lo Russo G, Proto C, Prelaj A, De Toma A, Galli G, Signorelli D, Ciardiello F, Remon J, Chaput N, Besse B, de Braud F, Garassino MC, Torri V, Ciniini M, Ferrara R. Comparative assessment of early mortality risk upon immune checkpoint inhibitors alone or in combination with other agents across solid malignancies: a systematic review and meta-analysis. *Eur J Cancer* 2022; **177**: 175-185 [PMID: [36368251](#) DOI: [10.1016/j.ejca.2022.09.031](#)]
- 23 **Hommes JW**, Verheijden RJ, Suijkerbuijk KPM, Hamann D. Biomarkers of Checkpoint Inhibitor Induced Immune-Related Adverse Events-A Comprehensive Review. *Front Oncol* 2021; **10**: 585311 [PMID: [33643899](#) DOI: [10.3389/fonc.2020.585311](#)]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

