

CASE REPORT

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Lactobacillus plantarum liver abscess following ERCP: a case report and review

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Abstract

Background *Lactobacillus plantarum* is a probiotic. It has a positive effect on the intestinal flora, improving intestinal barrier function and regulating immune function. At present, it is clinically used to prevent or treat a variety of diseases. However, in recent years, serious infections caused by *Lactobacillus plantarum* have been reported. Endoscopic retrograde cholangiopancreatography (ERCP) is one of the main methods for managing biliary and pancreatic disorders. With the widespread application of ERCP, there are increasing reports of concurrent infections.

Case presentation In this case, a 62-year-old female patient with pancreatic cancer developed chills and fever after undergoing ERCP and biliary stenting. She was diagnosed with a liver abscess, and the pathogenic bacterium identified was *Lactobacillus plantarum*, a rare instance of a probiotic causing disease.

Conclusion This report describes the first case of a liver abscess caused by *Lactobacillus plantarum* following ERCP. This suggests that although *Lactobacillus plantarum* is a probiotic, it is risky for patients with anatomical disruptions, impaired mucosal barrier function, or immunocompromised status. Clinical applications of *Lactobacillus plantarum* should be treated with caution.

Keywords ERCP, Liver abscess, *Lactobacillus plantarum*

Introduction

Lactobacillus plantarum is a probiotic and a member of the genus *Lactobacillus*. It can function as an anaerobe or facultative anaerobe and is among the most widely recognized species within the genus. *Lactobacillus plantarum* belongs to the phylum Firmicutes, which is a major group of intestinal microorganisms [1]. It is found in a variety of foods (e.g., vegetables, fruits, legumes, dairy products,

meat products, and wine, etc.), as well as in the mucous membrane environments (e.g., the oral cavity, stomach, intestines, and vagina, etc.) of humans and animals [2, 3, 4]. They are generally straight or curved rods, sometimes in the form of chains [5]. *Lactobacillus plantarum* is closely related to human life and is widespread not only in various foods but also in the gastrointestinal tract [6]. There has been an increasing number of trials exploring the therapeutic effects of *Lactobacillus plantarum* in various diseases [7]. However, there has also been a rise in reported cases of *Lactobacillus plantarum* infection.

ERCP is a commonly utilized surgical procedure for pancreaticobiliary diseases. Despite its high effectiveness, ERCP is frequently linked with various complications. With the global proliferation of ERCP, reports of its complications are steadily rising each year [8]. This article recounts a case involving a liver abscess caused by

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the intestinal probiotic *Lactobacillus plantarum* following ERCP.

Case presentation

A 62-year-old woman was admitted to the hospital presenting with chills, fever, and a temperature reaching 40 °C. She had been diagnosed with pancreatic cancer and biliary obstruction, indicated by yellow skin discoloration, five months ago. Endoscopic management, including ERCP with biliary sphincterotomy and stone extraction followed by placement of a biliary stent, was performed. One month ago, she was hospitalized due to abdominal pain, nausea, vomiting, and fever, and was subsequently diagnosed with a liver abscess. Blood and pus cultures revealed *Candida albicans*. After undergoing CT-guided percutaneous liver abscess catheter insertion and drainage, along with fluconazole treatment, she was discharged upon improvement. The patient had no history of diabetes or hepatitis, no recent travel or change in residence within the three months preceding onset of illness, and no history of smoking or alcohol consumption.

We conducted relevant examinations for the patient. Abdominal CT scan revealed (Fig. 1) a hypodense lesion in the hepatic caudate lobe. Abdominal ultrasound showed mixed echogenicity in the hepatic caudate lobe, measuring 7.4*5.7 cm. Laboratory tests exhibited leukocytosis with neutrophilia and elevated C-reactive protein levels (WBC: 13.6210⁹/L, NE%: 79.40%, CRP: 174.39 mg/L), as well as increased hepatocellular enzyme levels (ALT: 58.41U/L, AST: 93.39U/L). Blood and pus cultures were positive for *Lactobacillus plantarum*. Given its probiotic nature, no drug susceptibility testing

was performed, and empiric treatment with Piperacillin tazobactam was initiated. CT-guided percutaneous liver abscess puncture catheter drainage was performed, resulting in normalization of body temperature and reduction in abscess size. Subsequent abdominal ultrasound revealed mixed echogenicity in the hepatic caudate lobe, measuring 3.4*2.8 cm. The patient's symptoms improved, and she was discharged from the hospital. However, three months later, the patient died due to fever and gastrointestinal bleeding.

Discuss

Liver abscess is a purulent lesion of the liver caused by bacteria, fungi, or microorganisms such as *Entamoeba histolytica*, which primarily invade the liver via the biliary route. Pyogenic liver abscess (PLA) is a prevalent clinical liver infection, constituting 80% of all liver abscesses. Pathogenic bacteria commonly associated with PLA include *Escherichia coli*, *Klebsiella pneumoniae*, *enterococci*, *streptococcus*, *anaerobic bacteria*, *Staphylococcus aureus*, among others, with *Escherichia coli* and *Klebsiella pneumoniae* being the predominant species [9]. In this case, both pus culture and blood culture of the liver abscess patient yielded *Lactobacillus plantarum*, a rare pathogen of liver abscesses. *Lactobacillus plantarum* is commonly acknowledged as a probiotic and is frequently utilized as a starter culture in various food fermentations, as well as in probiotic formulations [10]. It holds a Qualified Presumption of Safety designation from the European Food Safety Authority and is listed under the “generally recognized as safe” status by the United States Food and Drug Administration [11]. It also plays a large role in biomedicine, treating many diseases with little or

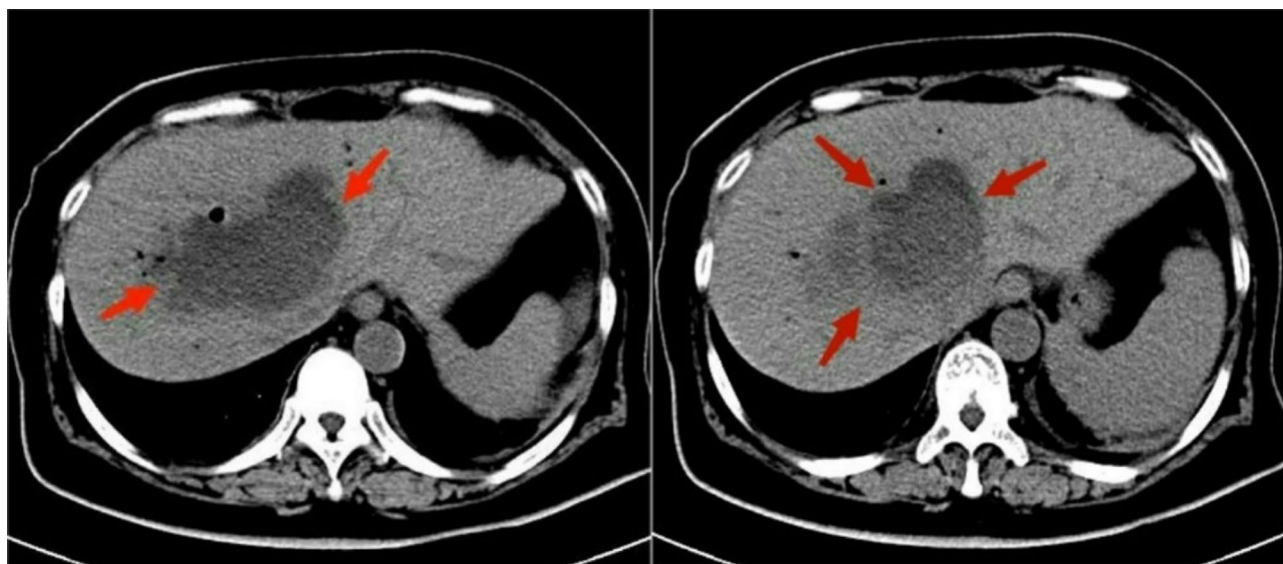


Fig. 1 Abdominal CT showing a liver abscess (red arrow)
CT: computed tomography

no side effects, and can be used as a safe curative drug [12]. Therefore, *Lactobacillus plantarum* is presently utilized in the treatment of various diseases, including burn infections [13], severe acute pancreatitis [14], regulation of intestinal microbiota to enhance intestinal barrier function [15], and management of critical diseases. But is *Lactobacillus plantarum* really safe? We conducted a search for 19 cases of *Lactobacillus plantarum* over the past 50 years using Web of Science and PubMed databases (Table 1), Keywords included *lactobacillus*, *lactobacillus* Sepsis, *lactobacillus plantarum*, liver abscess, and endocarditis [16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33]. In our literature review, the median age of the 19 patients was 57 years (range:34–75 years), with a gender distribution of 11 males for every 7 females, except for one case with unclear gender. *Lactobacillus plantarum* was isolated from blood culture or tissue fluid culture in all 19 infected patients. Fever was reported in approximately 70% of patients, with most experiencing pain at the infection site. About 63% of patients showed symptom improvement after antibiotic treatment, which included penicillins, gentamicin, and imipenem. Among the cases, there were 8 instances of *Lactobacillus plantarum* endocarditis, 3 cases of sepsis, and single cases of pneumonia, throat infection, meningitis, arthritis, liver abscess, ostomy site abscess post-gastric cancer, acute acalculous cholecystitis complicated by peritonitis, and descending necrotizing mediastinitis. It is evident that under certain conditions, *Lactobacillus plantarum* can lead to multisystem infection. Some patients required surgery or abscess drainage based on their condition. Isobe et al.(1990) reported a case of *Lactobacillus plantarum*-associated liver abscess following percutaneous ethanol injection for liver cancer. In conclusion, Liver abscess following ERCP has not been previously reported. To our knowledge, this is the first report of *Lactobacillus plantarum*-associated Liver abscess following ERCP. ERCP is widely acknowledged as the primary treatment for various pancreaticobiliary diseases and is highly effective across multiple indications [34]. ERCP with Endoscopic sphincterotomy (ES) is generally considered a safe procedure, with expanding indications [8]. However, there are some complications that need to be addressed. Prior ES can lead to duodenal-biliary reflux by disrupting the barrier between the hepatobiliary system and duodenum. This disruption may facilitate bacterial colonization, cholangitis, or even liver abscess [35]. We consider that this patient developed a liver abscess and bloodstream infection due to infection with the intestinal *Lactobacillus plantarum*, with ERCP and stent implantation being significant contributing factors.

In summary, the patient in this case presented with multiple risk factors for liver abscess, including advanced age, recent ERCP, and underlying malignant tumors.

Building upon previous case reports, it is evident that the *Lactobacillus plantarum* poses a significant risk for patients with disrupted anatomy, impaired barrier function, and compromised immune systems, potentially leading to fatal infections. Particularly in today's context, where research on *Lactobacillus plantarum* is widely exploring its therapeutic potential across various diseases, this case highlights the elevated risk of severe infection associated with *Lactobacillus plantarum* in certain patients, including those undergoing ERCP, post-stenting, and those with advanced tumors. We share this case with the hope that it will serve as a valuable reference for our peers.

Conclusion

This report describes the first case of a liver abscess caused by *Lactobacillus plantarum* following ERCP. The patient in this case presented with multiple risk factors for hepatic abscess, including advanced age, recent ERCP with biliary stent placement, and underlying malignancy. In conjunction with previous case reports, probiotic treatments such as *Lactobacillus plantarum* are not completely safe in patients with anatomical disruption, abnormal barrier function, and immunocompromised patients, and it can lead to fatal infections. Especially in the current context, where *Lactobacillus plantarum* has been extensively studied for the treatment of various diseases, infections caused by this organism may become increasingly common. We report this case and hope that it will be a reference for many peers. Clinical applications of *Lactobacillus plantarum* should be treated with caution.

Table 1 Summary of 19 cases of *Lactobacillus plantarum* over the past 50 years

Reference, year	Incentives	Underlying Condition	Infections caused by <i>Lactobacillus plantarum</i>	Symptoms	Age/sex	Treatment	Out-com
Judith Axelrod Gerald T. Keusch Edward Bottone et al., 1973	Dental scraping	None	Endocarditis	Fever	44/F	Penicillin Gx4weeks Ampicillinx6weeks	Cured
M. Elisabeth Sharpe L. R. Hill S. P. Lapag 1973	No reported	No reported	Troat infection	No reported	34/F	No reported	No reported
M. Elisabeth Sharpe L. R. Hill S. P. Lapag, 1973	Gastrostomy and cardioesophagectomy	Aeno-carcinoma of the stomach	Gastrostomy site abscess	Fever	64/M	Gentamicinx4days	Cured
Arnold S. Bayer Anthony W. Chow and Lucien B. Guze, 1978	No reported	Cardiomyopathy; Starr-Edwards prosthetic aortic valve	Endocarditis of prosthetic aortic valve	No reported	48/F	No reported	Died
Arnold S. Bayer Anthony W. Chow and Lucien B. Guze 1978	None	Heroin addiction; previous endocarditis with group D <i>Streptococcus</i> ; carious teeth	Endocarditis of aortic valve	Fever, back pain	52/M	Penicillin, amphotericin Bx3 weeks; aortic valve replacement	Died of ruptured aortic aneurysm
Reference, year	Incentives	Underlying Condition	Infections caused by <i>Lactobacillus plantarum</i>	Symptoms	Age/sex	Treatment	Out-com
Zech F, Buy J J and De Plaen J, 1983	No reported	Cardiology, atrial fibrillation	Endocarditis	Fever	74/M	ampicillinx6 weeks and gentamicinx2weeks, then penicillin and gentamicinx 6 weeks	Cured
Davies A J, James P A and Hawkey P M, 1985	None	None	Endocarditis	Night sweats, chest pain and shortness of breath, fever	40/M	Penicillinx5weeks + gentamicin x2weeks then surgery	Cured
Bar W, Euteneuer B and Schuster S, 1987	Immunovascultitis		Bacteremia , endocarditis lenta		43/-		
Irene Thangkhiew and R. F. Gunstone, 1987	None	Hypertension and obesity	Endocarditis	Muscular weakness	66/M	Amoxycillinx2weeks	Died
Struve J, Weiland O and Nord C E, 1988	Severe dental caries with periapical osteitis in three places	Endocarditis, cerebral emboli, a peptic ulcer followed by pneumonia With transient heart failure	Endocarditis	Fever, a feeling of being 'out of shape	69/M	Netilmicinx2 weeks + penicillin Gx 6 weeks	Cured
Isobe H, Fukai T, Iwamoto H, et al., 1990	Percutaneous ethanol injection therapy	HCC, Parkinson's disease	Liver abscess, sepsis	Fever	75/M	piperacillin	Improved
Reference, year	Incentives	Underlying Condition	Infections caused by <i>Lactobacillus plantarum</i>	Symptoms	Age/sex	Treatment	Out-com

Table 1 (continued)

Reference, year	Incentives	Underlying Condition	Infections caused by <i>Lactobacillus plantarum</i>	Symptoms	Age/sex	Treatment	Out-com
Pavel Švec, Ivo Sedláček and Alena Ševčíková et al., 2006	-	Corticoddependency, immunodeficiency, secondary bone marrow inhibition, intravenous port	-	Bronchial asthma	37/F	CEF I.gen., AMX-clav, GEN	Died
Daniel Tena, Nora Mariela Martínez, Cristina Losa et al., 2013	None	Non-insulin-dependent diabetes, chronic arterial ischemia, diabetic foot	Acute acalculous cholecystitis complicated with peritonitis	Acute abdominal pain and fever	57/F	Imipenem x 2 weeks	Cured
Takahito Nei, Shunta Inai, Iwao Mikami et al., 2013	Neck abscess	Diabetes mellitus, surgical resection of advanced laryngeal cancer	Descending necrotizing mediastinitis	Fever, neck swelling	69/M	Mediastinal drainage, levofloxacin x 5 days then meropenem then ampicillin	Cured
B. Franko, P. Fournier and T. Jouve et al., 2016	None	Diabetes	Aspiration pneumonia	Fever, respiratory distress	52/F	Piperacillin-tazobactam	Died
A. Mizrahi, B. Pilimis, T. Lambert et al., 2016	Injured by peeling an orange	Diabetes	Thumb osteoarthritis	Swelling, redness, and severe acute pain at the fingertip.	61/M	Surgery then amoxicillin	Cured
Reference, year	Incentives	Underlying Condition	Infections caused by <i>Lactobacillus plantarum</i>	Symptoms	Age/sex	Treatment	Out-com
Grazyna Biesiada, Roza Krycinska, Jacek Czepiel et al., 2018	None	Metastatic plasmocytoma lung cancer	Meningoencephalitis	Change in mental status, fever, drowsiness	63/M	Vancomycin + ceftriaxone + ampicillin + dexamethasone + mannitol + furosemide + valproic acid/sodium valproate	Improved
Tavernese A, Caldara F, Muscoli S et al., 2020	No reported	Surgical aortic replacement with a biological prosthetic valve	Prosthetic valve endocarditis	Fever, worsening asthenia	48/M	Intravenous penicillin G (18 million U/day) + intravenous gentamicin (3 mg/kg/day) x 6 weeks then amoxicillin/clavulanic acid then 6 months later he underwent redo valve replacement.	Cured
H. Matsuura, Y. Kiura, T. Ito et al., 2020	None	Rectal cancer	Sepsis	Fever, diarrhea and shaking chills	72/F	Ampicillin x 10 days then endoscopic submucosal dissection.	Improved

* Please note that the use of “-”, here indicates that specific information has not been consulted. Actual data and information should be substituted accordingly

Abbreviations

ERCP Endoscopic retrograde cholangiopancreatography
PLA Pyogenic liver abscess
ES Endoscopic sphincterotomy

Author contributions

All authors contributed to the study conception and design. W.Ren was the main author of the article and produced Table 1, G. Lian collected case data and produced Figure 1, Y.Wei reviewed the literature and analysed it, and Y.Liu and C.Yang reviewed and proofread the article. All authors read and approved the final manuscript.

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Data availability

Data is provided within the manuscript. The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval

This article was reviewed and approved by The Second Hospital of Dalian Medical University ethical committee.

Consent for publication

Written informed consent was obtained from the patient's legal guardian for publication of this article.

Competing interests

The authors declare no competing interests.

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