ISSN 1948-5190 (online)

World Journal of *Gastrointestinal Endoscopy*

World J Gastrointest Endosc 2019 September 16; 11(9): 477-490

Published by Baishideng Publishing Group Inc

WJGE

World Journal of Gastrointestinal Endoscopy

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World Journal of Gastrointestinal Endoscopy

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Proofing Production Department Director: *Xiang Li*

NAME OF JOURNAL
World Journal of Gastrointestinal Endoscopy

ISSN
ISSN 1948-5190 (online)

LAUNCH DATE
October 15, 2009

FREQUENCY
Monthly

EDITORS-IN-CHIEF
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EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/1948-5190/editorialboard.htm

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PUBLICATION DATE
September 16, 2019

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World J Gastrointest Endosc 2019 September 16; 11(9): 477-485

DOI: 10.4253/wjge.v11.i9.477

ISSN 1948-5190 (online)

ORIGINAL ARTICLE

Retrospective Study

Usefulness of serum lipase for early diagnosis of post-endoscopic retrograde cholangiopancreatography pancreatitis

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Institutional review board statement: This study was reviewed and approved by the Ethics Committee of the Kitasato University.

Informed consent statement: Patients were not required to give informed consent to the study because the analysis used anonymous clinical data that were obtained after each patient agreed

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Abstract

BACKGROUND

Post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis (PEP) is new onset acute pancreatitis after ERCP. This complication is sometimes fatal. As such, PEP should be diagnosed early so that therapeutic interventions can be carried out. Serum lipase (s-Lip) is useful for diagnosing acute pancreatitis. However, its usefulness for diagnosing PEP has not been sufficiently investigated.

AIM

This study aimed to retrospectively examine the usefulness of s-Lip for the early diagnosis of PEP.

METHODS

We retrospectively examined 4192 patients who underwent ERCP at our two hospitals over the last 5 years. The primary outcomes were a comparison of the areas under the receiver operating characteristic (ROC) curves (AUCs) of s-Lip and serum amylase (s-Amy), s-Lip and s-Amy cutoff values based on the presence or absence of PEP in the early stage after ERCP *via* ROC curves, and the diagnostic properties [sensitivities, specificities, positive predictive values (PPV), and negative predictive value (NPV)] of these cutoff values for PEP diagnosis.

RESULTS

Based on the eligibility and exclusion criteria, 804 cases were registered. Over the entire course, PEP occurred in 78 patients (9.7%). It occurred in the early stage after ERCP in 40 patients (51.3%) and in the late stage after ERCP in 38 patients (48.7%). The AUCs were 0.908 for s-Lip [95% confidence interval (CI): 0.880-0.940,

to endoscopic retrograde cholangiopancreatography by written consent.

Conflict-of-interest statement: All authors declare no conflicts of interest related to this article.

Data sharing statement: No additional data are available.

Manuscript source: Unsolicited manuscript

Received: July 12, 2019
Peer-review started: July 12, 2019
First decision: August 2, 2019
Revised: August 21, 2019
Accepted: August 9, 2019
Article in press: August 9, 2019
Published online: September 16, 2019

P-Reviewer: Smith RC, Leerhøy B
S-Editor: Tang JZ
L-Editor: A
E-Editor: Zhou BX

$P < 0.001$] and 0.880 for s-Amy (95%CI: 0.846-0.915, $P < 0.001$), indicating both are useful for early diagnosis. By comparing the AUCs, s-Lip was found to be significantly more useful for the early diagnosis of PEP than s-Amy ($P = 0.023$). The optimal cutoff values calculated from the ROC curves were 342 U/L for s-Lip (sensitivity, 0.859; specificity, 0.867; PPV, 0.405; NPV, 0.981) and 171 U/L for s-Amy (sensitivity, 0.859; specificity, 0.763; PPV, 0.277; NPV, 0.979).

CONCLUSION
S-Lip was significantly more useful for the early diagnosis of PEP. Measuring s-Lip after ERCP could help diagnose PEP earlier; hence, therapeutic interventions can be provided earlier.

Key words: Endoscopic retrograde cholangiopancreatography; Post-endoscopic retrograde cholangiopancreatography pancreatitis; Pancreatitis; Lipase; Amylase

Core tip: Serum lipase (s-Lip) is useful for diagnosing acute pancreatitis. The aim of this study was to retrospectively examine the usefulness of s-Lip for the early diagnosis of post-endoscopic retrograde cholangiopancreatography pancreatitis (PEP). Based on the eligibility and exclusion criteria, 804 cases were registered. Over the entire course, PEP occurred in 78 patients. The areas under the receiver operating characteristic curves (AUCs) were 0.908 for s-Lip ($P < 0.001$) and 0.880 for serum amylase (s-Amy) ($P < 0.001$), indicating both are useful for early diagnosis. By comparing the AUCs, s-Lip was found to be significantly more useful for the early diagnosis of PEP than s-Amy ($P = 0.023$).

Citation: Tadehara M, Okuwaki K, Imaizumi H, Kida M, Iwai T, Yamauchi H, Kaneko T, Hasegawa R, Miyata E, Kawaguchi Y, Masutani H, Koizumi W. Usefulness of serum lipase for early diagnosis of post-endoscopic retrograde cholangiopancreatography pancreatitis. *World J Gastrointest Endosc* 2019; 11(9): 477-485
URL: https://www.wjgnet.com/1948-5190/full/v11/i9/477.htm
DOI: https://dx.doi.org/10.4253/wjge.v11.i9.477

INTRODUCTION

Post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis (PEP) is new onset acute pancreatitis after ERCP. The consensus criteria and revised Atlanta criteria are international consensus diagnostic criteria[1,2], but they are not unified or ideal in the setting of PEP[3,4,5]. In the consensus criteria, PEP is defined as "new onset or worsened upper abdominal pain; pancreatic amylase and lipase at least three times the upper limit of normal at more than 24 h after ERCP; requiring hospital admission or a prolongation of planned admission"[1]. The limitations include patients in an acute pancreatitis setting or a flare-up of chronic pancreatitis that prevents PEP diagnosis in less than 24 h. In the revised Atlanta criteria, the diagnosis of PEP requires two of the following three criteria: (1) abdominal pain consistent with acute pancreatitis (acute onset of a persistent, severe, epigastric pain often radiating to the back); (2) serum lipase or amylase activity at least three times greater than the upper limit of normal; and (3) characteristic findings of acute pancreatitis on contrast-enhanced computed tomography (CT) and, less commonly, magnetic resonance imaging or transabdominal ultrasonography[2]. The limitation is the fact that it is not primarily developed to define PEP. For an assessment of the severity of PEP, it has been reported that the revised Atlanta classification is superior for predicting PEP mortality[6]. The frequency of PEP is reported to be 3% to 15%[7,8,9]. PEP is sometimes fatal, with death occurring in 3% of cases[7]. Therefore, from our experience, PEP needs to be diagnosed early so that therapeutic interventions can be carried out. Normally, acute pancreatitis is diagnosed based on elevated levels of pancreatic enzymes in the blood or urine, accompanied by abdominal pain and imaging findings[3]. However, using serum levels of the pancreatic enzyme amylase is problematic because of its low diagnostic specificity[10,11]. In contrast, serum lipase (s-Lip) has been shown to be the most useful pancreatic enzyme for diagnosing acute pancreatitis, with a sensitivity of

86.5%-100% and specificity of 84.7%-99.0%[11]. Moreover, s-Lip is known to have greater diagnostic power than serum amylase (s-Amy)[12,13]. Furthermore, s-Lip levels increase in the early stages of acute pancreatitis and have been reported to be useful for diagnosing acute pancreatitis when s-Amy levels are normal[13,14]. With regard to ERCP, although there have been reports on how s-Lip and other pancreatic enzyme levels change over time[15,16], the usefulness of s-Lip for the early diagnosis of PEP has yet to be fully investigated.

Thus, we conducted a retrospective study to examine the usefulness of s-Lip and s-Amy for the early diagnosis of PEP.

MATERIALS AND METHODS

Patients

A total of 4192 patients who underwent ERCP at Kitasato University Hospital and Kitasato University East Hospital over a 5-year period from October 1, 2012 to September 30, 2017 were evaluated for inclusion. The eligibility criteria included having had (1) Both s-Lip and s-Amy measured before ERCP, 3 h post-ERCP, and the next morning; (2) Naïve major duodenal papilla; and (3) Continuous follow-up after ERCP. The exclusion criteria included acute pancreatitis, history of chronic pancreatitis, cholangiojejunostomy for pancreatic disease, and kidney dysfunction with an estimated glomerular filtration rate ≤ 44 mL/min. We excluded cases diagnosed as acute or chronic pancreatitis by imaging.

Methods

Our study was reviewed and approved by our institutional ethics committee. Data on the purpose of ERCP, content of examinations, and post-ERCP course were collected from an ERCP database and from the medical records of the Department of Gastroenterology, Kitasato University School of Medicine. Assessments of physical findings, blood test items, and, if necessary, imaging findings that would indicate PEP were conducted 3 h after ERCP and the following morning. The primary outcomes were a comparison of the areas under the receiver operating characteristic (ROC) curves (AUCs) of s-Lip and s-Amy, s-Lip and s-Amy cutoff values based on the presence or absence of PEP in the early stage after ERCP *via* ROC curves, and comparisons of the diagnostic properties [sensitivities, specificities, positive predictive values (PPV), and negative predictive value (NPV)] of these cutoff values for PEP diagnosis.

Naïve major duodenal papilla was defined as duodenal papilla that had not been treated. Diagnostic ERCP was defined as cholangiography and/or pancreatography, bile cytology and/or pancreatic juice cytology, or intraductal ultrasonography. Therapeutic ERCP was defined as therapeutic interventions that did not include any form of diagnostic ERCP.

Serum pancreatic enzymes were considered elevated when the upper bounds of our institution's reference values exceeded (s-Lip 55 U/L and s-Amy 132 U/L) and the following PEP diagnostic criteria were not met: (1) Acute episodes of abdominal pain and pressure pain on the upper abdomen; (2) Elevated levels of pancreatic enzymes in the blood or urine; and (3) Abnormal signs of acute pancreatitis by abdominal ultrasonography, CT, or magnetic resonance imaging. PEP was diagnosed when at least 2 of these 3 items were met and the presence of other pancreatic diseases or acute abdomen could be excluded[3]. For example, in elderly people, it is often difficult to evaluate the presence or absence of spontaneous pain due to the effects of analgesics used in ERCP. Thus, if hyperlipasemia or hyperamylasemia occurred after ERCP, an imaging test was added at the discretion of the attending physician. Therefore, even if the abdominal pain was mild, it was determined as PEP if pancreatitis was observed in the image findings. Up to 3 h post-ERCP was analyzed as the early stage after ERCP, and from 3 h post-ERCP to the next morning was analyzed as the late stage after ERCP. An early PEP diagnosis was defined as one made in the early stage after ERCP. Patients diagnosed with PEP in the early stage are not included among patients diagnosed with PEP in the late stage after ERCP. PEP severity was assessed using the grades of severity according to the revised Atlanta criteria[2].

Statistical analysis

ROC curves were constructed to establish relationships between sensitivity and specificity. ROC analysis was performed using the statistical package SPSS Base 17.0 (IBM Corp., Armonk, NY, United States). Analysis of s-Lip and s-Amy AUCs and cutoff values based on the presence or absence of PEP was performed using SPSS Base

17.0 (IBM Corp., Armonk, NY, United States). The DeLong test was used to perform head-to-head comparison between s-Lip and s-Amy for diagnosing PEP. Cutoff values were the closest point from the upper left of the ROC curves. Continuous data were given as the median and range. Categorical data were shown as number and percentages. *P* values < 0.05 indicated statistical significance.

RESULTS

Based on the eligibility and exclusion criteria, 804 cases were registered (Figure 1). The patients' median age was 71 years (range, 6-98 years) (male, 496, 61.7%); 31 (3.9%) had a history of pancreatitis, 6 (0.75%) had a history of PEP, 3 (0.4%) displayed sphincter Oddi dysfunction, 412 (51.2%) had benign disease, 303 (37.7%) underwent diagnostic ERCP, 202 (25.1%) had hyperlipasemia before ERCP, and 97 (12.1%) had hyperamylasemia before ERCP (Table 1).

Of the patients with serum pancreatic enzyme levels greater than 3 times the institutional upper bound after ERCP, in the early stage after ERCP, 236 patients (29.4%) exhibited hyperlipasemia and 104 patients (12.9%) exhibited hyperamylasemia. In the late stage after ERCP, 239 patients (29.7%) exhibited hyperlipasemia and 138 patients (17.2%) exhibited hyperamylasemia. Over the entire course, PEP occurred in 78 patients (9.7%). It occurred in the early stage after ERCP in 40 patients (51.3%) and in the late stage after ERCP in 38 patients (48.7%) (Table 2). Based on the grades of severity by the revised Atlanta criteria[2], there were 72 mild PEP cases (9.0%), 5 moderate cases (0.6%), and 1 severe case (0.1%) (Table 3).

Figure 2 shows the ROC curves for s-Lip and s-Amy based on the presence or absence of PEP onset in the early stage after ERCP. The AUCs were 0.908 for s-Lip [95% confidence interval (CI): 0.880-0.940, $P < 0.001$] and 0.880 for s-Amy (95%CI: 0.846-0.915, $P < 0.001$), indicating both are useful for early diagnosis. By comparing the AUCs, s-Lip was found to be significantly more useful for the early diagnosis of PEP than s-Amy ($P = 0.023$) (Table 4). The optimal cutoff values calculated from the ROC curves were 342 U/L for s-Lip (sensitivity, 0.859; specificity, 0.867; PPV, 0.405; NPV, 0.981) and 171 U/L for s-Amy (sensitivity, 0.859; specificity, 0.763; PPV, 0.277; NPV, 0.979).

DISCUSSION

The objective of this study was to examine the usefulness of s-Lip for the early diagnosis of PEP, including a comparison with s-Amy. Our study indicated that s-Lip might be preferable for the early diagnosis of PEP (ROC analysis, $P = 0.023$).

ERCP is now an important examination method in the diagnosis and treatment of pancreaticobiliary diseases. Therefore, although it is important to develop methods for preventing PEP, it is also necessary to discover other indicators so that when PEP cannot be avoided, it can be diagnosed and treated early. As with acute pancreatitis, if PEP is diagnosed early, therapy appropriate for the patient's condition can be initiated early. Previous research on PEP has found that 37% of post-ERCP cases without abdominal pain but with hyperlipasemia (≥ 3 times normal upper bound) presented with PEP by CT[17] and that 30% of PEP cases diagnosed using image findings had pancreatic enzyme levels ≤ 3 times the normal upper bound[18]. However, most of these and other studies examined s-Amy levels[19-21]. S-Lip is superior to s-Amy in diagnosing acute pancreatitis, and if it could be shown to be similarly useful for the early diagnosis of PEP, more cases of PEP could be diagnosed early and receive treatment. The AUCs of s-Lip and s-Amy based on the presence or absence of PEP in the early stage after ERCP demonstrated the usefulness of both enzymes. Moreover, the optimal cutoff values based on the ROC curves had high sensitivity and specificity, indicating that both have high diagnostic power. The AUC of s-Lip was significantly larger, showing that s-Lip has a significantly greater diagnostic power than s-Amy for the early diagnosis of PEP. When these optimal cutoff values are used, the sensitivity of s-Lip resembles that of s-Amy. Although s-Lip and s-Amy are similarly useful for early screening tests for PEP, s-Lip had a higher specificity than s-Amy. S-Lip has a higher pancreatic specificity, and is known to be more useful than s-Amy in acute pancreatitis[12,13,22,23]. S-Lip might be more useful than s-Amy for PEP, similar to acute pancreatitis. Moreover, s-Lip had a higher PPV and NPV than s-Amy. A high PPV is an advantage in the diagnosis of PEP due to the low prevalence and high fatality associated with the condition; in such cases, early diagnosis and therapeutic intervention are more important. When the s-Lip cutoff value is exceeded, it is meaningful to actively perform a contrast CT examination. Based on these results,

Table 1 Participant background

Characteristic	Value median [range] or *n* (%)
Age, yr	71 [6-98]
Sex	
Male	496 (61.7)
Female	308 (38.3)
History of previous pancreatitis	
Yes	31 (3.9)
No	773 (96.1)
History of previous PEP	
Yes	6 (0.7)
No	798 (99.3)
Sphincter of Oddi dysfunction	
Yes	3 (0.4)
No	801 (99.6)
Diagnosis	
Benign	412 (51.2)
Malignancy	392 (48.8)
Indications for ERCP	
Diagnostic	303 (37.7)
Therapeutic	501 (62.3)
Hyperlipasemia before ERCP	
Yes	202 (25.1)
No	602 (74.9)
Hyperamylasemia before ERCP	
Yes	97 (12.1)
No	707 (87.9)

ERCP: Endoscopic retrograde cholangiopancreatography; PEP: Post-endoscopic retrograde cholangiopancreatography pancreatitis.

we believe that using s-Lip, with its higher specificity and PPV, would lead to more cases of PEP being diagnosed early and receiving treatment. In fact, of the 38 patients in the present study diagnosed with PEP in the late stage after ERCP, 32 patients (84.2%) had s-Lip levels higher than our cutoff value in the early stage after ERCP. In contrast, of the 38 patients in the present study diagnosed with PEP in the late stage after ERCP, 30 patients (78.9%) had s-Amy levels higher than our cutoff value in the early stage after ERCP. Sedatives and analgesics are often administered when ERCP is performed, which can make it difficult to assess abdominal pain in the early stage after ERCP. At this stage, none of these 32 cases exhibited abdominal pain, and none of them underwent CT, abdominal ultrasonography, or other imaging examinations. If imaging had been performed to examine these cases in more detail, PEP might have been diagnosed earlier and therapeutic interventions provided in some cases. In the future, when our s-Lip cutoff value is exceeded, we will carry out an image examination even when abdominal pain is unclear, as it may be possible to diagnose PEP earlier and to perform therapeutic intervention.

This study had several limitations, the most important of which was that it was performed at two centers as a retrospective study. Moreover, too many cases were excluded according to the exclusion criteria. Therefore, the usefulness of s-Lip needs to be reexamined by prospectively registering naïve major duodenal papilla cases as part of a multicenter study. Additionally, ERCP at a high-volume center is performed on more complicated cases than at other institutions. These include patients in whom cannulation of the bile duct or pancreatic duct is difficult, such as elderly patients with underlying diseases, patients who have undergone postoperative reconstruction using a balloon enteroscope, and patients with malignant disease. Thus, there could be slight differences between populations. A multicenter study is needed to resolve this limitation.

In this study, s-Lip was more useful than s-Amy for the early diagnosis of PEP (P = 0.023). Using the s-Lip cutoff value calculated in this study could help to diagnose

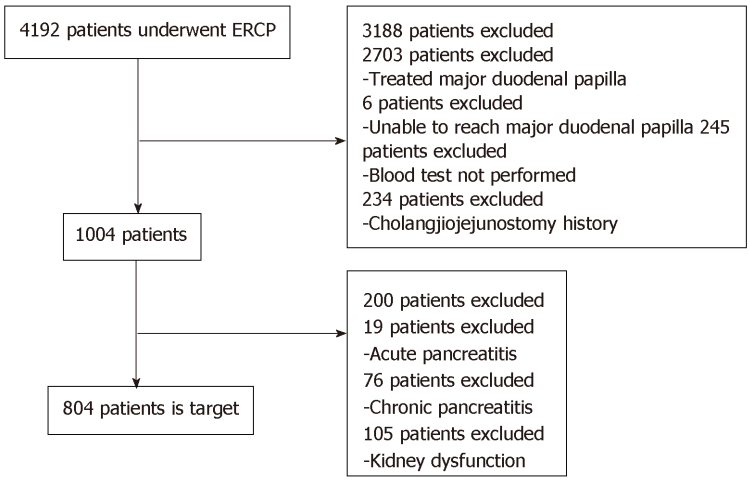

Figure 1 Flowchart for case extraction of naïve major duodenal papilla from the full population of 4192 cases.

PEP earlier, so that therapeutic interventions could be provided earlier.

Table 2 Incidence of post-endoscopic retrograde cholangiopancreatography pancreatitis and elevated serum pancreatic enzyme levels in the early and late stages after endoscopic retrograde cholangiopancreatography, *n* (%)

	Early stage after ERCP[1]	Late stage after ERCP[2]
PEP		
Yes	40 (5.0)	38 (4.7)
No	764 (95.0)	766 (95.3)
Hyperlipasemia[3]		
Yes	236 (29.4)	239 (29.7)
No	568 (70.6)	565 (70.3)
Hyperamylasemia[3]		
Yes	104 (12.9)	138 (17.2)
No	700 (87.1)	666 (82.8)

[1]Early stage is within 3 h after ERCP.
[2]Late stage is from 3 h after ERCP to the next morning.
[3]More than 3 times the standard value for the facility. ERCP: Endoscopic retrograde cholangiopancreatography; PEP: Post-endoscopic retrograde cholangiopancreatography pancreatitis.

Table 3 Incidence and severity of post-endoscopic retrograde cholangiopancreatography pancreatitis among participants[1], *n* (%)

	Value
PEP	78 (9.7)
Mild	72 (9.0)
Moderate	5 (0.6)
Severe	1 (0.1)

[1]Acute pancreatitis classification from the revised Atlanta classification[2]. PEP: Post-endoscopic retrograde cholangiopancreatography pancreatitis.

Table 4 The areas under the receiver operating characteristic curves and optimal cutoff values for s-Lipase and s-Amylase based on the presence/absence of post-endoscopic retrograde cholangiopancreatography pancreatitis in the early stage after endoscopic retrograde cholangiopancreatography

	s-Lip	s-Amy	*P*-value[1]
AUC (95%CI)	0.908 (0.880-0.940)	0.880 (0.846-0.915)	0.023
Optimal cutoff value (U/L)	342	171	—
Sensitivity	0.859	0.859	—
Specificity	0.867	0.763	—
Positive predictive value	0.405	0.277	—
Negative predictive value	0.981	0.979	—

[1]$P < 0.05$, s-Lip *vs* s-Amy. AUC: Area under the curve; CI: Confidence interval; s-Lip, Serum lipase; s-Amy: Serum amylase.

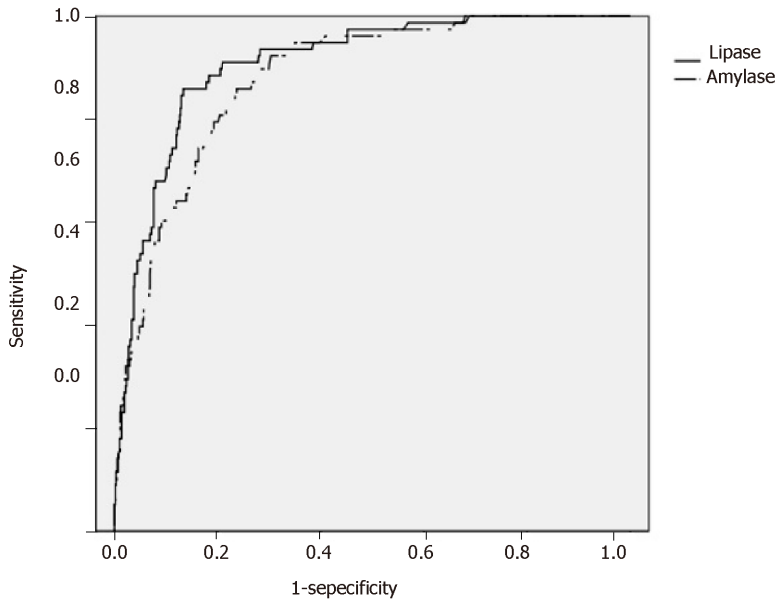

Figure 2 Receiver operating characteristic curves calculated using post-endoscopic retrograde cholangiopancreatography pancreatitis s-Lipase and s-Amylase levels at 3 h after endoscopic retrograde cholangiopancreatography. The areas under the receiver operating characteristic curves were 0.908 for s-Lip (95%CI: 0.880-0.940, $P < 0.001$) and 0.880 for s-Amy (95%CI: 0.846-0.915, $P < 0.001$).

ARTICLE HIGHLIGHTS

Research background

Serum lipase (s-Lip) is considered the most useful pancreatic enzyme for diagnosing acute pancreatitis, and s-Lip is known to have greater diagnostic power than serum amylase (s-Amy). However, its usefulness for diagnosing post-endoscopic retrograde cholangiopancreatography (ERCP) pancreatitis (PEP) has not been sufficiently investigated.

Research motivation

PEP is sometimes fatal. As such, PEP should be diagnosed early so that therapeutic interventions can be carried out. It is necessary to evaluate pancreatic enzymes that are useful for the early diagnosis of PEP.

Research objectives

This study aimed to retrospectively examine the usefulness of s-Lip for the early diagnosis of PEP.

Research methods

We retrospectively examined 4192 patients who underwent ERCP at our two hospitals over the last 5 years. The primary outcomes were a comparison of the areas under the receiver operating characteristic (ROC) curves (AUCs) of s-Lip and serum amylase (s-Amy), s-Lip and s-Amy cutoff values based on the presence or absence of PEP in the early stage after ERCP *via* ROC curves, and the diagnostic properties of these cutoff values for PEP diagnosis.

Research results

In total, 804 cases were registered. The AUCs were 0.908 for s-Lip [95% confidence interval (CI): 0.880-0.940, $P < 0.001$] and 0.880 for s-Amy (95%CI: 0.846-0.915, $P < 0.001$), indicating both are useful for early diagnosis. By comparing the AUCs, s-Lip was found to be significantly more useful for the early diagnosis of PEP than s-Amy ($P = 0.023$).

Research conclusions

S-Lip was significantly more useful for the early diagnosis of PEP. Measuring s-Lip after ERCP could help diagnose PEP early; hence, therapeutic interventions can be provided early.

Research perspectives

Measuring s-Lip is a useful option for the early diagnosis of PEP. However, this study was limited as a retrospective at two centers. The usefulness of s-Lip needs to be reexamined by prospectively registering cases as part of a multicenter study.

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World Journal of Gastrointestinal Endoscopy

Submit a Manuscript: https://www.f6publishing.com

World J Gastrointest Endosc 2019 September 16; 11(9): 486-490

DOI: 10.4253/wjge.v11.i9.486

ISSN 1948-5190 (online)

CASE REPORT

Chemical colitis caused by hydrogen peroxide vaginal douche: A case report

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Author contributions: Baiomi A wrote the initial manuscript; Patel H and Abbas H reviewed the images and manuscript; Vootla V critically reviewed the scientific content of the manuscript and also performed English language editing; Makker J critically reviewed and modified the manuscript.

Informed consent statement: Informed written consent was obtained from the patient for publication of this report and accompanying images.

Conflict-of-interest statement: Authors have no conflict of interest to disclose.

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).

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Abstract

BACKGROUND

Hydrogen peroxide is one of the most common household disinfectants worldwide. Hydrogen peroxide has been documented as a rare cause of chemical colitis.

CASE SUMMARY

We present a case of 31 years old lady who presented to our hospital with rectal bleeding and abdominal pain after using hydrogen peroxide vaginal douche as an enema. She underwent colonoscopy which showed findings suggestive of chemical colitis and was managed conservatively. Hydrogen peroxide can induce chemical injury in the colon. Clinical presentation and endoscopic findings of chemical colitis are nonspecific. History taking is an important tool in identifying the underlying etiology. Review of literature showed few case reports, mostly were managed with oral antibiotics and conservative approach.

CONCLUSION

Chemical colitis is usually managed conservatively. Complications including perforation, stricture and peritonitis may happen and need aggressive treatment accordingly.

Key words: Chemical colitis; Hydrogen peroxide; Colitis; Vaginal douche; Colonoscopy; Case report

Manuscript source: Unsolicited manuscript

Received: June 1, 2019
Peer-review started: June 4, 2019
First decision: August 2, 2019
Revised: August 9, 2019
Accepted: August 27, 2019
Article in press: August 27, 2019
Published online: September 16, 2019

P-Reviewer: Sitkin S
S-Editor: Wang JL
L-Editor: A
E-Editor: Zhou BX

Core tip: Chemical colitis is a rare entity. Depending on the extent of injury, it may lead to serious complications like perforation, stricture and peritonitis. We here present a case of chemical colitis caused by use of hydrogen peroxide vaginal douche as an enema. Patient's clinical condition improved with supportive care.

Citation: Baiomi A, Patel H, Abbas H, Vootla V, Makker J. Chemical colitis caused by hydrogen peroxide vaginal douche: A case report. *World J Gastrointest Endosc* 2019; 11(9): 486-490
URL: https://www.wjgnet.com/1948-5190/full/v11/i9/486.htm
DOI: https://dx.doi.org/10.4253/wjge.v11.i9.486

INTRODUCTION

Chemical colitis is an inflammation of the large intestine or colon, caused by exposure to chemicals which could be as a result of accidental contamination of endoscopes during the cleaning process or by use of enemas with accidental or intentional exposure to various chemicals. Glutaraldehyde, hydrogen peroxide (H_2O_2) and enemas for routine bowel cleansing or constipation relief or sexual practice are the most common causes of chemical colitis[1,2].

Here we present a rare case of diagnosed with chemical colitis due to hydrogen peroxide used as an enema.

CASE PRESENTATION

Chief complaints

A 31-year-old lady presented to our emergency room with rectal bleeding.

History of present illness

She was recently diagnosed with bacterial vaginosis for which she was treated with Hydrogen Peroxide vaginal douche. She has chronic constipation. She reported having no bowel movement during the past 3 days and she used her hydrogen peroxide vaginal douche as an enema to help her have a bowel movement. She presented with 2 episodes of rectal bleeding associated with left lower quadrant abdominal pain for 1 d.

History of past illness

She had a history of chronic constipation.

Personal and family history

She denied smoking cigarettes, alcohol or illicit drug use. No history of previous surgeries. Family history was negative for any gastrointestinal cancers.

Physical examination upon admission

On presentation her vitals were stable with temperature 98.6 degrees F, pulse 80 beats per minute, respiratory rate 18/min and blood pressure 15.2/9.9 kPa. On general physical examination she appeared comfortable and not in acute distress. Abdominal examination was unremarkable.

Laboratory examinations

Laboratory studies are shown in Table 1.

Imaging examinations

Computed tomography (CT) of the abdomen with oral and intravenous contrast (Figure 1) was done which showed diffuse bowel wall thickening involving the distal transverse colon, descending colon, sigmoid colon and rectum consistent with colitis. No bowel obstruction was noted.

Further diagnostic work-up

Patient had colonoscopy which showed severe inflammation characterized by congestion (edema), erythema, friability, loss of vascularity and confluent ulcerations found in a continuous and circumferential pattern from the rectum to the sigmoid

Table 1 Initial relevant laboratory values on presentation

Laboratory test	Results (Normal range)		
	Day-1	Day-2	Day-3
Hemoglobin	12.8 g/dL (12-16 g/dl)	10.9 g/dL (12-16 g/dL)	10.4 g/dL (12-16g/dL)
Hematocrit	38.9% (42%-51%)	33.0% (42%-51%)	31.2 % (42%-51%)
Leucocyte count	19.7 k/μL (4.8-10.8 k/μL)	14.2 k/μL (4.8-10.8 k/μL)	10.9 k/μL (4.8-10.8 k/μL)
Platelet count	449000/μL (150000-400000/μL)	373000/μL (150000-400000/μL)	330000/μL (150000-400000/μL)
Blood urea nitrogen	9 mg/dL (8-26 mg/dL)	8 mg/dL (8-26 mg/dL)	5 mg/dL (8-26 mg/dL)
Serum creatinine	0.8 mg/dL (0.5-1.5 mg/dL)	0.8 mg/dL (0.5-1.5 mg/dL)	0.7 mg/dL (0.5-1.5 mg/dL)
Serum albumin	4.5 g/dL (3.2-4.6 g/dL)		
Serum total bilirubin	0.9 mg/dL (0.2-1.1 mg/dL)		
Alkaline phosphatase	88 unit/L (43-160 unit/L)		
Serum alanine aminotransferase	11 unit/L (5-40 unit/L)		
Serum aspartate transaminase	16 unit/L (9-36 unit/L)		
Serum lipase	17 unit/L (< 61 unit/L)		

colon until 30 cm from anal verge (Figure 2). The descending colon was spared. Biopsies were taken with a cold forcep for histology and it showed colonic mucosa with mucosal erosion, extravasated red blood cells with hyalinization of lamina propria with mild glandular atrophic changes which was mostly related to chemical injury.

FINAL DIAGNOSIS

The final diagnosis of the presented case is chemical colitis secondary to hydrogen peroxide.

TREATMENT

Patient received intravenous hydration with normal saline and intravenous antibiotics including Ceftriaxone and Metronidazole.

OUTCOME AND FOLLOW-UP

Patient was discharged home on oral antibiotics and was seen for a follow up as outpatient where she reported resolution of her symptoms.

DISCUSSION

Chemical colitis occurs as a result of potentially caustic chemicals coming in contact with colonic mucosa. The most common causes of chemical colitis are - glutaraldehyde, alcohol, radiocontrast agents, formalin, ergotamine, sulfuric acid, acetic acid, ammonia soap, sodium hydroxide, hydrogen peroxide, herbal medicines, and potassium permanganate[3].

Hydrogen peroxide is one of the most common household disinfectants in the world. It is used to disinfect wounds and there are hundreds of remedies utilizing hydrogen peroxide including its use to bleach hair, antiseptic mouth rinse, whiten nails, remove stain from teeth, clear up acne[4], and relieve ear infections and vaginal douche to treat bacterial vaginosis[5].

Depending on the degree of inflammation, the presentation of chemical colitis may vary from asymptomatic patient to abdominal pain, bloating, nausea, vomiting, watery or bloody diarrhea, fever or severe sepsis with peritonitis, bowel stricture, perforation and rectovaginal fistula formation. Physical examination usually is unremarkable for mild cases. In severe cases with extensive inflammation and perforation, physical examination may reveal signs of peritonitis with acute abdomen[6-9].

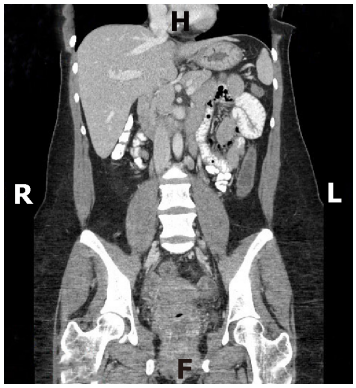

Figure 1 Computed tomography of abdomen with oral and intravenous contrast (coronal view). The computed tomography revealing thickened descending colon and rectum consistent with colitis.

Diagnostic tests usually include contrast enhanced abdominal CT which may show thickening of the colonic wall with pericolonic inflammation. It may also show stricture and fistula formation depending on the extent of injury and timing of presentation. Colonoscopy or flexible sigmoidoscopy with biopsy should be performed in all hemodynamically stable patients to assess the extent of injury. Colonoscopy may show evidence of colitis with inflammation, ulceration, granulation tissue, edema and exudates. Histological features of chemical colitis range from non-specific colitis with erosions, ulceration, extravasated red blood cells to glandular atrophy with hyalinization of lamina propria and evidence of ischemic colitis[2,3,5].

Since the clinical presentation, imaging, endoscopic and histological findings are nonspecific, the diagnosis of chemical colitis can be challenging, and it depends on detailed history taking. The management of chemical colitis is usually conservative with discontinuation of the offending agent, fluid replacement and a short course of antibiotics. Use of steroids locally or in systemic form has also been described. Some researchers advise using short term mesalamine for about 2 wk. Depending on the depth and extent of injury, patients may develop gastrointestinal bleeding, perforation, colonic rupture[10] and rarely require colectomy for ischemic colitis and/or peritonitis[7]. A recent review of literature by Pawar *et al*[11] reported 21 cases of hydrogen peroxide induced colitis. Most cases in that series presented with abdominal pain and bleeding per rectum, and most of the cases were diagnosed using CT scan and /or sigmoidoscopy with biopsy. Majority were managed conservatively and recovery period ranged from 3 d to 8 mo[11].

CONCLUSION

Chemical colitis can result from various chemical injuries to the colon, including hydrogen peroxide which is available over the counter as a wound disinfectant and a vaginal douche. In this case hydrogen peroxide was used as an enema to relieve constipation which resulted in chemical colitis. Bowel rest, discontinuation of exposure to the toxic agent, and broad-spectrum antibiotics resulted in complete resolution of the symptoms.

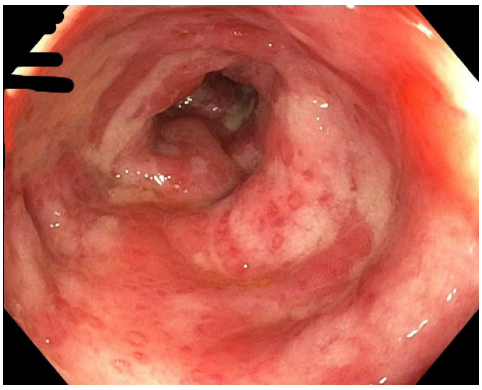

Figure 2 Colonoscopy examination. Colonoscopy revealing severe sigmoid colon inflammation characterized by congestion (edema), erythema, friability, loss of vascularity and confluent ulcerations.

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