

World Journal of *Clinical Cases*

World J Clin Cases 2022 May 6; 10(13): 3969-4326



Contents

Thrice Monthly Volume 10 Number 13 May 6, 2022

REVIEW

- 3969** COVID-19 and liver diseases, what we know so far
Elnaggar M, Abomhaya A, Elkhattib I, Dawoud N, Doshi R

MINIREVIEWS

- 3981** Amputation stump management: A narrative review
Choo YJ, Kim DH, Chang MC

ORIGINAL ARTICLE

Clinical and Translational Research

- 3989** Solute carrier family 2 members 1 and 2 as prognostic biomarkers in hepatocellular carcinoma associated with immune infiltration
Peng Q, Hao LY, Guo YL, Zhang ZQ, Ji JM, Xue Y, Liu YW, Lu JL, Li CG, Shi XL

Retrospective Cohort Study

- 4020** Role of clinical data and multidetector computed tomography findings in acute superior mesenteric artery embolism
Yang JS, Xu ZY, Chen FX, Wang MR, Cong RC, Fan XL, He BS, Xing W

Retrospective Study

- 4033** Effect of calcium supplementation on severe hypocalcemia in patients with secondary hyperparathyroidism after total parathyroidectomy
Liu J, Fan XF, Yang M, Huang LP, Zhang L
- 4042** Comparison of clinical efficacy and postoperative inflammatory response between laparoscopic and open radical resection of colorectal cancer
He LH, Yang B, Su XQ, Zhou Y, Zhang Z
- 4050** Three-dimensional echocardiographic assessment of left ventricular volume in different heart diseases using a fully automated quantification software
Pan CK, Zhao BW, Zhang XX, Pan M, Mao YK, Yang Y
- 4064** Clinical effect of ultrasound-guided nerve block and dexmedetomidine anesthesia on lower extremity operative fracture reduction
Ao CB, Wu PL, Shao L, Yu JY, Wu WG
- 4072** Correlation between thrombopoietin and inflammatory factors, platelet indices, and thrombosis in patients with sepsis: A retrospective study
Xu WH, Mo LC, Shi MH, Rao H, Zhan XY, Yang M

Observational Study

- 4084** High plasma CD40 ligand level is associated with more advanced stages and worse prognosis in colorectal cancer

Herold Z, Herold M, Herczeg G, Fodor A, Szasz AM, Dank M, Somogyi A

- 4097** Metabolic dysfunction is associated with steatosis but no other histologic features in nonalcoholic fatty liver disease

Dai YN, Xu CF, Pan HY, Huang HJ, Chen MJ, Li YM, Yu CH

Randomized Controlled Trial

- 4110** Effect of Xuebijing injection on myocardium during cardiopulmonary bypass: A prospective, randomized, double blind trial

Jin ZH, Zhao XQ, Sun HB, Zhu JL, Gao W

META-ANALYSIS

- 4119** Perioperative respiratory muscle training improves respiratory muscle strength and physical activity of patients receiving lung surgery: A meta-analysis

Yang MX, Wang J, Zhang X, Luo ZR, Yu PM

CASE REPORT

- 4131** Delayed diffuse lamellar keratitis after small-incision lenticule extraction related to immunoglobulin A nephropathy: A case report

Dan TT, Liu TX, Liao YL, Li ZZ

- 4137** Large vessel vasculitis with rare presentation of acute rhabdomyolysis: A case report and review of literature

Fu LJ, Hu SC, Zhang W, Ye LQ, Chen HB, Xiang XJ

- 4145** Primitive neuroectodermal tumor of the prostate in a 58-year-old man: A case report

Tian DW, Wang XC, Zhang H, Tan Y

- 4153** Bilateral superficial cervical plexus block for parathyroidectomy during pregnancy: A case report

Chung JY, Lee YS, Pyeon SY, Han SA, Huh H

- 4161** Primary myelofibrosis with thrombophilia as first symptom combined with thalassemia and Gilbert syndrome: A case report

Wufuer G, Wufuer K, Ba T, Cui T, Tao L, Fu L, Mao M, Duan MH

- 4171** Late contralateral recurrence of retinal detachment in incontinentia pigmenti: A case report

Cai YR, Liang Y, Zhong X

- 4177** Pregnancy and delivery after augmentation cystoplasty: A case report and review of literature

Ruan J, Zhang L, Duan MF, Luo DY

- 4185** Acute pancreatitis as a rare complication of gastrointestinal endoscopy: A case report

Dai MG, Li LF, Cheng HY, Wang JB, Ye B, He FY

- 4190** Paraneoplastic neurological syndrome with positive anti-Hu and anti-Yo antibodies: A case report
Li ZC, Cai HB, Fan ZZ, Zhai XB, Ge ZM
- 4196** Primary pulmonary meningioma: A case report and review of the literature
Zhang DB, Chen T
- 4207** Anesthesia of a patient with congenital cataract, facial dysmorphism, and neuropathy syndrome for posterior scoliosis: A case report
Hudec J, Kosinova M, Prokopova T, Filipovic M, Repko M, Stourac P
- 4214** Extensive myocardial calcification in critically ill patients receiving extracorporeal membrane oxygenation: A case report
Sui ML, Wu CJ, Yang YD, Xia DM, Xu TJ, Tang WB
- 4220** Trigeminal extracranial thermocoagulation along with patient-controlled analgesia with esketamine for refractory postherpetic neuralgia after herpes zoster ophthalmicus: A case report
Tao JC, Huang B, Luo G, Zhang ZQ, Xin BY, Yao M
- 4226** Thrombotic pulmonary embolism of inferior vena cava during caesarean section: A case report and review of the literature
Jiang L, Liang WX, Yan Y, Wang SP, Dai L, Chen DJ
- 4236** EchoNavigator virtual marker and Agilis NxT steerable introducer facilitate transseptal transcatheter closure of mitral paravalvular leak
Hsu JC, Khoi CS, Huang SH, Chang YY, Chen SL, Wu YW
- 4242** Primary isolated central nervous system acute lymphoblastic leukemia with *BCR-ABL1* rearrangement: A case report
Chen Y, Lu QY, Lu JY, Hong XL
- 4249** Coexistence of meningioma and other intracranial benign tumors in non-neurofibromatosis type 2 patients: A case report and review of literature
Hu TH, Wang R, Wang HY, Song YF, Yu JH, Wang ZX, Duan YZ, Liu T, Han S
- 4264** Treatment of condylar osteophyte in temporomandibular joint osteoarthritis with muscle balance occlusal splint and long-term follow-up: A case report
Lan KW, Chen JM, Jiang LL, Feng YF, Yan Y
- 4273** Hepatic perivascular epithelioid cell tumor: A case report
Li YF, Wang L, Xie YJ
- 4280** Multiple stress fractures of unilateral femur: A case report
Tang MT, Liu CF, Liu JL, Saijilafu, Wang Z
- 4288** Enigmatic rapid organization of subdural hematoma in a patient with epilepsy: A case report
Lv HT, Zhang LY, Wang XT

- 4294** Spinal canal decompression for hypertrophic neuropathy of the cauda equina with chronic inflammatory demyelinating polyradiculoneuropathy: A case report
Ye L, Yu W, Liang NZ, Sun Y, Duan LF
- 4301** Primary intracranial extraskeletal myxoid chondrosarcoma: A case report and review of literature
Zhu ZY, Wang YB, Li HY, Wu XM
- 4314** Mass brain tissue lost after decompressive craniectomy: A case report
Li GG, Zhang ZQ, Mi YH

LETTER TO THE EDITOR

- 4321** Improving outcomes in geriatric surgery: Is there more to the equation?
Goh SSN, Chia CL
- 4324** Capillary leak syndrome: A rare cause of acute respiratory distress syndrome
Juneja D, Kataria S

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Kai Zhang, PhD, Professor, Department of Psychiatry, Chaohu Hospital of Anhui Medical University, Hefei 238000, Anhui Province, China. zhangkai@ahmu.edu.cn

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 indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for WJCC as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The WJCC's CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Xu Guo; 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

May 6, 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>



EchoNavigator virtual marker and Agilis NxT steerable introducer facilitate transseptal transcatheter closure of mitral paravalvular leak

Jung-Cheng Hsu, Chong-Sun Khoi, Shan-Hui Huang, Yi-Yao Chang, Shu-Lu Chen, Yen-Wen Wu

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: Garg A, India; Gulel O, Turkey; Guo L, China; Santomauro M, Italy; Umapathi KK, United States

Received: October 5, 2021

Peer-review started: October 5, 2021

First decision: January 11, 2022

Revised: January 20, 2022

Accepted: March 16, 2022

Article in press: March 16, 2022

Published online: May 6, 2022



Jung-Cheng Hsu, Shan-Hui Huang, Yi-Yao Chang, Shu-Lu Chen, Yen-Wen Wu, Division of Cardiology, Department of Medicine, Far Eastern Memorial Hospital, New Taipei City 220216, Taiwan

Jung-Cheng Hsu, General Education Center, Lунghwa University of Science and Technology, Taoyuan City 333026, Taiwan

Chong-Sun Khoi, Department of Anesthesiology, Far Eastern Memorial Hospital, New Taipei City 220216, Taiwan

Corresponding author: Jung-Cheng Hsu, MD, Attending Doctor, Division of Cardiology, Department of Medicine, Far Eastern Memorial Hospital, No. 21, Sec. 2, Nanya S. Rd., Banqiao Dist., New Taipei City 220216, Taiwan. jungchenghsu@gmail.com

Abstract

BACKGROUND

Paravalvular leak (PVL), also known as paravalvular prosthetic regurgitation, is not a rare complication after surgical valve replacement, and it may cause varying degrees of heart failure. The transcatheter closure of PVL is technically demanding and challenging.

CASE SUMMARY

A 68-year-old man presented with degenerative mitral regurgitation with heart failure, New York Heart Association functional class 3. He received bioprosthetic mitral valve replacement in December 2019. PVL was noted at the location of the aorto-mitral curtain in transesophageal echocardiography without signs of endocarditis or dehiscence of the bioprosthetic valve. Transseptal transcatheter closure of the mitral PVL was performed efficiently using the EchoNavigator virtual marker and Agilis NxT steerable introducer.

CONCLUSION

This case highlights that the EchoNavigator virtual marker and Agilis NxT steerable introducer can facilitate transseptal transcatheter closure of mitral PVL by reducing the procedure time and contrast media.

Key Words: Paravalvular leak; Paravalvular prosthetic regurgitation; EchoNavigator; Steerable introducer; Case report

Core Tip: The transcatheter closure of paravalvular leak (PVL) is technically demanding and can be time consuming. Transseptal transcatheter closure of mitral PVL can be performed efficiently using the EchoNavigator virtual marker (fusion imaging) and Agilis NxT steerable introducer.

Citation: Hsu JC, Khoi CS, Huang SH, Chang YY, Chen SL, Wu YW. EchoNavigator virtual marker and Agilis NxT steerable introducer facilitate transseptal transcatheter closure of mitral paravalvular leak. *World J Clin Cases* 2022; 10(13): 4236-4241

URL: <https://www.wjgnet.com/2307-8960/full/v10/i13/4236.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v10.i13.4236>

INTRODUCTION

Paravalvular leak (PVL), also known as paravalvular prosthetic regurgitation, is not a rare complication after surgical or transcatheter valve replacement, and it may cause varying degrees of heart failure or hemolysis[1,2]. Paraprosthetic jets have been reported in 10% of aortic and 15% of mitral valves after around 1 year of follow-up in transesophageal echocardiography (TEE)[2]. Surgical repair and transcatheter closure of PVL are both the treatment options. However, transcatheter closure of PVL is technically demanding and can be time consuming. We present this case to demonstrate a more efficient way to close PVL.

CASE PRESENTATION

Chief complaints

A 68-year-old man presented with progressive dyspnea and bilateral lower leg edema. Orthopnea was noted several days before this hospitalization.

History of present illness

He received mitral valve replacement with a Hancock II 29 mm bioprosthesis (Medtronic, Minneapolis, MN) in December 2019 because of degenerative mitral regurgitation with heart failure, New York Heart Association functional class 3.

History of past illness

The patient had not been diagnosed with any diseases.

Personal and family history

There was no significant family history.

Physical examination

The patient's temperature was 36.4°C, heart rate was 98 bpm, respiratory rate was 20 breaths per minute, blood pressure was 132/80 mmHg, and oxygen saturation in room air was 94%. His consciousness was clear and oriented. His jugular vein was engorged, and a holosystolic murmur was heard at the left sternal border. There was also bilateral lower leg pitting edema.

Laboratory examinations

The complete blood count and serum creatinine were within normal limits. No hemolysis was noted from the laboratory findings.

Imaging examinations

PVL was noted at the location of the aorto-mitral curtain in TEE without signs of endocarditis or dehiscence of the bioprosthesis valve.

FINAL DIAGNOSIS

Severe mitral PVL with heart failure was diagnosed.

TREATMENT

We chose to perform transseptal antegrade transcatheter closure of the PVL rather than redo surgery as the procedure is less invasive. Transapical access would be the alternative if the transseptal approach failed. EchoNavigator transesophageal echocardiographic-fluoroscopic fusion imaging software (Philips Medical Systems, Best, the Netherlands) was used during the procedure (Figure 1). PVL was well visualized at the X-plane (zero and 90°) in TEE. We used the mark function of the EchoNavigator software and easily adjusted marker 1 for the location of the PVL in the X-plane views of TEE. Virtual marker 1 then appeared in real-time fluoroscopic imaging indicating the PVL location. Transseptal puncture was done using an SL0 transseptal sheath (St Jude Medical, 8.5 Fr) and a BRK1 transseptal needle at the superior/mid-anterior fossa ovalis. We changed this to an Agilis NxT steerable introducer (Abbot Vascular, Santa Clara, CA) using Amplatzer Super Stiff wire. The fluoroscopic projection was changed to right anterior oblique to visualize the side view of the bioprosthetic valve. Through a combination of the virtual marker on the fluoroscopic screen and the TEE imaging, we adjusted the Agilis NxT steerable introducer to orient the path to the PVL. After crossing the PVL with Terumo Stiff guidewire (0.035 inches) supported by the telescoping system of a 6 Fr MP guide catheter and 5 Fr JR4 diagnostic catheter, we sequentially deployed two Amplatzer Vascular Plug II (AVP II 12 mm/10 mm; Abbot Vascular, Santa Clara, CA, United States). When a significant reduction in the PVL was noted in TEE imaging without interfering with the function of the mitral bioprosthetic valve (transmitral mean pressure gradient below 2 mmHg), we successfully released the devices one at a time. No contrast media was administered, and the whole procedure was finished within 2 h from skin to skin.

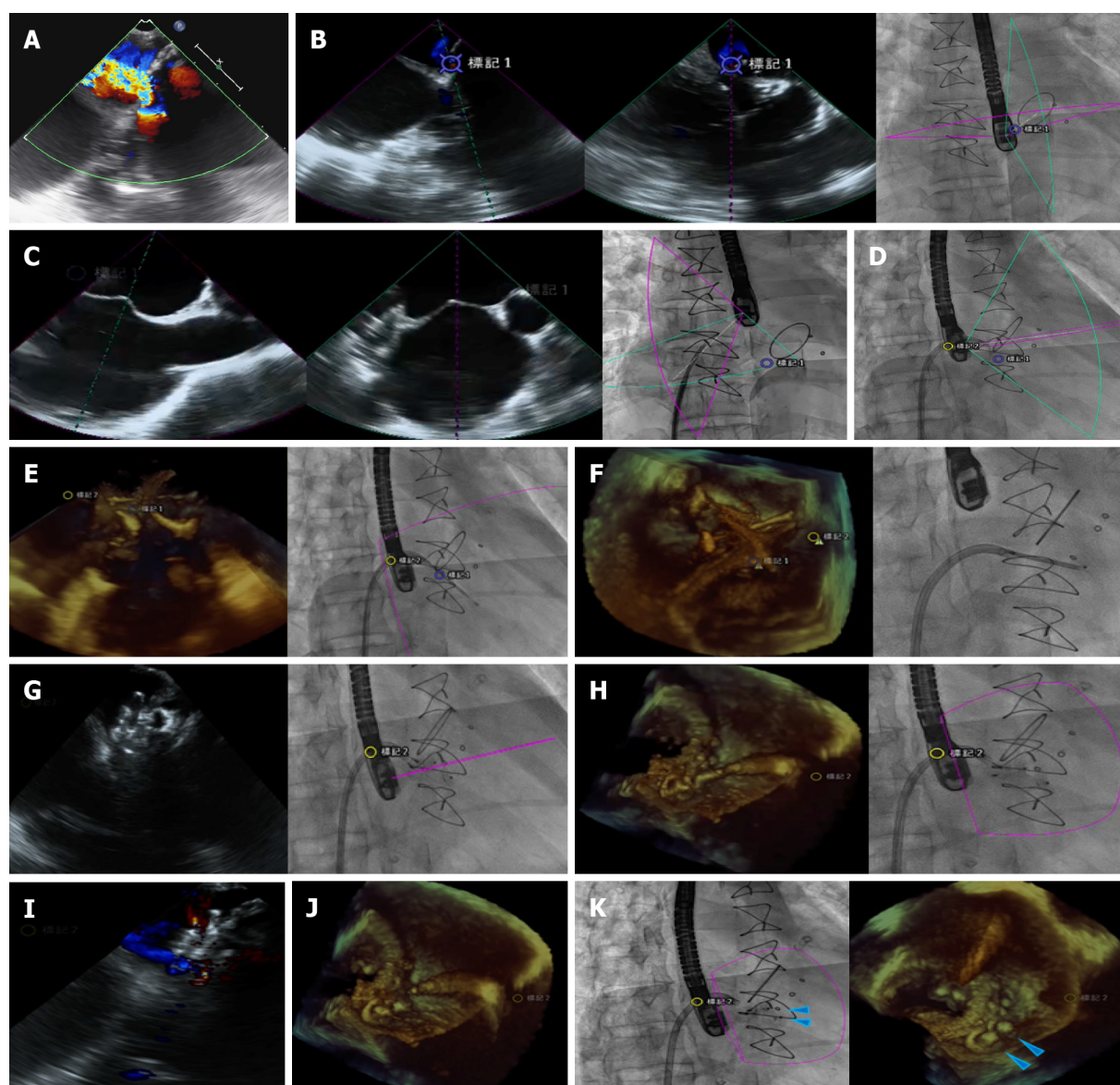
OUTCOME AND FOLLOW-UP

Follow-up echocardiography showed only mild residual paravalvular mitral regurgitation, and chest plain film showed improvements in heart size and bilateral pleural effusion (Figure 2). He currently leads an uneventful life without signs of heart failure, and he was appreciative to the whole team for this episode of care.

DISCUSSION

Paravalvular leak, also known as paravalvular prosthetic regurgitation, is not a rare complication after surgical valve replacement, and it may cause heart failure[1,2]. Considering the high risk of redo surgery, we planned to perform transseptal antegrade transcatheter closure of the PVL as the procedure is less invasive. The transcatheter closure of PVL has been discussed in previous studies[3,4], and the reported success rate generally ranges from 80% to 90%[5,6]. The clinical success rates and 5-year overall survival rates of transcatheter closure and surgical treatment of PVL are similar, however fewer in-hospital major adverse events have been reported with transcatheter closure[7]. We chose transseptal access rather than retrograde transapical access because it is less invasive and is associated with a lower risk of bleeding. However, there are still advantages in using transapical access, including easier wire probing (especially PVL defects located at the medial aspect and when there is little room for device manipulation) and a shorter procedure time. In the present case, TEE provided precise guidance of transseptal puncture. In contrast to the fixed curve introducer, the Agilis NxT steerable introducer tip can be adjusted to various angles by rotating the knob on the handle. Therefore, we use the Agilis NxT steerable introducer to overcome difficulties when dealing with medial PVL defects. Several occluder devices to close PVL are currently available[4]. Among these devices, Amplatzer Vascular Plug (AVP) III and II are the most commonly used due to the ovoid shape of the lobe of AVP III which can fit the crescentic shape of PVL and the low profile of AVP II.

In our case, a virtual marker indicating the PVL location was shown in real-time on the fluoroscopic screen regardless of the projection angles using EchoNavigator transesophageal echocardiographic-fluoroscopic fusion imaging software. This substantially reduced the time required to orient the steerable introducer and pass the wire through the PVL defect. Fusion imaging using EchoNavigator software is very helpful if the bioprosthetic valve is radiolucent. Other clinical implications of EchoNavigator software include transcatheter edge-to-edge repair of the mitral valve, and transcatheter closure of the left atrial appendage. The procedure can be facilitated by making virtual markers on the site of clipping on the mitral valve and the orifice of the left atrial appendage.



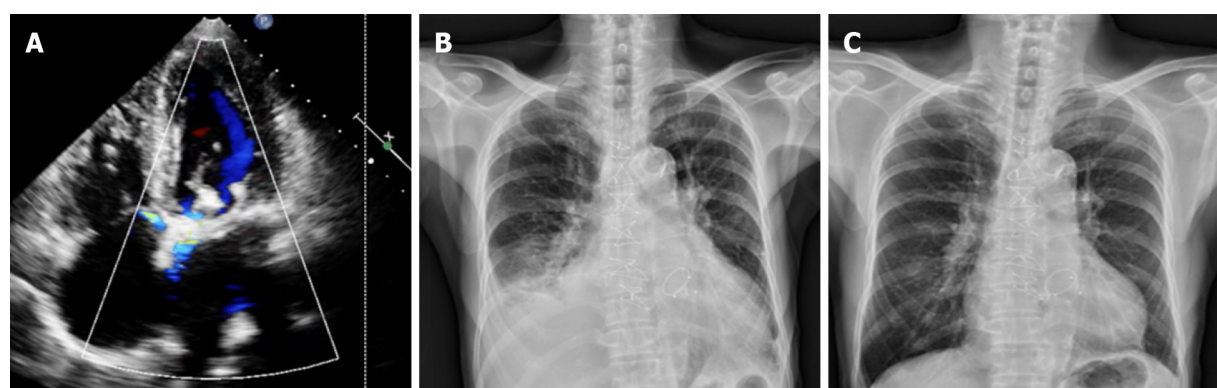
DOI: 10.12998/wjcc.v10.i13.4236 Copyright ©The Author(s) 2022.

Figure 1 EchoNavigator virtual marker and fusion imaging for transcatheter closure of paravalvular leak. A: Significant mitral paravalvular leak (PVL) was seen in transesophageal echocardiography (TEE 0 degrees); B: The PVL location at the X-plane views of TEE was marked to generate marker 1 on the fluoroscopic screen; C: A suitable point for transeptal puncture was made under the guidance of TEE; D: The curvature of the Agilis NxT steerable introducer was adjusted for better orientation; E: The PVL defect was crossed with a 0.035-inch guidewire supported by the telescoping system of a 6 Fr MP guide catheter and JR4 diagnostic catheter; F: Three-dimensional TEE showed the first Amplatzer Vascular Plug II (AVP II 12 mm); G: The second AVP II (10 mm) was deployed without releasing the first AVP II; H: The second AVP II (10 mm) was released first; I: Color Doppler mode of the TEE showed only mild residual PVL; J: Three-dimensional TEE showed that the 1st AVP II (12 mm) had been released; K: Final position of the two AVP II (blue arrow heads).

In addition, we sequentially deployed the second AVP II without losing the orientation of the Agilis NxT steerable introducer, and we could pass the wire easily through the defect despite the presence of the first AVP II. Mitral PVL defects are usually crescentic, and if we had used Amplatzer Vascular Plug III we may have been able to close the defect more efficiently. We used real-time three-dimensional TEE imaging (left atrial side view) during the intervention which provided clear imaging without the need for additional radiation exposure or contrast media. Using a combination of fluoroscopy and TEE imaging avoided the need for contrast media, thereby minimizing the risk of further deterioration of renal function.

CONCLUSION

Transcatheter closure of mitral PVL is feasible and should be the first choice of therapy in experienced centers. Using EchoNavigator virtual marker and Agilis NxT steerable introducer enabled us to finish



DOI: 10.12998/wjcc.v10.i13.4236 Copyright ©The Author(s) 2022.

Figure 2 Clinical follow-up. A: Transthoracic echocardiography showed only mild residual paravalvular mitral regurgitation 5 mo after the transcatheter closure of paravalvular leak (PVL); B: Chest plain film before the transcatheter closure of the PVL; C: Chest plain film 6 mo after the transcatheter closure of the PVL.

the challenging intervention more efficiently and safely. Clinical improvements were obvious in our case. Long-term follow-up of these patients is warranted.

FOOTNOTES

Author contributions: Hsu JC and Wu YW were the patient's cardiologists, reviewed the literature and contributed to manuscript drafting; Khoi CS was the interventional echocardiographer who performed the transesophageal echocardiography during the procedure, and contributed to illustrations and manuscript drafting; Huang SH and Chang YY were also cardiologists who performed the follow-up transthoracic echocardiography for the patient and contributed to manuscript drafting. Cheng SL provided technical assistance during the procedure and contributed to the literature review; all authors issued final approval for the version to be submitted. No competing interests were disclosed by any author.

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

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

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

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

Country/Territory of origin: Taiwan

ORCID number: Jung-Cheng Hsu 0000-0002-1622-9235; Chong-Sun Khoi 0000-0003-1040-9857; Shan-Hui Huang 0000-0003-1877-9246; Yi-Yao Chang 0000-0002-9148-8667; Shu-Lu Chen 0000-0003-0753-1691; Yen-Wen Wu 0000-0003-1520-1166.

S-Editor: Ma YJ

L-Editor: A

P-Editor: Ma YJ

REFERENCES

- 1 **Rallidis LS**, Moyssakis IE, Ikonomidis I, Nihoyannopoulos P. Natural history of early aortic paraprosthesis regurgitation: a five-year follow-up. *Am Heart J* 1999; **138**: 351-357 [PMID: 10426851 DOI: 10.1016/s0002-8703(99)70124-9]
- 2 **Ionescu A**, Fraser AG, Butchart EG. Prevalence and clinical significance of incidental paraprosthesis valvar regurgitation: a prospective study using transoesophageal echocardiography. *Heart* 2003; **89**: 1316-1321 [PMID: 14594888 DOI: 10.1136/heart.89.11.1316]
- 3 **Eleid MF**, Cabalka AK, Malouf JF, Sanon S, Hagler DJ, Rihal CS. Techniques and Outcomes for the Treatment of Paravalvular Leak. *Circ Cardiovasc Interv* 2015; **8**: e001945 [PMID: 26206850 DOI: 10.1161/CIRCINTERVENTIONS.115.001945]

- 10.1161/CIRCINTERVENTIONS.115.001945]
- 4 **Gafoor S**, Franke J, Bertog S, Lam S, Vaskelyte L, Hofmann I, Sievert H, Matic P. A Quick Guide to Paravalvular Leak Closure. *Interv Cardiol* 2015; **10**: 112-117 [PMID: 29588686 DOI: 10.15420/ICR.2015.10.2.112]
- 5 **Sorajja P**, Cabalka AK, Hagler DJ, Rihal CS. The learning curve in percutaneous repair of paravalvular prosthetic regurgitation: an analysis of 200 cases. *JACC Cardiovasc Interv* 2014; **7**: 521-529 [PMID: 24746657 DOI: 10.1016/j.jcin.2014.01.159]
- 6 **Ruiz CE**, Jelnin V, Kronzon I, Dudiy Y, Del Valle-Fernandez R, Einhorn BN, Chiam PT, Martinez C, Eiros R, Roubin G, Cohen HA. Clinical outcomes in patients undergoing percutaneous closure of periprosthetic paravalvular leaks. *J Am Coll Cardiol* 2011; **58**: 2210-2217 [PMID: 22078427 DOI: 10.1016/j.jacc.2011.03.074]
- 7 **Zhang Y**, Pan X, Qu X, Wang C, Huang E, Ma L, Wu W, Fang W. Comparison of transcatheter and surgical treatment of paravalvular leak: Results from a 5-year follow-up study. *Catheter Cardiovasc Interv* 2019; **94**: E88-E95 [PMID: 29068133 DOI: 10.1002/ccd.27371]



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>

