ISSN 2307-8960 (online)

World Journal of *Clinical Cases*

World J Clin Cases 2022 October 16; 10(29): 10391-10822

Published by Baishideng Publishing Group Inc

World Journal of Clinical Cases

Contents

Thrice Monthly Volume 10 Number 29 October 16, 2022

STANDARD AND CONSENSUS

10391 Baishideng's *Reference Citation Analysis* database announces the first *Article Influence Index* of multidisciplinary scholars

Wang JL, Ma YJ, Ma L, Ma N, Guo DM, Ma LS

REVIEW

10399 Cholecystectomy for asymptomatic gallstones: Markov decision tree analysis

Lee BJH, Yap QV, Low JK, Chan YH, Shelat VG

10413 Liver transplantation for hepatocellular carcinoma: Historical evolution of transplantation criteria

Ince V, Sahin TT, Akbulut S, Yilmaz S

MINIREVIEWS

10428 Prostate only radiotherapy using external beam radiotherapy: A clinician's perspective

Lee JW, Chung MJ

ORIGINAL ARTICLE

Retrospective Study

10435 Age-adjusted NT-proBNP could help in the early identification and follow-up of children at risk for severe multisystem inflammatory syndrome associated with COVID-19 (MIS-C)

Rodriguez-Gonzalez M, Castellano-Martinez A

10451 Clinicopathological characteristics and prognosis of gastric signet ring cell carcinoma

Tian HK, Zhang Z, Ning ZK, Liu J, Liu ZT, Huang HY, Zong Z, Li H

10467 Development and validation of a prognostic nomogram for decompensated liver cirrhosis

Zhang W, Zhang Y, Liu Q, Nie Y, Zhu X

Observational Study

10478 Effect of medical care linkage-continuous management mode in patients with posterior circulation cerebral infarction undergoing endovascular interventional therapy

Zhu FX, Ye Q

10487 Effect of the COVID-19 pandemic on patients with presumed diagnosis of acute appendicitis

Akbulut S, Tuncer A, Ogut Z, Sahin TT, Koc C, Guldogan E, Karabulut E, Tanriverdi ES, Ozer A

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 29 October 16, 2022

Contents

EVIDENCE-BASED MEDICINE

10501 Delineation of a SMARCA4-specific competing endogenous RNA network and its function in hepatocellular carcinoma

Zhang L, Sun T, Wu XY, Fei FM, Gao ZZ

SYSTEMATIC REVIEWS

10516 Comparison of laboratory parameters, clinical symptoms and clinical outcomes of COVID-19 and influenza in pediatric patients: A systematic review and meta-analysis

Yu B, Chen HH, Hu XF, Mai RZ, He HY

CASE REPORT

10529 Surgical treatment of bipolar segmental clavicle fracture: A case report

Liang L, Chen XL, Chen Y, Zhang NN

10535 Multiple disciplinary team management of rare primary splenic malignancy: Two case reports

Luo H, Wang T, Xiao L, Wang C, Yi H

10543 Klippel-Trenaunay-Weber syndrome with ischemic stroke: A case report

Lee G, Choi T

10550 Vedolizumab in the treatment of immune checkpoint inhibitor-induced colitis: Two case reports

Zhang Z, Zheng CQ

10559 Novel way of patent foramen ovale detection and percutaneous closure by intracardiac echocardiography: A case report

Han KN, Yang SW, Zhou YJ

10565 Treatment failure in a patient infected with *Listeria* sepsis combined with latent meningitis: A case report

Wu GX, Zhou JY, Hong WJ, Huang J, Yan SQ

10575 Three-in-one incidence of hepatocellular carcinoma, cholangiocellular carcinoma, and neuroendocrine carcinoma: A case report

Wu Y, Xie CB, He YH, Ke D, Huang Q, Zhao KF, Shi RS

10583 Intestinal microbiome changes in an infant with right atrial isomerism and recurrent necrotizing enterocolitis: A case report and review of literature

Kaplina A, Zaikova E, Ivanov A, Volkova Y, Alkhova T, Nikiforov V, Latypov A, Khavkina M, Fedoseeva T, Pervunina T, Skorobogatova Y, Volkova S, Ulyantsev V, Kalinina O, Sitkin S, Petrova N

10600 *Serratia fonticola* and its role as a single pathogen causing emphysematous pyelonephritis in a non-diabetic patient: A case report

Villasuso-Alcocer V, Flores-Tapia JP, Perez-Garfias F, Rochel-Perez A, Mendez-Dominguez N

10606 Cardiac myxoma shedding leads to lower extremity arterial embolism: A case report

Meng XH, Xie LS, Xie XP, Liu YC, Huang CP, Wang LJ, Zhang GH, Xu D, Cai XC, Fang X

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 29 October 16, 2022

Contents

10614 Extracorporeal membrane oxygenation in curing a young man after modified Fontan operation: A case report

Guo HB, Tan JB, Cui YC, Xiong HF, Li CS, Liu YF, Sun Y, Pu L, Xiang P, Zhang M, Hao JJ, Yin NN, Hou XT, Liu JY

10622 Wandering small intestinal stromal tumor: A case report

Su JZ, Fan SF, Song X, Cao LJ, Su DY

10629 Acute mesenteric ischemia secondary to oral contraceptive-induced portomesenteric and splenic vein thrombosis: A case report

Zhao JW, Cui XH, Zhao WY, Wang L, Xing L, Jiang XY, Gong X, Yu L

10638 Perioperative anesthesia management in pediatric liver transplant recipient with atrial septal defect: A case report

Liu L, Chen P, Fang LL, Yu LN

10647 Multiple tophi deposits in the spine: A case report

Chen HJ, Chen DY, Zhou SZ, Chi KD, Wu JZ, Huang FL

10655 Myeloproliferative neoplasms complicated with β-thalassemia: Two case report

Xu NW, Li LJ

10663 Synchronous renal pelvis carcinoma associated with small lymphocytic lymphoma: A case report

Yang HJ, Huang X

10670 *Leclercia adecarboxylata* infective endocarditis in a man with mitral stenosis: A case report and review of the literature

Tan R, Yu JQ, Wang J, Zheng RQ

10681 Progressive ataxia of cerebrotendinous xanthomatosis with a rare c.255+1G>T splice site mutation: A case report

Chang YY, Yu CQ, Zhu L

10689 Intravesical explosion during transurethral resection of bladder tumor: A case report

Xu CB, Jia DS, Pan ZS

10695 Submucosal esophageal abscess evolving into intramural submucosal dissection: A case report

Jiao Y, Sikong YH, Zhang AJ, Zuo XL, Gao PY, Ren QG, Li RY

10701 Immune checkpoint inhibitor-associated arthritis in advanced pulmonary adenocarcinoma: A case report

Yang Y, Huang XJ

10708 Chondroid syringoma of the lower back simulating lipoma: A case report

Huang QF, Shao Y, Yu B, Hu XP

10713 Tension-reduced closure of large abdominal wall defect caused by shotgun wound: A case report

Li Y, Xing JH, Yang Z, Xu YJ, Yin XY, Chi Y, Xu YC, Han YD, Chen YB, Han Y

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 29 October 16, 2022

Contents

10721 Myocardial bridging phenomenon is not invariable: A case report

Li HH, Liu MW, Zhang YF, Song BC, Zhu ZC, Zhao FH

10728 Recurrent atypical leiomyoma in bladder trigone, confused with uterine fibroids: A case report

Song J, Song H, Kim YW

10735 Eczema herpeticum *vs* dermatitis herpetiformis as a clue of dedicator of cytokinesis 8 deficiency diagnosis: A case report

Alshengeti A

10742 Cutaneous allergic reaction to subcutaneous vitamin K_1: A case report and review of literature

Zhang M, Chen J, Wang CX, Lin NX, Li X

10755 Perithyroidal hemorrhage caused by hydrodissection during radiofrequency ablation for benign thyroid nodules: Two case reports

Zheng BW, Wu T, Yao ZC, Ma YP, Ren J

10763 Malignant giant cell tumors of the tendon sheath of the right hip: A case report

Huang WP, Gao G, Yang Q, Chen Z, Qiu YK, Gao JB, Kang L

10772 Atypical Takotsubo cardiomyopathy presenting as acute coronary syndrome: A case report

Wang ZH, Fan JR, Zhang GY, Li XL, Li L

10779 Secondary light chain amyloidosis with Waldenström's macroglobulinemia and intermodal marginal zone lymphoma: A case report

Zhao ZY, Tang N, Fu XJ, Lin LE

10787 Bilateral occurrence of sperm granulomas in the left spermatic cord and on the right epididymis: A case report

Lv DY, Xie HJ, Cui F, Zhou HY, Shuang WB

10794 Glucocorticoids combined with tofacitinib in the treatment of Castleman's disease: A case report

Liu XR, Tian M

10803 Giant bilateral scrotal lipoma with abnormal somatic fat distribution: A case report

Chen Y, Li XN, Yi XL, Tang Y

10811 Elevated procalcitonin levels in the absence of infection in procalcitonin-secretin hepatocellular carcinoma: A case report

Zeng JT, Wang Y, Wang Y, Luo ZH, Qing Z, Zhang Y, Zhang YL, Zhang JF, Li DW, Luo XZ

LETTER TO THE EDITOR

10817 "*Helicobacter pylori* treatment guideline: An Indian perspective": Letter to the editor

Swarnakar R, Yadav SL

10820 Effect of gender on the reliability of COVID-19 rapid antigen test among elderly

Nori W, Akram W

World Journal of Clinical Cases

Thrice Monthly Volume 10 Number 29 October 16, 2022

Contents

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Natalia Stepanova, DSc, MD, PhD, Academic Research, Chief Doctor, Full Professor, Department of Nephrology and Dialysis, State Institution "Institute of Nephrology of the National Academy of Medical Sciences of Ukraine", Kyiv 04050, Ukraine. nmstep88@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
World Journal of Clinical Cases

ISSN
ISSN 2307-8960 (online)

LAUNCH DATE
April 16, 2013

FREQUENCY
Thrice Monthly

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

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
October 16, 2022

COPYRIGHT
© 2022 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS
https://www.wjgnet.com/bpg/gerinfo/204

GUIDELINES FOR ETHICS DOCUMENTS
https://www.wjgnet.com/bpg/GerInfo/287

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
https://www.wjgnet.com/bpg/gerinfo/240

PUBLICATION ETHICS
https://www.wjgnet.com/bpg/GerInfo/288

PUBLICATION MISCONDUCT
https://www.wjgnet.com/bpg/gerinfo/208

ARTICLE PROCESSING CHARGE
https://www.wjgnet.com/bpg/gerinfo/242

STEPS FOR SUBMITTING MANUSCRIPTS
https://www.wjgnet.com/bpg/GerInfo/239

ONLINE SUBMISSION
https://www.f6publishing.com

E-mail: bpgoffice@wjgnet.com https://www.wjgnet.com

World Journal of Clinical Cases

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

World J Clin Cases 2022 October 16; 10(29): 10772-10778

DOI: 10.12998/wjcc.v10.i29.10772

ISSN 2307-8960 (online)

CASE REPORT

Atypical Takotsubo cardiomyopathy presenting as acute coronary syndrome: A case report

Zi-Han Wang, Jia-Rong Fan, Gao-Yu Zhang, Xian-Lun Li, Lin Li

Specialty type: Cardiac and cardiovascular systems

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

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

P-Reviewer: Faraji N, Iran; Lin MS, Taiwan; Shrestha AB, Bangladesh; Ullah K, Pakistan

Received: June 23, 2022
Peer-review started: June 23, 2022
First decision: July 12, 2022
Revised: July 22, 2022
Accepted: August 30, 2022
Article in press: August 30, 2022
Published online: October 16, 2022

Zi-Han Wang, Jia-Rong Fan, Gao-Yu Zhang, Beijing University of Chinese Medicine, Graduate School, Beijing 100029, Chaoyang District, China

Xian-Lun Li, Lin Li, Department of Integrative Cardiology, China-Japan Friendship Hospital, Beijing 100029, Chaoyang District, China

Corresponding author: Lin Li, PhD, Doctor, Professor, Department of Integrative Cardiology, China-Japan Friendship Hospital, No. 2 Yinghua East Street, Beijing 100029, Chaoyang District, China. lilinxcy@126.com

Abstract

BACKGROUND

Takotsubo cardiomyopathy (TS) is a rare acute cardiac disease with clinical features, symptoms, and electrocardiographic manifestations similar to those of acute myocardial infarction. We present the case of a patient with TS caused by a pheochromocytoma, which was confirmed by the postoperative pathology. Furthermore, we present the patient's subsequent management, treatment, and outcome.

CASE SUMMARY

A 64-year-old woman was admitted to the hospital with episodic chest pain and palpitations, electrocardiogram (ECG) findings suggestive of high lateral wall myocardial infarction, echocardiogram showing left ventricular wall segmental motion abnormalities, and elevated levels of the myocardial marker troponin. The patient underwent coronary angiography, which revealed unobstructed blood flow without obvious stenosis. During their hospitalization, the patient had paroxysmal elevation of blood pressure accompanied by palpitations and profuse sweating, with elevated blood catecholamine levels during seizures. Subsequent computerized tomography of the adrenal glands revealed the presence of a nodule in the right adrenal, which was resected and determined to be an adrenal pheochromocytoma. Therefore, the diagnosis of pheochromocytoma-induced atypical TS was made. The patient had an uneventful postoperative recovery.

CONCLUSION

Cardiologists should consider pheochromocytoma in patients with TS. Early detection allows timely intervention, benefiting patients.

Key Words: Takotsubo cardiomyopathy; Acute coronary syndromes; Pheochromocytoma;

Diagnose; Prognosis; Case report

Core Tip: Pheochromocytomas are a common class of endocrine tumors that can cause cardiovascular pathology, often resulting in stress cardiomyopathy due to the intermittent or sustained release of catecholamines. We report a patient with a postoperatively confirmed diagnosis of Takotsubo cardiomyopathy caused by pheochromocytoma.

Citation: Wang ZH, Fan JR, Zhang GY, Li XL, Li L. Atypical Takotsubo cardiomyopathy presenting as acute coronary syndrome: A case report. *World J Clin Cases* 2022; 10(29): 10772-10778
URL: https://www.wjgnet.com/2307-8960/full/v10/i29/10772.htm
DOI: https://dx.doi.org/10.12998/wjcc.v10.i29.10772

INTRODUCTION

Takotsubo cardiomyopathy (TS) is a rare acute cardiac disease that was first reported by a Japanese physician in 1991[1] but has not been widely recognized. TS mainly occurs in women, with a higher incidence in postmenopausal women[2], which may be related to the loss of estrogen protection[3]. Because TS is closely related to emotions and external stimuli, it is also called "broken heart syndrome". At present, more attention has been paid to the increase of blood-derived catecholamines in the pathogenesis of TS. Pheochromocytoma is a common type of endocrine system tumor[4] that can cause cardiovascular pathology due to the intermittent or persistent release of catecholamines, which can lead to the development of TS. There are few previous reports in the literature on this secondary stress cardiomyopathy, especially caused by pheochromocytoma. Here we report a case in which atypical TS occurred due to the presence of a pheochromocytoma with massive release of catecholamines.

CASE PRESENTATION

Chief complaints

A 64-year-old Chinese woman was admitted to the Department of Integrative Cardiology of the China-Japan Friendship Hospital with severe chest pain.

History of present illness

The patient presented with left-sided chest pain confined to the precordial region, accompanied by panic, shoulder and back pain, dizziness, and profuse sweating for several hours after receiving acupuncture treatment on the scapula 12 d prior.

History of past illness

The patient had hyperlipidemia and homocysteinemia but was not taking medications. She denied a history of hypertension and diabetes mellitus.

Personal and family history

The patient did not smoke or drink alcohol. She became menopausal at age 50 without the use of chemotherapy drugs. She also confirmed no family history of genetic disorders.

Physical examination

General examination revealed no cardiopulmonary or abdominal abnormalities. The patient had a heart rate of 60 beats/min and a BMI of 31.6. At the time of admission, her blood pressure was elevated to 20.0/14.7 kPa; however, when she was at rest, a stable blood pressure of 16.0/10.7 kPa was measured. During the patient's hospitalization, we found that her blood pressure was unstable, occasionally up to 26.7/14.7 kPa.

Laboratory examinations

Blood test results were as follows: Creatine kinase-MB 15.67 ng/mL (reference range: < 5.00); cardiac troponin I 5.31 ng/mL (reference range: < 1.00); myoglobin 78.6 ng/mL (reference range: < 70.0); and N-terminal pro-brain natriuretic peptide 3578 pg/mL (reference range: < 300). Further examinations

revealed a fasting blood-glucose of 8.73 mmol/L (reference range: 3.90-6.10), normal C-reactive protein, normal renal function, and negative tumor markers. Importantly, catecholamine levels were significantly elevated during episodes of elevated blood pressure, with epinephrine of 11.60 pmol/L (reference range: 0.164-0.519) and norepinephrine of 56.19 pmol/L (reference range: 1.182-2.364).

Imaging examinations

The electrocardiogram (ECG) showed ST-segment elevation in lead I and AVL and ST-segment depression in leads II, III, and AVF (Figure 1). Echocardiogram findings showed reverse motion of the posterior wall of the left ventricle and septum, normal motion of the posterior septum and posterior ventricular wall, and loss of motion of the rest of the ventricular wall, with an ejection fraction of 50%. Re-examination of the ECG showed T-wave inversion in leads I and AVL, while the echocardiogram showed normal wall motion in each compartment. Imaging results showed no meaningful stenosis in the coronary arteries and unobstructed blood flow (Figure 2). Computed tomography scan of the adrenal glands showed the presence of nodules in the right adrenal gland, on the basis of which we suspected the presence of a pheochromocytoma (Figure 3A).

FINAL DIAGNOSIS

Considering the patient's history, laboratory examinations, and imaging results, we determined that she had developed atypical TS with involvement of the lateral wall caused by a pheochromocytoma.

TREATMENT

At the time of admission, we gave the patient aspirin (100 mg, qd, po), clopidogrel (75 mg, qd, po), metoprolol (47.5 mg, qd, po), and atorvastatin (20 mg, qn, po) to prevent recurrence of cardiovascular events, isosorbide mononitrate (60 mg, qd, po) to improve cardiac circulation, and acarbose (50 mg, tid, po) to lower blood glucose. The patient underwent laparoscopic surgical resection of the pheochromocytoma, and doxazosin mesylate (4 mg, qd, po) was applied. The postsurgical pathologic diagnosis was right adrenal pheochromocytoma (size: 3.5 cm + ACo-3.5 cm + ACo-3 cm) (Figure 3B-D).

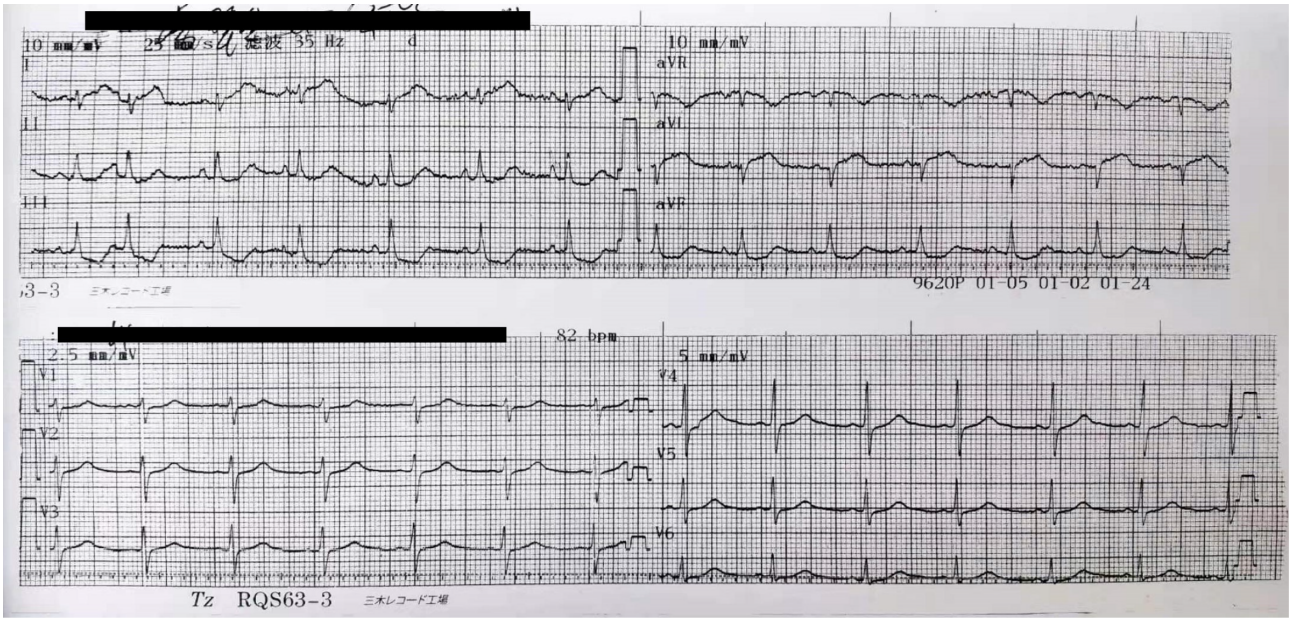
OUTCOME AND FOLLOW-UP

After tumor resection, the patient had a smooth postoperative recovery without adverse events and was treated only with atorvastatin 10 mg qd for lipid-lowering. Repeat ECG examination showed no ST-segment abnormality, and the echocardiogram showed normal motion of all ventricular walls. We followed the patient for one year, and she did not have any further cardiac-related diseases, while the ECG and echocardiogram were normal.

DISCUSSION

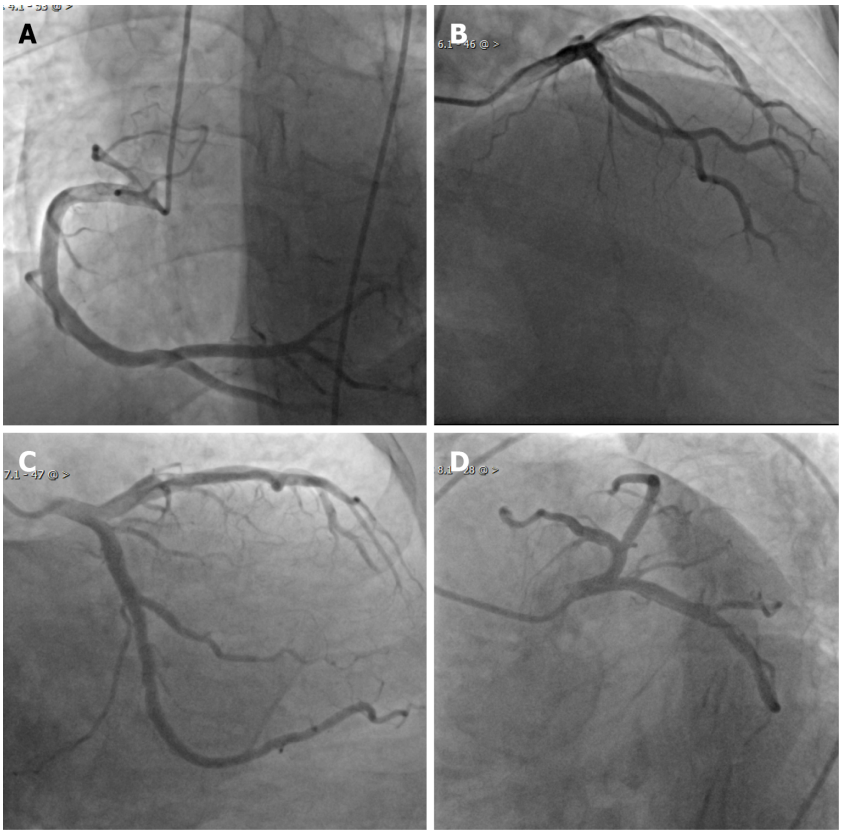
The electrocardiographic changes and clinical presentation of TS are similar to acute coronary syndromes (ACS) without the presence of coronary occlusion. The typical patient with TS has a distinctive abnormal contour of ventricular annular contraction with a peculiar circumferential pattern and apical ballooning of the left ventricle extending beyond the coronary blood supply region[5]. In our present report, the heart showed abnormal activity of the lateral wall and was judged to be an atypical case of TS. This abnormal motion is reversible, and ventricular dysfunction returns to normal within hours to weeks. Coronary angiogram is the key test to distinguish ACS from TS[6].

The pathogenesis of TS is unclear, and pathophysiological mechanisms such as myocardial ischemia, left ventricular outlet tract obstruction, blood-borne catecholamine myocardial toxicity, adrenergic-induced signal transduction abnormalities, and autonomic nervous system dysfunction have been proposed[7]. More attention is currently focused on elevated blood-borne catecholamine levels and excessive activation of cardiac sympathetic nerves. The rapid elevation of plasma catecholamine levels leads to vasospasm and activation of cardiac sympathetic nerves, inducing TS and acute reversible myocardial dysfunction[8]. Pheochromocytomas produce large amounts of catecholamines when stimulated, which have been reported to induce TS[9] and were the final etiologic diagnosis in this case. Previously, many guidelines for the diagnosis of TS required the exclusion of pheochromocytoma, such as the Mayo diagnostic criteria[10] that had been used for many years; however, the European Journal of Heart Failure introduced new diagnostic principles[7] in recent years, and pheochromocytoma is no longer an exclusion criterion for TS. Typical apical balloon-like changes account for approximately 80%



DOI: 10.12998/wjcc.v10.i29.10772

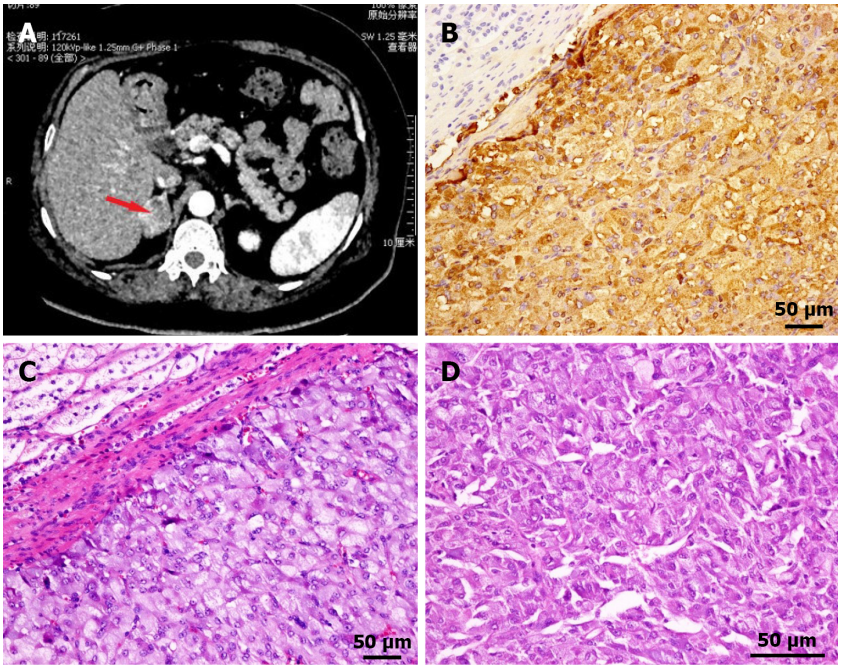
Figure 1 Electrocardiogram images. ST-segment elevation in leads I and AVL and ST-segment depression in leads II, III, and AVF; we initially predicted a high lateral wall myocardial infarction.



DOI: 10.12998/wjcc.v10.i29.10772

Figure 2 Coronary angiogram images. A-D: Coronary angiogram results showed no meaningful stenosis in the coronary arteries and unobstructed blood flow.

of all TS, and the current literature is dominated by these cases, while the remaining atypical subtypes are rarely reported. Epidemiologic studies show[11] that the incidence of secondary forms of TS is about 3.4 hospitalizations per 100000 person-years, and TS caused by pheochromocytoma is rarely reported.



DOI: 10.12998/wjcc.v10.i29.10772

Figure 3 Adrenal computed tomography scan and pathology. A: Mass-like soft tissue shadow with heterogeneous density was present in the medial branch of the right adrenal gland; B: Immunohistochemical staining showed Chromogranin A (+), which was confined to the adrenal gland and did not invade the peri-adrenal tissue; C: HE stained tissue observed under 200 × light microscope; D: HE stained tissue observed under 400 × light microscope. HE: Hematoxylin-eosin.

TS is broadly classified into four subtypes according to the site of involvement, apical, midventricular, basal, or focal[6]. In mammalian studies, it has been reported[12] that sympathetic nerve endings and β-adrenergic receptors are unevenly distributed across the myocardium, thus providing some evidence that different sympathetic nerve branches in the affected heart can lead to different lesion sites. One report[13] shows a significant difference in heart rate variability between apical and midventricular TS, which also suggests that differences in sympathetic activation may be a potential mechanism for the different sites of TS pathology. Atypical TS has different clinical features from typical TS in that its patients have a younger age of onset, more frequent ST-segment alterations, and a higher prevalence of neurological disease, whereas a decrease in left ventricular ejection fraction and an increase in brain natriuretic peptide values are not evident[14]. Atypical TS is more difficult to detect in the clinical setting.

In this case, the patient had the classical symptoms of myocardial infarction, such as episodes of chest tightness and breathlessness, ST-T segment abnormalities on ECG, wall dyskinesia on echocardiogram, and elevated troponin levels, as well as newly discovered unexplained paroxysmal palpitations, sweating, and elevated blood pressure and blood glucose levels. Although cardiac imaging did not reveal typical apical spherical changes, the diagnosis of TS could be made based on the absence of significant abnormalities on coronary angiogram, echocardiographic findings suggesting a basic loss of proximal apical lateral wall motion and abnormal segmental ventricular wall motion, and a repeat echocardiogram showing normal motion, which could further be classified as an atypical focal type of TS. The postoperative pathology clearly showed the presence of pheochromocytoma, which was the underlying cause of TS.

Pheochromocytomas are a significant pathogenic factor in TS. The sudden production of large doses of catecholamines is directly toxic to the myocardium, producing catecholamine-induced myocarditis, diffuse myocardial fibrosis, and induced heart failure[15]; most patients can recover normal cardiac function after removal of the primary tumor[16].

CONCLUSION

In conclusion, we report a case of TS caused by pheochromocytoma. The leading causes of death in patients with TS are the sudden onset of illness and failure to receive prompt emergency treatment; therefore, the patient's prognosis depends on timely detection of the cause of the illness. Pheochromocytoma as the causative factor should not be overlooked in the management of TS, since early intervention can effectively improve myocardial remodeling, and clinicians should pay attention to this.

ACKNOWLEDGEMENTS

This report was supported by doctors working in the Department of Integrative Cardiology, China-Japan Friendship Hospital in acquisition, analysis and interpretation of data.

FOOTNOTES

Author contributions: Li L did the conception and design; Wang ZH collected the data and wrote the manuscript; Fan JR and Zhang GY performed the patient follow-up; Wang ZH and Fan JR analyzed and interpreted the data; Li XL made important revisions to the manuscript; all authors approved the final manuscript.

Supported by the Capital Health Development Scientific Research Project, No. 2018–2-4063; and Elite Medical Professionals Project of China-Japan Friendship Hospital, No. ZRJY2021-TD03.

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

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

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

Country/Territory of origin: China

ORCID number: Zi-Han Wang 0000-0003-4588-480X; Jia-Rong Fan 0000-0002-7298-9378; Gao-Yu Zhang 0000-0003-1809-2807; Xian-Lun Li 0000-0001-7553-6203; Lin Li 0000-0002-3659-7529.

S-Editor: Chen YL
L-Editor: A
P-Editor: Chen YL

REFERENCES

1 **Tofield A**. Hikaru Sato and Takotsubo cardiomyopathy. *Eur Heart J* 2016; **37**: 2812 [PMID: 27923850 DOI: 10.1093/eurheartj/ehw367]
2 **Hurst RT**, Prasad A, Askew JW 3rd, Sengupta PP, Tajik AJ. Takotsubo cardiomyopathy: a unique cardiomyopathy with variable ventricular morphology. *JACC Cardiovasc Imaging* 2010; **3**: 641-649 [PMID: 20541719 DOI: 10.1016/j.jcmg.2010.01.009]
3 **Ueyama T**, Hano T, Kasamatsu K, Yamamoto K, Tsuruo Y, Nishio I. Estrogen attenuates the emotional stress-induced cardiac responses in the animal model of Tako-tsubo (Ampulla) cardiomyopathy. *J Cardiovasc Pharmacol* 2003; **42** Suppl 1: S117-S119 [PMID: 14871041 DOI: 10.1097/00005344-200312001-00024]
4 **Nölting S**, Bechmann N, Taieb D, Beuschlein F, Fassnacht M, Kroiss M, Eisenhofer G, Grossman A, Pacak K. Personalized Management of Pheochromocytoma and Paraganglioma. *Endocr Rev* 2022; **43**: 199-239 [PMID: 34147030 DOI: 10.1210/endrev/bnab019]
5 **Ono R**, Falcão LM. Takotsubo cardiomyopathy systematic review: Pathophysiologic process, clinical presentation and diagnostic approach to Takotsubo cardiomyopathy. *Int J Cardiol* 2016; **209**: 196-205 [PMID: 26896623 DOI: 10.1016/j.ijcard.2016.02.012]
6 **Templin C**, Ghadri JR, Diekmann J, Napp LC, Bataiosu DR, Jaguszewski M, Cammann VL, Sarcon A, Geyer V, Neumann CA, Seifert B, Hellermann J, Schwyzer M, Eisenhardt K, Jenewein J, Franke J, Katus HA, Burgdorf C, Schunkert H, Moeller C, Thiele H, Bauersachs J, Tschöpe C, Schultheiss HP, Laney CA, Rajan L, Michels G, Pfister R, Ukena C, Böhm M, Erbel R, Cuneo A, Kuck KH, Jacobshagen C, Hasenfuss G, Karakas M, Koenig W, Rottbauer W, Said SM, Braun-Dullaeus RC, Cuculi F, Banning A, Fischer TA, Vasankari T, Airaksinen KE, Fijalkowski M, Rynkiewicz A, Pawlak M, Opolski G, Dworakowski R, MacCarthy P, Kaiser C, Osswald S, Galiuto L, Crea F, Dichtl W, Franz WM, Empen K, Felix SB, Delmas C, Lairez O, Erne P, Bax JJ, Ford I, Ruschitzka F, Prasad A, Lüscher TF. Clinical Features and Outcomes of Takotsubo (Stress) Cardiomyopathy. *N Engl J Med* 2015; **373**: 929-938 [PMID: 26332547 DOI: 10.1056/NEJMoa1406761]
7 **Lyon AR**, Bossone E, Schneider B, Sechtem U, Citro R, Underwood SR, Sheppard MN, Figtree GA, Parodi G, Akashi YJ, Ruschitzka F, Filippatos G, Mebazaa A, Omerovic E. Current state of knowledge on Takotsubo syndrome: a Position Statement from the Taskforce on Takotsubo Syndrome of the Heart Failure Association of the European Society of

Cardiology. *Eur J Heart Fail* 2016; **18**: 8-27 [PMID: 26548803 DOI: 10.1002/ejhf.424]

8 **Kato K**, Lyon AR, Ghadri JR, Templin C. Takotsubo syndrome: aetiology, presentation and treatment. *Heart* 2017; **103**: 1461-1469 [PMID: 28839096 DOI: 10.1136/heartjnl-2016-309783]

9 **Kido K**, Guglin M. Drug-Induced Takotsubo Cardiomyopathy. *J Cardiovasc Pharmacol Ther* 2017; **22**: 552-563 [PMID: 28490198 DOI: 10.1177/1074248417708618]

10 **Prasad A**, Lerman A, Rihal CS. Apical ballooning syndrome (Tako-Tsubo or stress cardiomyopathy): a mimic of acute myocardial infarction. *Am Heart J* 2008; **155**: 408-417 [PMID: 18294473 DOI: 10.1016/j.ahj.2007.11.008]

11 **Y-Hassan S**, Tornvall P. Epidemiology, pathogenesis, and management of takotsubo syndrome. *Clin Auton Res* 2018; **28**: 53-65 [PMID: 28917022 DOI: 10.1007/s10286-017-0465-z]

12 **Paur H**, Wright PT, Sikkel MB, Tranter MH, Mansfield C, O'Gara P, Stuckey DJ, Nikolaev VO, Diakonov I, Pannell L, Gong H, Sun H, Peters NS, Petrou M, Zheng Z, Gorelik J, Lyon AR, Harding SE. High levels of circulating epinephrine trigger apical cardiodepression in a β2-adrenergic receptor/Gi-dependent manner: a new model of Takotsubo cardiomyopathy. *Circulation* 2012; **126**: 697-706 [PMID: 22732314 DOI: 10.1161/CIRCULATIONAHA.112.111591]

13 **Bonnemeier H**, Demming T, Weidtmann B, Ortak J, Burgdorf C, Reppel M, Mäuser W, Rosenberg M, Frey N. Differential heart rate dynamics in transient left ventricular apical and midventricular ballooning. *Heart Rhythm* 2010; **7**: 1825-1832 [PMID: 20817016 DOI: 10.1016/j.hrthm.2010.08.025]

14 **Ghadri JR**, Cammann VL, Napp LC, Jurisic S, Diekmann J, Bataiosu DR, Seifert B, Jaguszewski M, Sarcon A, Neumann CA, Geyer V, Prasad A, Bax JJ, Ruschitzka F, Lüscher TF, Templin C; International Takotsubo (InterTAK) Registry. Differences in the Clinical Profile and Outcomes of Typical and Atypical Takotsubo Syndrome: Data From the International Takotsubo Registry. *JAMA Cardiol* 2016; **1**: 335-340 [PMID: 27438117 DOI: 10.1001/jamacardio.2016.0225]

15 **Ferreira VM**, Marcelino M, Piechnik SK, Marini C, Karamitsos TD, Ntusi NAB, Francis JM, Robson MD, Arnold JR, Mihai R, Thomas JDJ, Herincs M, Hassan-Smith ZK, Greiser A, Arlt W, Korbonits M, Karavitaki N, Grossman AB, Wass JAH, Neubauer S. Pheochromocytoma Is Characterized by Catecholamine-Mediated Myocarditis, Focal and Diffuse Myocardial Fibrosis, and Myocardial Dysfunction. *J Am Coll Cardiol* 2016; **67**: 2364-2374 [PMID: 27199060 DOI: 10.1016/j.jacc.2016.03.543]

16 **Falhammar H**, Kjellman M, Calissendorff J. Treatment and outcomes in pheochromocytomas and paragangliomas: a study of 110 cases from a single center. *Endocrine* 2018; **62**: 566-575 [PMID: 30220006 DOI: 10.1007/s12020-018-1734-x]

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