# World Journal of *Clinical Cases*

World J Clin Cases 2022 December 16; 10(35): 12804-13147





Published by Baishideng Publishing Group Inc

W J C C World Journal of Clinical Cases

# Contents

# Thrice Monthly Volume 10 Number 35 December 16, 2022

# **EVIDENCE REVIEW**

12804 Principle and progress of radical treatment for locally advanced esophageal squamous cell carcinoma Zhang XF, Liu PY, Zhang SJ, Zhao KL, Zhao WX

# **REVIEW**

12812 Minimally invasive techniques in benign and malignant adrenal tumors Dogrul AB, Cennet O, Dincer AH

12822 Planning issues on linac-based stereotactic radiotherapy Huang YY, Yang J, Liu YB

# **MINIREVIEWS**

- 12837 Hepatitis of unknown etiology in children: Current evidence and association Zhong R, Yi F, Xiang F, Qiu YF, Zhu L, Zou YH, Wang W, Zhang Q
- 12844 Anatomical basis for pancreas transplantation via isolated splenic artery perfusion: A literature review Dmitriev I, Oganesyan M, Popova A, Orlov E, Sinelnikov M, Zharikov Y
- 12854 Antenatal imaging: A pictorial review Ece B, Aydın S, Kantarci M
- 12875 Real role of growth factor receptor-binding protein 10: Linking lipid metabolism to diabetes cardiovascular complications

Yang Y, Yao HJ, Lin WJ, Huang SC, Li XD, He FZ

# **ORIGINAL ARTICLE**

# **Retrospective Study**

12880 Radiological and clinical outcomes of midline lumbar fusion on sagittal lumbar-pelvic parameters for degenerative lumbar diseases

Wang YT, Li BX, Wang SJ, Li CD, Sun HL

12890 Clinical features of elderly patients with COVID-19 in Wuhan, China Wei S, Chen G, Ouyang XC, Hong YC, Pan YH

# **Observational Study**

12899 Do inflammatory bowel disease patient preferences from treatment outcomes differ by ethnicity and gender? A cross-sectional observational study

Naftali T, Richter V, Mari A, Khoury T, Shirin H, Broide E



World Journal of Clinical Cases			
Conter	its Thrice Monthly Volume 10 Number 35 December 16, 2022		
12909	Lipoprotein (a) variability is associated with mean follow-up C-reactive protein in patients with coronary artery disease following percutaneous coronary intervention		
	Zhang SS, Hu WY, Li YJ, Yu J, Sang S, Alsalman ZM, Xie DQ		
12920	Efficacy evaluation of neuroendoscopy $vs$ burr hole drainage in the treatment of chronic subdural hematoma: An observational study		
	Wang XJ, Yin YH, Wang ZF, Zhang Y, Sun C, Cui ZM		
12928	Optimal approach for total endoscopic discectomy and its effect on lumbar and leg function in patients with disc herniation		
	Zhang ZH, Du Q, Wu FJ, Liao WB		
12936	Value of inflammatory mediator profiles and procalcitonin in predicting postoperative infection in patients with hypertensive cerebral hemorrhage		
	Yin RH, Zhang B, Zhou XH, Cao LP, Li M		
	SYSTEMATIC REVIEWS		
12946	De novo non-alcoholic fatty liver disease after pancreatectomy: A systematic review		
	Shah P, Patel V, Ashkar M		
	META-ANALYSIS		
12959	Comparative effectiveness of first-line therapies for eradication of antibiotic-resistant <i>Helicobacter pylori</i> strains: A network meta-analysis		
	Zou SP, Cheng Q, Feng CY, Xu C, Sun MH		
	CASE REPORT		
12971	Malignant atrophic papulosis: Two case reports		
	Li ZG, Zhou JM, Li L, Wang XD		
12980	Endoscopic treatment of urothelial encrusted pyelo-ureteritis disease: A case series		
	Liu YB, Xiao B, Hu WG, Zhang G, Fu M, Li JX		
12990	Nearly-complete labial adhesions diagnosed with repetitive cystitis in postmenopausal women: A case report		
	Kwon H		
12996	Congenital dysfibrinogenemia misdiagnosed and inappropriately treated as acute fatty liver in pregnancy: A case report and review of literature		
	Jia Y, Zhang XW, Wu YS, Wang QY, Yang SL		
13006	Lung squamous cell carcinoma presenting as rare clustered cystic lesions: A case report and review of literature		
	Shen YY, Jiang J, Zhao J, Song J		
13015	Management of ductal spasm in a neonate with pulmonary atresia and an intact ventricular septum during cardiac catheterization: A case report		
	Zhang X, Zhang N, Song HC, Ren YY		



	World Journal of Clinical Cases
Conter	Thrice Monthly Volume 10 Number 35 December 16, 2022
13022	Symptomatic accessory soleus muscle: A cause for exertional compartment syndrome in a young soldier: A case report
	Woo I, Park CH, Yan H, Park JJ
13028	Multiple myeloma presenting with amyloid arthropathy as the first manifestation: Two case reports <i>He C, Ge XP, Zhang XH, Chen P, Li BZ</i>
13038	Kawasaki disease without changes in inflammatory biomarkers: A case report Yamashita K, Kanazawa T, Abe Y, Naruto T, Mori M
13044	Atypical Whipple's disease with special endoscopic manifestations: A case report
15044	Chen S, Zhou YC, Si S, Liu HY, Zhang QR, Yin TF, Xie CX, Yao SK, Du SY
13052	Acute limb ischemia after minimally invasive cardiac surgery using the ProGlide: A case series
	Lee J, Huh U, Song S, Lee CW
13058	Genetic changes in refractory relapsed acute myeloid leukemia with NPM1 mutation: A case report
	Wang SL
13064	Successful surgical treatment of polybacterial gas gangrene confirmed by metagenomic next-generation sequencing detection: A case report
	Lu HY, Gao YB, Qiu XW, Wang Q, Liu CM, Huang XW, Chen HY, Zeng K, Li CX
13074	Pulmonary sarcoidosis: A novel sequelae of drug reaction with eosinophilia and systemic symptoms: A case report
	Hu YQ, Lv CY, Cui A
13081	Hammered silver appearance of the corneal endothelium in Fuchs uveitis syndrome: A case report
	Cheng YY, Wang CY, Zheng YF, Ren MY
13088	Tracheostomy and venovenous extracorporeal membrane oxygenation for difficult airway patient with carinal melanoma: A case report and literature review
	Liu IL, Chou AH, Chiu CH, Cheng YT, Lin HT
13099	Surgery combined with antibiotics for thoracic vertebral <i>Escherichia coli</i> infection after acupuncture: A case report
	Mo YF, Mu ZS, Zhou K, Pan D, Zhan HT, Tang YH
13108	Multidisciplinary treatment of a patient with severe immune checkpoint inhibitor-induced colitis: A case report
	Lu L, Sha L, Feng Y, Yan L
13115	Systemic combined with intravitreal methotrexate for relentless placoid chorioretinitis: A case report
	Luo L, Chen WB, Zhao MW, Miao H
13122	Response to roxadustat in a patient undergoing long-term dialysis and allergic to erythropoiesis- stimulating agents: A case report
	Xu C, Luo DG, Liu ZY, Yang D, Wang DD, Xu YZ, Yang J, Fu B, Qi AR



Contor	World Journal of Clinical Cases
Conter	Thrice Monthly Volume 10 Number 35 December 16, 2022
13129	Liver collision tumor of primary hepatocellular carcinoma and neuroendocrine carcinoma: A rare case report
	Jeng KS, Huang CC, Chung CS, Chang CF
13138	Unexpected delayed reversal of rocuronium-induced neuromuscular blockade by sugammadex: A case report and review of literature
	Wang HC, Lu CW, Lin TY, Chang YY
	LETTER TO THE EDITOR
13146	Immunoglobulin G4 associated autoimmune cholangitis and pancreatitis and nivolumab
	Joob B, Wiwanitkit V



# Contents

Thrice Monthly Volume 10 Number 35 December 16, 2022

# **ABOUT COVER**

Editorial Board Member of World Journal of Clinical Cases, Lovenish Bains, FACS, FICS, FRCS, MBBS, MS, Associate Professor, Surgeon, Teacher, Department of Surgery, Maulana Azad Medical College, New Delhi 110002, India. lovenishbains@gmail.com

# **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, Scopus, 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. The WJCC's CiteScore for 2021 is 1.2 and Scopus CiteScore rank 2021: General Medicine is 443/826.

# **RESPONSIBLE EDITORS FOR THIS ISSUE**

Production Editor: Hua-Ge Yu; Production Department Director: Xiang Li; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL	INSTRUCTIONS TO AUTHORS
World Journal of Clinical Cases	https://www.wignet.com/bpg/gerinfo/204
<b>ISSN</b>	GUIDELINES FOR ETHICS DOCUMENTS
ISSN 2307-8960 (online)	https://www.wignet.com/bpg/GerInfo/287
LAUNCH DATE	GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
April 16, 2013	https://www.wignet.com/bpg/gerinfo/240
FREQUENCY	PUBLICATION ETHICS
Thrice Monthly	https://www.wjgnet.com/bpg/GerInfo/288
<b>EDITORS-IN-CHIEF</b> Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku	PUBLICATION MISCONDUCT https://www.wjgnet.com/bpg/gerinfo/208
EDITORIAL BOARD MEMBERS	ARTICLE PROCESSING CHARGE
https://www.wjgnet.com/2307-8960/editorialboard.htm	https://www.wjgnet.com/bpg/gerinfo/242
PUBLICATION DATE December 16, 2022	STEPS FOR SUBMITTING MANUSCRIPTS https://www.wjgnet.com/bpg/GerInfo/239
COPYRIGHT	ONLINE SUBMISSION
© 2022 Baishideng Publishing Group Inc	https://www.f6publishing.com

© 2022 Baishideng Publishing Group Inc. All rights reserved. 7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA E-mail: bpgoffice@wjgnet.com https://www.wjgnet.com



W J C C World Journal of Clinical Cases

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

World J Clin Cases 2022 December 16; 10(35): 13064-13073

DOI: 10.12998/wjcc.v10.i35.13064

ISSN 2307-8960 (online)

CASE REPORT

# Successful surgical treatment of polybacterial gas gangrene confirmed by metagenomic next-generation sequencing detection: A case report

Hong-Yan Lu, Yan-Bin Gao, Xue-Wen Qiu, Qi Wang, Chen-Mei Liu, Xiao-Wen Huang, Hong-Yu Chen, Kang Zeng, Chang-Xing Li

Specialty type: Medicine, research and experimental

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): 0 Grade C (Good): C, C, C Grade D (Fair): 0 Grade E (Poor): 0

P-Reviewer: Chang CP, Taiwan; Paparoupa M, Germany

Received: September 7, 2022 Peer-review started: September 7, 2022 First decision: September 27, 2022 Revised: October 2, 2022 Accepted: November 17, 2022 Article in press: November 17, 2022 Published online: December 16, 2022



Hong-Yan Lu, Qi Wang, Chen-Mei Liu, Xiao-Wen Huang, Hong-Yu Chen, Kang Zeng, Chang-Xing Li, Department of Dermatology, Nanfang Hospital, Southern Medical University, Guangzhou 510515, Guangdong Province, China

Yan-Bin Gao, Xue-Wen Qiu, Department of Burns Surgery, Nanfang Hospital, Southern Medical University, Guangzhou 510515, Guangdong Province, China

Corresponding author: Chang-Xing Li, PhD, Professor, Department of Dermatology, Nanfang Hospital, Southern Medical University, No. 1838 Guangzhou Avenue North, Guangzhou 510515, Guangdong Province, China. lilichangxing@163.com

# Abstract

# BACKGROUND

We report on a case of Vibrio vulnificus (V. vulnificus) detected by metagenomics next-generation sequencing (mNGS) in a 53-year-old male patient with polymicrobial gas gangrene and successful treatment by surgery. This report raises awareness among dermatologists that when a patient is clinically suspected of a special type of pathogenic infection, the mNGS method should be preferred to identify the patient's pathogen infection as soon as possible and then take effective treatment in time to save patients' lives.

# CASE SUMMARY

A 53-year-old male who worked in the aquatic market complained of redness and swelling of the lower limbs, blisters and ulcers with fever for 3 d. We used mNGS to test the pathogens in ulcer secretions. The results were returned in 24 h and indicated: V. vulnificus, Fusobacterium necrophorum, Staphylococcus haemolyticus, Staphylococcus aureus, Streptococcus dysgalactiae and Klebsiella aerogenes. This patient was diagnosed with V. vulnificus infection. The emergency operation was performed immediately under combined lumbar and epidural anesthesia: Left leg expansion and exploration (August 10, 2021). After surgery, we continued to use piperacillin sodium tazobactam sodium 4.5 g every 8 h and levofloxacin 0.5 g for anti-infection treatment. The patient underwent further surgery under lumbar anesthesia on August 17, 2021 and August 31, 2021: Left leg deactivation and skin grafting, negative pressure closed drainage and right thigh skin removal. After treatment, the transplanted flap survived.



# CONCLUSION

We could confirm the diagnosis of *Vibrio vulnificus* infection within 24 h through mNGS detection and then immediately performed emergency surgery.

**Key Words:** Metagenomics next-generation sequencing; Vibrio vulnificus; Polymicrobial gas gangrene; Surgery; Case report

©The Author(s) 2022. Published by Baishideng Publishing Group Inc. All rights reserved.

**Core Tip:** We report on a case of *Vibrio vulnificus* detected by metagenomic next-generation sequencing (mNGS) in a 53-year-old male patient with polymicrobial gas gangrene and successful treatment by surgery. This report raises awareness among dermatologists that when a patient is clinically suspected of a special type of pathogenic infection, the mNGS method should be preferred to identify the patient's pathogen infection as soon as possible, and then take effective treatment in time to save patients' lives.

**Citation:** Lu HY, Gao YB, Qiu XW, Wang Q, Liu CM, Huang XW, Chen HY, Zeng K, Li CX. Successful surgical treatment of polybacterial gas gangrene confirmed by metagenomic next-generation sequencing detection: A case report. *World J Clin Cases* 2022; 10(35): 13064-13073

**URL:** https://www.wjgnet.com/2307-8960/full/v10/i35/13064.htm **D0I:** https://dx.doi.org/10.12998/wjcc.v10.i35.13064

# INTRODUCTION

*Vibrio vulnificus (V. vulnificus)* is a halophilic, motile, gram-negative bacterium that is an important opportunistic pathogen. *V. vulnificus* can cause septicemia and necrotizing infections[1]. *V. vulnificus* necrotizing skin and soft tissue infections are a serious, highly fatal and disabling disease that can cause fulminant sepsis with a mortality rate of over 50%[2-4].

*V. vulnificus* usually causes infection *via* exposure to seawater or through the consumption of seafood, and its pathophysiology can be divided into three types: (1) Primary sepsis; (2) Gastrointestinal diseases; and (3) Wound infections. Men (90% of cases) and older patients (85% > 40 years) are susceptible, especially those with liver disease, diabetes and underlying conditions such as immunodeficiency and hemochromatosis[5].

Primary *V. vulnificus* sepsis is a serious disease with a high mortality rate. Approximately 1/3 of patients with primary sepsis develop shock or hypotension within 12 h of admission. Bullous lesions are characteristic in three quarters of patients. Thrombocytopenia is common and patients often have evidence of diffuse intravascular coagulation[6].

The diagnosis of *V. vulnificus* infection is usually verified by a nonculture method or by traditional culture. *V. vulnificus* grows easily on standard media. Isolation of this bacterium from feces usually requires the use of a specific selective medium, namely, thiosulfate-citrate-bile salts-sucrose medium[7].

Here, we report the case of a 53-year-old male with polymicrobial gas gangrene complicated with *V*. *vulnificus* infection. The patient was diagnosed with *V*. *vulnificus* infection by metagenomic next-generation sequencing (mNGS) within 24 h and underwent immediate emergency debridement, followed by effective antibiotics and further surgical treatment. The patient recovered 1 mo later.

# CASE PRESENTATION

# Chief complaints

Redness and swelling of lower limbs, blisters and ulcers with fever for 3 d.

## History of present illness

Three months prior, erythema and blisters had appeared in both lower extremities. He was diagnosed with a "skin infection" at a local hospital and improved after treatment. Three days prior, erythema, blisters, ulcers and fever had suddenly appeared in the left lower extremities. The local hospital administered cefoperazone for anti-infection, mannitol for dehydration, a magnesium sulfate wet compress, and other treatments without significant improvement.

WJCC | https://www.wjgnet.com

# History of past illness

The patient denied a history of medical illness. System physical examination showed no obvious abnormality.

# Personal and family history

The patient had no relevant personal or family history.

# Physical examination

Obvious ulcerations and a large blister area were observed on the left calf; the blister walls were thin, and the blister fluid was pale yellow or bloody; the left inguinal lymph nodes were palpable and swollen (Figure 1); the patient also had a fever, with a maximum temperature of 38.9 °C.

# Laboratory examinations

Infection index C-reactive protein (CRP) 134.30 mg/L (0.00-6.00 mg/L) (August 6, 2021), liver function: Alanine aminotransferase 47 U/L (9-50 U/L), Aspartate aminotransferase (AST) 40 U/L (15-40 U/L). The culture results showed that V. vulnificus, Staphylococcus haemolyticus and Proteus vulgaris/penneri were positive, and no fungus grew. The antimicrobial sensitivity of S. haemolyticus shows that it was sensitive to Linezolid, Nitrofurantoin, Rifampin, Trimethoprim-Sulfamethoxazole, Teicoplanin, Trimethoprim, and Vancomycin. The antimicrobial sensitivity of *P. vulgaris/penneri* shows that it was sensitive to Amoxicillin/Clavulanic, Amikacin, Aztreonam, Ceftazidime, Chloramphenicol, Ciprofloxacin, Cefotaxime, Cefepime, Gentamicin, Imipenem, Levofloxacin, Meropenem, Piperacillin, Trimethoprim-Sulfamethoxazole, and Piperacillin-Tazobactam. The results of AST showed that the cultured bacteria were sensitive to Piperacillin-Tazobactam and Levofloxacin. Detailed antimicrobial susceptibility testing results are shown in Table 1 and 2.

# Imaging examinations

Lung radiographs and computed tomography showed exudative changes in both lungs. The left lower limb ultrasound showed a dark fluid area. Abdominal ultrasonography revealed chronic liver disease.

# MULTIDISCIPLINARY EXPERT CONSULTATION

The patient did not undergo a multidisciplinary consultation.

# FINAL DIAGNOSIS

Polybacterial gas gangrene.

# TREATMENT

The emergency operation was performed immediately under combined lumbar and epidural anesthesia; a left leg expansion and exploration (August 10, 2021). After surgery, we continued to use piperacillin sodium tazobactam sodium 4.5 g every 8 h and levofloxacin 0.5 g for anti-infection treatment. The patient underwent further surgery under lumbar anesthesia on August 17, 2021, and again on August 31, 2021, including left leg deactivation and skin grafting, negative pressure closed drainage and right thigh skin removal.

# **OUTCOME AND FOLLOW-UP**

After treatment, the transplanted flap survived (Figure 2). The patients' infection indicators, CRP and Procalcitonin, decreased gradually and returned to normal on September 1, 2021 (Figure 3 and 4).

# DISCUSSION

Although V. vulnificus infections are rare, V. vulnificus is responsible for the largest number of vibrio deaths[8,9]. Recent surveillance by the Centers for Disease Control and Prevention shows that the geographic area affected by V. vulnificus is expanding and that infection rates are rising worldwide due to global warming and rising ocean temperatures[10,11].



Table 1 List of antimicrobial susceptibility testing results of Proteus vulgaris/penneri			
Code	Antimicrobial	Result	MIC
AMC	Amoxicillin/Clavulanic	Sensitivity	≤ 4/2
AMK	Amikacin	Sensitivity	≤8
AMP	Ampicillin	Resistance	8
ATM	Aztreonam	Sensitivity	≤2
CAZ	Ceftazidime	Sensitivity	≤1
CDR	Cefdinir	-	-
CEC	Cefaclor	-	-
CEP	Cephalothin	-	-
CFM	Cefixime	-	-
CFP	Cefoperazone	-	-
CHL	Chloramphenicol	Sensitivity	≤4
CID	Cefonicid	-	-
CIN	Cinoxacin	-	-
CIP	Ciprofloxacin	Sensitivity	0.25
CL	Colistin	Resistance	> 2
CMZ	Cefmetazole		-
CPR	Cefprozil	-	-
СРХ	Cefpodoxime proxetil		-
CRB	Carbenicillin	-	-
CRO	Ceftriaxone	-	-
CSL	Cefoperazone/Sulbactam	-	-
CTT	Cefotetan		-
CTX	Cefotaxime	Sensitivity	≤1
CXM	Cefuroxime	-	-
CZO	Cefazolin	Resistance	> 16
CZX	Ceftizoxime	-	-
DOX	Doxycycline	-	-
ETP	Ertapenem	-	-
FEP	Cefepime	Sensitivity	≤2
FLE	Fleroxacin	-	-
FOS	Fosfomycin	-	-
FOX	Cefoxitin	-	-
GAT	Gatifloxacin	-	-
GEN	Gentamicin	Sensitivity	≤2
IPM	Imipenem	Sensitivity	≤1
KAN	Kanamycin	-	-
LOM	Lomefloxaccin	-	-
LOR	Loracarbef	-	-
LVX	Levofloxacin	Sensitivity	0.5
MAN	Cefamandole	-	-
MEC	Mecillinam	-	-

Saisbideng® WJCC | https://www.wjgnet.com

MEM	Meropenem	Sensitivity	≤1
MEZ	Mezlocillin	-	-
MFX	Moxifloxacin	Mediation	4
MNO	Minocycline	-	-
MOX	Moxalactam	-	-
NET	Netilmicin	-	-
NIT	Nitrofurantoin	-	-
NOR	Norfloxacin	-	-
OFX	Ofloxacin	-	-
PIP	Piperacillin	Sensitivity	≤ 4
SAM	Ampicillin-Sulbactam	Sensitivity	≤ 4/2
SSS	Sulfonamides	-	-
STR	Streptomycin	-	-
SXT	Trimethoprim-Sulfamethoxazole	Sensitivity	≤ 0.5/9.5
TCC	Ticarcillin/Clavulanic	-	-
TCY	Tetracycline	Resistance	≤2
TIC	Ticarcillin	-	-
TMP	Trimethoprim	-	-
ТОВ	Tobramycin	-	-
TZP	Piperacillin-Tazobactam	Sensitivity	$\leq 4/4$

MIC: Minimum inhibitory concentration.



DOI: 10.12998/wjcc.v10.i35.13064 Copyright ©The Author(s) 2022.

## Figure 1 Skin lesions of the left lower limb on admission.

Infections caused by *V. vulnificus* were first reported by Hollis *et al*[12] in 1976. *V. vulnificus* has the highest case fatality rate among all foodborne pathogens. Infections spread extremely rapidly, with an average incubation period of only 16 h for wound infection and 26 h for septicemia[13]. A case series study from South Korea reported that the incubation period for sepsis ranged from 3 h to 6 d[14].

Primary *V. vulnificus* sepsis is a serious disease with a high mortality rate. *V. vulnificus* has the highest case fatality rate (39%) of all reported foodborne infections in the United States, with a fatality rate of more than 90% in cases with existing hypotension at the time of presentation[15,16]. In Japan, the majority of cases of *V. vulnificus* infection manifest as primary septicemia, with a mortality rate of up to 70%, and more than one-half of the patients die within 3 d[17]. Researchers have found that the longer the interval between the onset and the initiation of antimicrobial therapy, the higher the mortality rate of *V. vulnificus* infection [18]. Although patients with *V. vulnificus* infection can fully recover, complications associated with multiple organ system failure may persist. Therefore, it is

Table 2 List of antimicrobial susceptibility testing results of Staphylococcus haemolyticus			
Code	Antimicrobial	Result	MIC
AMC	Amoxicillin/Clavulanic	Resistance	> 4/2
AMP	Ampicillin	Resistance	> 8
AZM	Azithromycin	-	-
CHL	Chloramphenicol	-	-
CIP	Ciprofloxacin	Resistance	> 4
CLI	Clindamycin	-	-
CLR	Clarithromycin	-	-
DAP	Daptomycin	-	-
DOX	Doxycycline	-	-
ERY	Erythromycin	Resistance	> 4
GEN	Gentamicin	Resistance	> 8
LNZ	Linezolid	Sensitivity	1
LVX	Levofloxacin	-	-
MFX	Moxifloxacin	-	-
MUH	Mupirocin	Resistance	> 256
NIT	Nitrofurantoin	Sensitivity	≤16
OFX	Ofloxacin	-	-
OXA	Oxacillin	Resistance	> 2
PEN	Penicillin	Resistance	> 0.25
QDA	Quinupristin-Dalfopristin	-	-
RA	Rifampin	Sensitivity	≤ 0.5
RIF	Rifampin		
SXT	Trimethoprim-Sulfamethoxazole	Sensitivity	≤1/19
TCY	Tetracycline	Resistance	> 8
TEC	Teicoplanin	Sensitivity	4
TLT	Telithromycin	-	-
TMP	Trimethoprim	Sensitivity	2
VAN	Vancomycin	Sensitivity	2

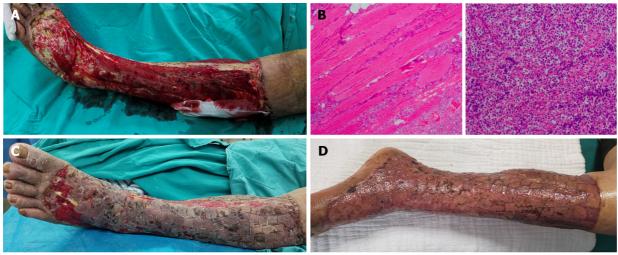
MIC: Minimum inhibitory concentration.

very important to recognize this disease and diagnose it correctly as soon as possible.

However, the identification of microorganisms by culturing methods usually takes 7-10 d or longer [19]. In addition, many microorganisms require specific growth conditions that are difficult to simulate in a laboratory environment, and microbial culture methods may not always detect pathogenic agents [20,21]. Using blood samples from patients with skin and soft tissue infections, C-polymerase chain reaction (PCR) and N-PCR were found to be 45% and 86% sensitive to V. vulnificus target gene toxicity R gene, respectively. Previous studies have reported that Q-PCR detection of V. vulnificus-specific genes is the most sensitive and specific technology and the fastest diagnostic method at present[5]. In this study, we propose that mNGS is a promising new diagnostic technique that can theoretically identify all known microbial genomes from clinical specimens. This analysis is usually performed in a short period of time (24-36 h)[22].

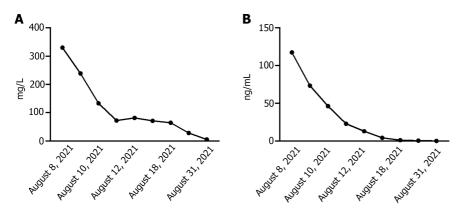
The traditional medical treatment for V. vulnificus infection is third-generation cephalosporins combined with tetracycline or fluoroquinolones. However, as a result of the excessive use of antibiotics in human, agriculture, and aquaculture systems, antibiotic resistance has emerged and evolved in many bacterial genera, including Vibrio, during the past few decades [23,24]. A case-series study of 121 Taiwanese patients presenting with necrotizing fasciitis found that surgical treatment within 12 h of

Baishidena® WJCC | https://www.wjgnet.com



**DOI:** 10.12998/wjcc.v10.i35.13064 **Copyright** ©The Author(s) 2022.

Figure 2 Left lower extremity skin lesions at different stages of treatment and postoperative pathological examination results. A: Image of left lower limb after enlarged debridement; B: The pathological findings of surgical specimens suggested the formation of soft tissue abscess; C: Image of left lower limb flap after transplantation; D: Left lower extremity flap transplantation.



**DOI:** 10.12998/wjcc.v10.i35.13064 **Copyright** ©The Author(s) 2022.

## Figure 3 Patient's infection index. A: C-reactive protein; B: Procalcitonin.

admission resulted in significantly improved survival[25]. Of the 423 *V. vulnificus* wound infections reported in the United States, 10% required some type of amputation. However, some patients still die after undergoing surgical treatment[26]. In 1992, Chuang *et al*[27] reviewed 28 cases of *V. vulnificus* infection in 27 patients in Taiwan. They argued that clearing the infected area within the first 24 h was crucial because most patients died within 48 h of being hospitalized.

In this study, the patient developed a skin infection of the left lower limb 3 mo prior to admission, and a hemorrhagic blister with fever had suddenly appeared at the site of the original skin infection 3 d prior. The infection progressed rapidly with a tendency toward multiple organ failure. We found *V. vulnificus*, a highly lethal pathogen of skin infection, in time through the mNGS method. Meanwhile, *Staphylococcus hemolyticus, Staphylococcus aureus, Streptococcus dysgalactiae, Fusobacterium necrophorum* and Klebsiella were also detected through mNGS (Table 3). This result suggested that the patient had a mixed infection with multiple pathogenic bacteria. Therefore, we quickly chose antibiotic treatment covering *V. vulnificus* and other pathogens, followed by immediate surgical debridement and treatment resulting in effective control of the patient's infection and avoiding amputation and even death.

Therefore, this report raises awareness among dermatologists that when a patient is clinically suspected of a special type of pathogenic infection, the mNGS method can be preferred to identify the patient's pathogen infection as soon as possible, and then take effective treatment measures in time, which can benefit the patient to a greater extent and even save the patient's life.

Zaishidena® WJCC | https://www.wjgnet.com

Table 3 List of bacteria detected by metagenomics next-generation sequencing				
Туре	Genera	Number of sequences	Species	Number of sequences
G+	Staphylococcus	7166	Staphylococcus haemolyticus	6493
			Staphylococcus aureus	88
G-	Vibrio	7026	Vibrio vulnificus	6491
G+	Streptococcus	973	Streptococcus dysgalactiae	664
G-	Fusobacterium	43	Fusobacterium necrophorum	40
G-	Klebsiella	11	Klebsiella aerogenes	10

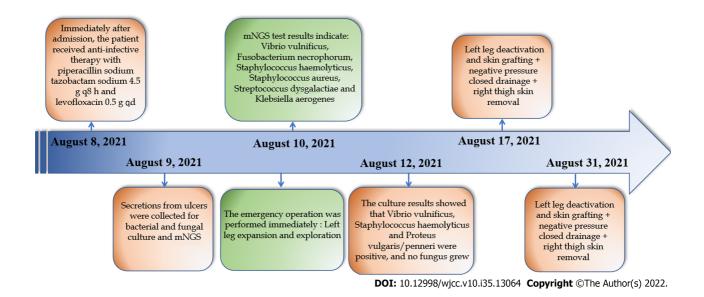


Figure 4 Flow charts of diagnosis and treatment. mNGS: Metagenomics next-generation sequencing.

# CONCLUSION

In conclusion, we reported a case of *V. vulnificus* detected by mNGS in a 53-year-old male patient with polymicrobial gas gangrene and successful treatment by surgery. This patient was successfully treated with surgery, while amputation or even death was avoided. The main benefit was that we were able to confirm the diagnosis of *V. vulnificus* infection within 24 h through mNGS detection. We immediately performed emergency surgery which helped gain precious time to save the patient's life. Conversely, the traditional method of bacterial and fungal culture has a low positive rate, a small detection range and is time-consuming.

# ACKNOWLEDGEMENTS

We would like to thank Precision Medicine Center of Nanfang Hospital for doing mNGS and analysis.

# FOOTNOTES

**Author contributions:** Lu HY performed sequencing and was a major contributor in writing the manuscript; Gao YB and Qiu XW performed the surgery; Wang Q and Huang XW provided samples, clinical data, contributed to project design and operation, data interpretation, and manuscript preparation; Liu CM and Chen HY contributed to project design and operation; Li CX and Zeng K contributed to project design and operation, data interpretation, and was a major contributor in writing the manuscript; All authors read and approved the final manuscript.

**Supported by** National Natural Science Foundation of China, No. 82173437; and Natural Science Foundation of Guangdong Province, No. 2020A15150875.

Zaishidene® WJCC | https://www.wjgnet.com

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

Conflict-of-interest statement: All the authors report having no relevant conflicts of interest for this article.

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 noncommercial. See: https://creativecommons.org/Licenses/by-nc/4.0/

# Country/Territory of origin: China

ORCID number: Hong-Yan Lu 0000-0002-0369-7582; Chang-Xing Li 0000-0001-9837-9650.

S-Editor: Wei ZH L-Editor: Filipodia P-Editor: Cai YX

# REFERENCES

- Daniels NA. Vibrio vulnificus oysters: pearls and perils. Clin Infect Dis 2011; 52: 788-792 [PMID: 21367733 DOI: 1 10.1093/cid/ciq251]
- 2 Dickerson J Jr, Gooch-Moore J, Jacobs JM, Mott JB. Characteristics of Vibrio vulnificus isolates from clinical and environmental sources. Mol Cell Probes 2021; 56: 101695 [PMID: 33453365 DOI: 10.1016/j.mcp.2021.101695]
- 3 Huang KC, Weng HH, Yang TY, Chang TS, Huang TW, Lee MS. Distribution of Fatal Vibrio Vulnificus Necrotizing Skin and Soft-Tissue Infections: A Systematic Review and Meta-Analysis. Medicine (Baltimore) 2016; 95: e2627 [PMID: 26844475 DOI: 10.1097/MD.00000000002627]
- 4 Chuang PY, Yang TY, Huang TW, Tsai YH, Huang KC, Weng HH. Hepatic disease and the risk of mortality of Vibrio vulnificus necrotizing skin and soft tissue infections: A systematic review and meta-analysis. PLoS One 2019; 14: e0223513 [PMID: 31652263 DOI: 10.1371/journal.pone.0223513]
- 5 Hori M, Nakayama A, Kitagawa D, Fukushima H, Asai H, Kawai Y, Okuchi K. A case of Vibrio vulnificus infection complicated with fulminant purpura: gene and biotype analysis of the pathogen. JMM Case Rep 2017; 4: e005096 [PMID: 29026623 DOI: 10.1099/jmmcr.0.005096]
- 6 Kim K, Kim NJ, Kim SY, Kim IH, Kim KS, Lee GR. Cyclo(Phe-Pro) produced by the human pathogen Vibrio vulnificus inhibits host innate immune responses through the NF-κB pathway. Infect Immun 2015; 83: 1150-1161 [PMID: 25561711 DOI: 10.1128/IAI.02878-14]
- Bhat P, Bhaskar M, Sistla S, Kadhiravan T. Fatal case of necrotising fasciitis due to Vibrio vulnificus in a patient with 7 alcoholic liver disease and diabetes mellitus. BMJ Case Rep 2019; 12 [PMID: 30659010 DOI: 10.1136/bcr-2018-227851]
- Kang SJ, Jung SI, Peck KR. Historical and Clinical Perspective of Vibrio vulnificus Infections in Korea. Infect Chemother 2020; 52: 245-251 [PMID: 32468743 DOI: 10.3947/ic.2020.52.2.245]
- Jayakumar JM, Shapiro OH, Almagro-Moreno S. Improved Method for Transformation of Vibrio vulnificus by Electroporation. Curr Protoc Microbiol 2020; 58: e106 [PMID: 32614522 DOI: 10.1002/cpmc.106]
- 10 Heng SP, Letchumanan V, Deng CY, Ab Mutalib NS, Khan TM, Chuah LH, Chan KG, Goh BH, Pusparajah P, Lee LH. Vibrio vulnificus: An Environmental and Clinical Burden. Front Microbiol 2017; 8: 997 [PMID: 28620366 DOI: 10.3389/fmicb.2017.00997]
- Lee MT, Dinh AQ, Nguyen S, Krucke G, Tran TT. Late-onset Vibrio vulnificus septicemia without cirrhosis. Proc (Bayl Univ Med Cent) 2019; 32: 286-288 [PMID: 31191157 DOI: 10.1080/08998280.2019.1580661]
- 12 Hollis DG, Weaver RE, Baker CN, Thornsberry C. Halophilic Vibrio species isolated from blood cultures. J Clin Microbiol 1976; 3: 425-431 [PMID: 1262454 DOI: 10.1128/jcm.3.4.425-431.1976]
- 13 Huang KC, Tsai YH, Huang KC, Lee MS. Model for end-stage liver disease (MELD) score as a predictor and monitor of mortality in patients with Vibrio vulnificus necrotizing skin and soft tissue infections. PLoS Negl Trop Dis 2015; 9: e0003720 [PMID: 25923115 DOI: 10.1371/journal.pntd.0003720]
- Mead PS, Slutsker L, Dietz V, McCaig LF, Bresee JS, Shapiro C, Griffin PM, Tauxe RV. Food-related illness and death in 14 the United States. Emerg Infect Dis 1999; 5: 607-625 [PMID: 10511517 DOI: 10.3201/eid0505.990502]
- 15 Liu JW, Lee IK, Tang HJ, Ko WC, Lee HC, Liu YC, Hsueh PR, Chuang YC. Prognostic factors and antibiotics in Vibrio vulnificus septicemia. Arch Intern Med 2006; 166: 2117-2123 [PMID: 17060542 DOI: 10.1001/archinte.166.19.2117]
- Otomo S, Maekawa K, Goto T, Baba T, Yoshitake A. Pre-existing cerebral infarcts as a risk factor for delirium after 16 coronary artery bypass graft surgery. Interact Cardiovasc Thorac Surg 2013; 17: 799-804 [PMID: 23851990 DOI: 10.1093/icvts/ivt304]
- Kim HS, Kim DM, Neupane GP, Lee YM, Yang NW, Jang SJ, Jung SI, Park KH, Park HR, Lee CS, Lee SH. Comparison 17 of conventional, nested, and real-time PCR assays for rapid and accurate detection of Vibrio vulnificus. J Clin Microbiol



2008; 46: 2992-2998 [PMID: 18614647 DOI: 10.1128/JCM.00027-08]

- 18 Kuo Chou TN, Chao WN, Yang C, Wong RH, Ueng KC, Chen SC. Predictors of mortality in skin and soft-tissue infections caused by Vibrio vulnificus. World J Surg 2010; 34: 1669-1675 [PMID: 20151130 DOI: 10.1007/s00268-010-0455-y]
- Raghuram AC, Yu RP, Lo AY, Sung CJ, Bircan M, Thompson HJ, Wong AK. Role of stem cell therapies in treating 19 chronic wounds: A systematic review. World J Stem Cells 2020; 12: 659-675 [PMID: 32843920 DOI: 10.4252/wjsc.v12.i7.659]
- Sawaya AP, Jozic I, Stone RC, Pastar I, Egger AN, Stojadinovic O, Glinos GD, Kirsner RS, Tomic-Canic M. Mevastatin 20 promotes healing by targeting caveolin-1 to restore EGFR signaling. JCI Insight 2019; 4 [PMID: 31661463 DOI: 10.1172/ici.insight.129320]
- Omar A, Wright JB, Schultz G, Burrell R, Nadworny P. Microbial Biofilms and Chronic Wounds. Microorganisms 2017; 21 5 [PMID: 28272369 DOI: 10.3390/microorganisms5010009]
- 22 Rhoads DD, Cox SB, Rees EJ, Sun Y, Wolcott RD. Clinical identification of bacteria in human chronic wound infections: culturing vs. 16S ribosomal DNA sequencing. BMC Infect Dis 2012; 12: 321 [PMID: 23176603 DOI: 10.1186/1471-2334-12-321
- Kim SE, Shin SU, Oh TH, Kim UJ, Darboe KS, Kang SJ, Jang HC, Jung SI, Shin HY, Park KH. Outcomes of Third-23 Generation Cephalosporin Plus Ciprofloxacin or Doxycycline Therapy in Patients with Vibrio vulnificus Septicemia: A Propensity Score-Matched Analysis. PLoS Negl Trop Dis 2019; 13: e0007478 [PMID: 31188821 DOI: 10.1371/journal.pntd.0007478]
- 24 Tang HJ, Chen CC, Lai CC, Zhang CC, Weng TC, Chiu YH, Toh HS, Chiang SR, Yu WL, Ko WC, Chuang YC. In vitro and in vivo antibacterial activity of tigecycline against Vibrio vulnificus. J Microbiol Immunol Infect 2018; 51: 76-81 [PMID: 27260781 DOI: 10.1016/j.jmii.2016.04.009]
- Chao WN, Tsai CF, Chang HR, Chan KS, Su CH, Lee YT, Ueng KC, Chen CC, Chen SC, Lee MC. Impact of timing of 25 surgery on outcome of Vibrio vulnificus-related necrotizing fasciitis. Am J Surg 2013; 206: 32-39 [PMID: 23414632 DOI: 10.1016/j.amjsurg.2012.08.008]
- Dechet AM, Yu PA, Koram N, Painter J. Nonfoodborne Vibrio infections: an important cause of morbidity and mortality in 26 the United States, 1997-2006. Clin Infect Dis 2008; 46: 970-976 [PMID: 18444811 DOI: 10.1086/529148]
- Chuang YC, Yuan CY, Liu CY, Lan CK, Huang AH. Vibrio vulnificus infection in Taiwan: report of 28 cases and review 27 of clinical manifestations and treatment. Clin Infect Dis 1992; 15: 271-276 [PMID: 1520762 DOI: 10.1093/clinids/15.2.271]





# 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

