



## Case Report

# Pancreaticoduodenectomy after transcatheter aortic valve implantation in an elderly patient with severe aortic stenosis and pancreas cancer: A case report



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## ABSTRACT

**Introduction and importance:** Not only pancreatic cancer but also aortic stenosis (AS) is increasing with the aging population. There is no optimal strategy for elderly patients with both pancreatic cancer and AS. We report a case of pancreatic head cancer with severe AS undergoing pancreaticoduodenectomy (PD) after transcatheter aortic valve implantation (TAVI).

**Case presentation:** An 88-year-old woman was referred to our hospital because of severe AS with symptoms of heart failure. Preoperative examination revealed resectable pancreatic head cancer, so TAVI was performed before PD to reduce the perioperative risk. The patient underwent PD 34 days after TAVI, with no significant postoperative complications, and was transferred to the other hospital for rehabilitation on postoperative day 45. No recurrence was observed at more than 7 months without adjuvant therapy.

**Clinical discussion:** Aortic valve replacement (AVR) is recommended before non-cardiac surgery in patients with symptomatic severe AS. Surgical aortic valve replacement (SAVR) is the standard treatment. However, owing to the highly invasive procedure and increased perioperative risk, SAVR is usually avoided in elderly patients with malignancy and severe AS. We demonstrated that TAVI followed by PD could be safely performed in high-risk elderly patients presenting with both severe AS and pancreatic head cancer. To our knowledge, this is the first case report of PD after TAVI in a patient with severe AS.

**Conclusion:** We demonstrated that TAVI followed by PD could be safely performed in high-risk elderly patients presenting with severe AS and co-existing malignancy.

## 1. Introduction

The number of patients with pancreatic cancer is increasing with the aging population [1]. Surgical treatment is recommended in resectable pancreatic cancers [2]. Pancreaticoduodenectomy (PD) is the standard procedure for pancreatic head cancer, but it is one of the most demanding procedures and the European Society of Cardiology guidelines suggests it as a high-risk procedure with a 30-day risk of cardiovascular deaths and myocardial infarction [3]. This warrant preoperative evaluation of complications in patients with co-existing

cardiovascular diseases to ensure safe perioperative management after PD.

Aortic stenosis (AS) is another disease that is increasing with the aging population [4]. The standard treatment for severe AS is surgical aortic valve replacement (SAVR). However, due to the higher perioperative risk in the elderly and cancer patients, they have been considered unsuitable for SAVR [5]. Recently, for such cases, minimally invasive transcatheter aortic valve implantation (TAVI) is increasingly being performed [6].

In elderly patients with cancer and AS, the optimal treatment is not

**Abbreviations:** PD, Pancreaticoduodenectomy; AS, Aortic stenosis; SAVR, Surgical aortic valve replacement; TAVI, Transcatheter aortic valve implantation; CT, computed tomography; DAPT, dual antiplatelet therapy; CPB, Cardiopulmonary bypass.

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well established and complex choices have to be made. Preceding TAVI may be a useful therapeutic strategy for earlier and safer surgical intervention for malignancy. In this article, we report a case of pancreatic head cancer with severe AS undergoing PD after TAVI that highlights the importance of efficient therapeutic strategy and secure management in elderly patient with gastroenterological malignancy and severe AS. This work was done in compliance with SCARE checklist [7].

## 2. Case presentation

An 88-year-old woman was referred to our hospital because of severe AS with symptoms of heart failure (New York Heart Association class II). The patient's medical history included appendectomy in her twenties, cataract surgery 10 years ago, chronic kidney disease, hypertension, hyperlipidemia, hyperuricemia, and osteoporosis. She was a non-smoker and non-alcoholic and was taking imidapril (5 mg), amlodipine (5 mg), rosuvastatin (2.5 mg), carvedilol (0.625 mg), and eldelcalcitol (0.75 µg) per day orally at home. Family history was negative. Echocardiography showed very severe AS with an aortic valve area of 0.61 cm<sup>2</sup>, a mean aortic pressure gradient of 78 mmHg, a maximum jet velocity of 5.6 m/s, and an ejection fraction of 76%. SAVR or TAVI was indicated, but pancreatic head cancer was diagnosed on preoperative computed tomography (CT) (Fig. 1). The cancer graded T3, N0, M0, clinical Stage IIA based on the 7th edition of the General Rules for the Study of Pancreatic Cancer, resectable on CT, required surgical intervention. However, due to severe AS, the perioperative risk of PD was high. The European Society of Cardiology guidelines recommend that SAVR or TAVI should be prioritized in symptomatic severe AS patients with non-cardiac surgery [8], and we decided to prioritize the treatment of severe AS in this case as well. Although the predicted risk of mortality of SAVR was moderate at 5.6% according to the Society of Thoracic Surgeons web-based calculator (<http://riskcalc.sts.org/stswebriskcalc/calculate>), TAVI instead of SAVR was performed by a senior cardiologist and a cardiovascular surgeon because of the advanced age, the risk of dissemination of cancer cells by immunosuppression due to extracorporeal circulation during SAVR and to avoid the possibilities that would delay PD because of the highly-invasive nature of SAVR.

The patient underwent TAVI through the right femoral artery in May 2020 (Fig. 2). A 23 mm SAPIEN 3 valve (Edwards Lifesciences Corp., Tokyo, Japan) was placed under rapid pacing (180 bpm). There were no perioperative complications. Echocardiography showed an improvement in an aortic valve area of 1.63 cm<sup>2</sup>, a mean aortic pressure gradient of 10 mmHg, and a maximum jet velocity of 2.5 m/s.

After TAVI, the patient was treated with dual antiplatelet therapy (DAPT) including aspirin and clopidogrel. Aspirin and clopidogrel were discontinued for 7 days and 14 days respectively, prior to the surgery and were replaced with unfractionated heparin for 7 days with target activated partial thromboplastin time of 1.5–2 times the control value. Subtotal stomach-preserving PD followed by invaginated

pancreaticogastrostomy, hepaticojejunostomy and ante colic gastrojejunostomy was performed by a senior general surgeon 34 days after TAVI. The operation time was 279 minutes and the estimated blood loss was 900 ml. Aspirin was resumed on postoperative day 3 and clopidogrel was resumed on postoperative day 7. There were no complications, including post-pancreatectomy hemorrhage, postoperative pancreatic fistula, delayed gastric emptying, or valve thrombosis after surgery. The pathological diagnosis was T3, N0, M0, tubular adenocarcinoma, pathological Stage IIA (Fig. 3). The patient was transferred to another hospital 45 days after surgery for rehabilitation for disuse muscle weakness. No recurrence and symptoms of heart failure were observed at more than 7 months without adjuvant therapy.

## 33. Discussion

The incidence of AS is increasing with the aging population [4]. Similarly, the number of patients with malignant tumors is also increasing. Although the exact prevalence of malignancy in patients with AS has not been reported, the most recent meta-analysis found that 368 (7.1%) of the 5162 patients who underwent TAVI in three studies had co-existing malignancy [9–12]. In AS patients with concomitant malignancy, the treating surgeons may have difficulty establishing therapeutic priorities. The European Society of Cardiology guidelines recommend preoperative AVR in cases of symptomatic severe AS, as in this case, or even asymptomatic severe AS undergoing non-cardiac surgery with high risk of perioperative cardiovascular complications [13].

Although SAVR had been established as the standard treatment for severe AS, however, due to its highly invasive nature and increased perioperative risk, SAVR is often avoided in patients with co-existing malignancy [5]. This led to frequent treatment dilemma if surgery for malignant tumors should be considered in these patients. In recent years, with the introduction of TAVI, which is less invasive than SAVR, the perspective of management has been shifting in these high-risk patients [6]. There are two major benefits of TAVI in cancer patients: by avoiding cardiopulmonary bypass (CPB), bleeding from the tumor along with tumor dissemination associated with immunosuppression can be prevented [14–17], and second, TAVI does not require sternotomy and CPB offering benefits of a minimally invasive procedure that allows for faster postoperative recovery and a shorter transition time for the treatment of malignant tumor. Complications after TAVI were reported to be no different between patients with and without cancer, demonstrating the safety of TAVI in cancer patients [9]. However, the mortality rate at 1 year after TAVI is significantly higher in cancer patients with Stage III-IV than in patients without cancer [10], and the indication should be carefully considered. In this case, although the perioperative risk of SAVR was moderate at 5.6% according to the Society of Thoracic Surgeons web-based calculator (<http://riskcalc.sts.org/stswebriskcalc/calculate>), considering the age and frailty (Clinical Frailty score 4/9)

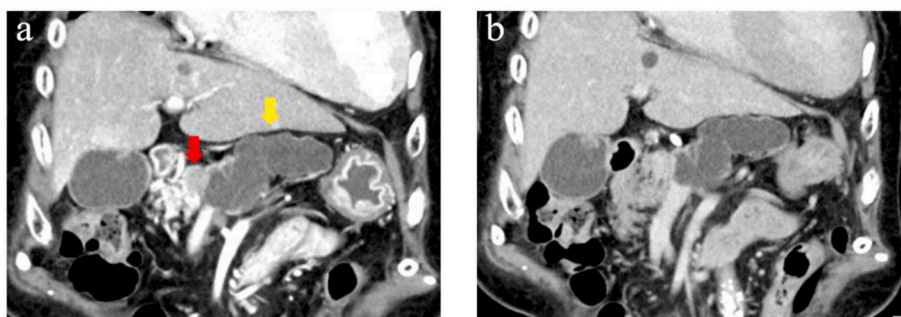
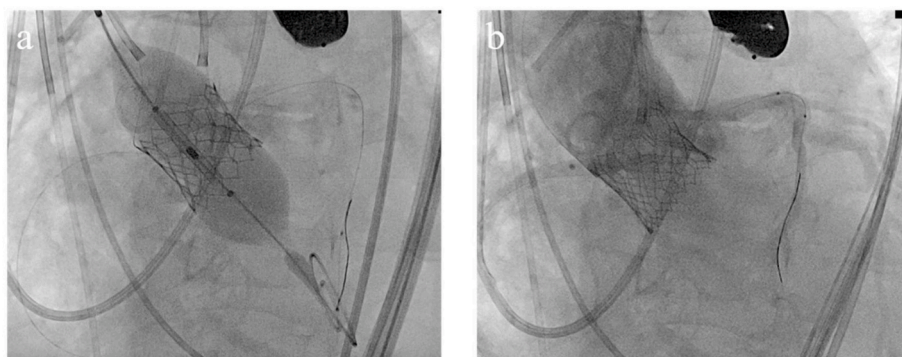
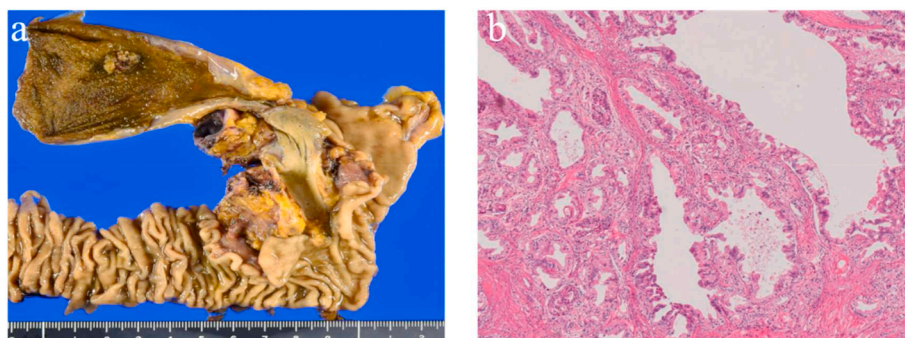


Fig. 1. Preoperative computed tomography findings. a Hypovascular mass (red arrow) compared to the pancreatic parenchyma in the early phase and main pancreatic duct dilatation (yellow arrow). b Mass shadow with a contrast-enhancing effect in the late phase. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)



**Fig. 2.** Fluoroscopy during transcatheter aortic valve implantation. **a** Implantation of a self-expanding 23-mm SAPIEN 3 valve. **b** Aortography after valve deployment.



**Fig. 3.** Pathological findings of the specimen. **a** Resected specimen showed a 30 × 15 mm white nodular lesion in the head of the pancreas. **b** Histological specimens showed an invasive adenocarcinoma.

of the patient and pancreatic head cancer that required surgical intervention (cStage IIA, resectable), we preceded with TAVI.

Since the patient had no pancreatic head cancer-related symptoms, she was treated with DAPT after TAVI and allowing a month gap before PD. There is no clear consensus suggesting the time between TAVI and non-cardiac surgery. Also, DAPT including aspirin and clopidogrel is recommended for 3–6 months as antithrombotic therapy after TAVI to prevent valve thrombosis [18]. In this case, there was about a month gap to PD with no risk of bleeding from the tumor, so DAPT was performed as recommended, and heparin replacement was also performed during the withdrawal period. However, a recent report showed no difference in the development of emboli after TAVI and a lower risk of bleeding with aspirin alone compared to DAPT [19]. Clopidogrel has a long withdrawal period of 14 days, antithrombotic therapy with aspirin alone may be useful in cases that require early surgical intervention after TAVI in cases where there is a risk of tumor progression or bleeding from the tumor, such as gastric or colon cancer.

PD is a complex surgical procedure with a high risk of cardiovascular complications, but by correcting severe AS before PD, the perioperative period could be managed safely without complications such as bleeding events, embolism and valve thrombosis, even with DAPT. To the best of our knowledge, this is the first case report of PD after TAVI in a patient with severe AS.

#### 4. Conclusion

Preceding TAVI in elderly patients with malignancy and severe AS may be a useful therapeutic strategy for earlier and safer surgical intervention for malignancy. However, the number of cases of non-cardiac surgery after TAVI is still few, and there is no clear consensus on perioperative antithrombotic therapy or time to non-cardiac surgery. Further high quality and larger cohort studies are required to get a better

insight in identifying a solid therapeutic strategy in operable cancer patients with severe AS.

#### Provenance and peer review

Not commissioned, externally peer reviewed.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request. Patient perspective: "I am glad that many doctors will learn from my case and I do not mind my name or my condition being addressed on the case study."

#### Ethical approval

N/a.

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#### Author contribution

Ryo Imada drafted the manuscript and provided the original pictures. Teruo Komokata revised the manuscript critically. All authors read and approved the final manuscript.

### Research registration (for case reports detailing a new surgical technique or new equipment/technology)

N/a.

### Guarantor

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### Declaration of competing interest

The authors declare no conflict of interest.

### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.amsu.2021.01.050>.

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