

CASE REPORT

Use of an $\bar{O}\bar{N}\bar{O}$ Retrieval Device for Removal of a Covered CP Stent

Chelsea E. Miller | D. Scott Lim | Michael J. Shorofsky

Pediatric Cardiology, University of Virginia, Charlottesville, Virginia, USA

Correspondence: Chelsea E. Miller (chelseamiller093@gmail.com)

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ABSTRACT

We report the use of the $\bar{O}\bar{N}\bar{O}$ retrieval system to remove a fully inflated 3.9 cm length by 24 mm diameter NuDEL CP Stent from the left pulmonary artery. There was no damage to any cardiac structures or venous anatomy following stent removal. To our knowledge, this is the first case of removal of a large caliber covered CP stent with the $\bar{O}\bar{N}\bar{O}$ system.

1 | Introduction

The $\bar{O}\bar{N}\bar{O}$ retrieval system received FDA clearance in early 2022 [1] and has been used for a variety of cases including removal of LAA occlusion devices, ASD devices, thrombus, and atrial tumor [2–4]. To our knowledge, this is the first case of removal of a large caliber covered CP stent with the $\bar{O}\bar{N}\bar{O}$ system.

2 | Case

A 27-year-old male with a history of Tetralogy of Fallot (TOF) that was repaired in his first year of life with a transannular patch was referred for transcatheter pulmonary valve replacement (TPVR) due to mixed pulmonary stenosis and free pulmonary regurgitation. Although he had a dilated main pulmonary artery and a dilated RV, there appeared to be a landing zone (23 mm $\times$ 16 mm) for a balloon-expandable valve at his native valve leaflets on CT scan. After a discussion with the patient, it was felt that pre-stenting his narrow target landing zone first and then placing a balloon-expandable pulmonary valve would be the best course of action.

After access was obtained a right heart catheterization was performed which showed favorable hemodynamics to proceed with TPVR. Wire position was obtained in a left lower lung segment with a Cook Lunderquist wire (Cook Medical LLC, Bloomington, IN). A 30 mm PTS Sizing Balloon (B. Braun

Interventional Systems Inc. Bethlehem, Pennsylvania) was then inflated at the landing zone and measured approximately 21 mm at its waist. A 26 Fr DrySeal sheath (W. L. Gore & Associates Inc., Flagstaff, AZ) was then placed and positioned in the IVC/RA junction. A 3.9 cm length by 24 mm diameter NuDEL CP Stent Delivery System was then advanced to the landing zone and the stent was deployed. However, during inflation the stent foreshortened and migrated distally, missing the landing zone. The stent was already fully inflated to 24 mm at the time of it embolizing. The stent migrated over the wire to the LPA which was extremely dilated.

A discussion was had and due to the patient's anatomy, it was felt that there was no good distal pulmonary artery position to leave the stent and that using the $\bar{O}\bar{N}\bar{O}$ to remove the stent would be the best next step.

The $\bar{O}\bar{N}\bar{O}$ system was placed in the DrySeal sheath and through the center of the $\bar{O}\bar{N}\bar{O}$ catheter a snare catheter and a 0.035" glide wire were placed. A loop was then made around the CP stent by snaring a wire that passed along the outside of the stent through the center of the stent via the snare. The wire was then pulled back out of the DrySeal creating a V-V loop around the CP stent and allowing the stent to be pulled to the $\bar{O}\bar{N}\bar{O}$ basket. The proximal part of the stent was then able to be pulled into the $\bar{O}\bar{N}\bar{O}$, however, one crown of the stent repeatedly got caught on the edge of the $\bar{O}\bar{N}\bar{O}$. Nonetheless, the V-V loop around the stent and the size of the basket of the $\bar{O}\bar{N}\bar{O}$ allowed

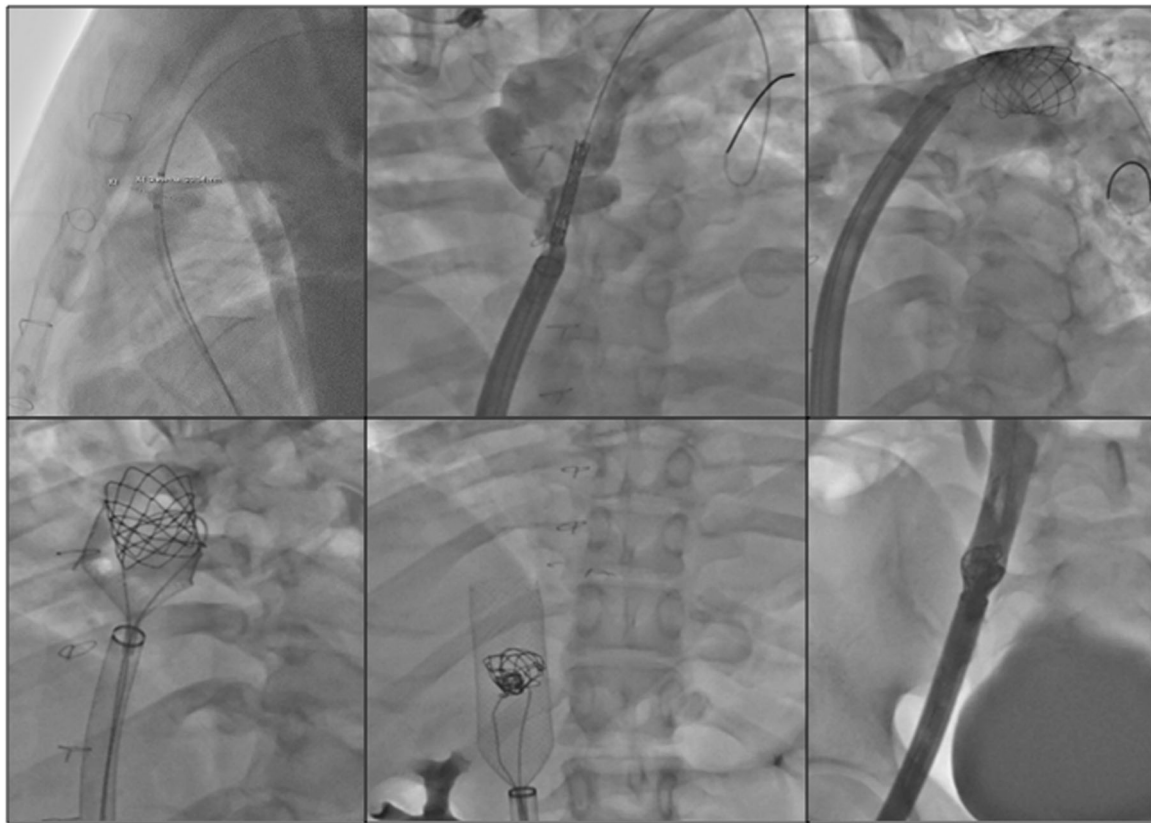


FIGURE 1 | Angiography showing attempted stenting of RVOT with stent embolization to the left pulmonary artery and subsequent retrieval using the $\bar{O}\bar{N}\bar{O}$ system. This was able to be retracted into the long sheath in the IVC.

for the stent to position itself sideways in the basket. Once the full stent was in the $\bar{O}\bar{N}\bar{O}$ basket the DrySeal was advanced over the $\bar{O}\bar{N}\bar{O}$ and the stent started to crumple and compress. Due to how the stent originally was positioned in the $\bar{O}\bar{N}\bar{O}$ and how it compressed we were initially unable to pull the stent and $\bar{O}\bar{N}\bar{O}$ into the DrySeal fully. However, the system was pulled through the heart to the IVC where the stent was further compressed but still unable to be pulled fully into the DrySeal. Finally, as the system reached the iliac vein the stent was able to be fully compressed and pulled into the DrySeal sheath. Angiography then confirmed no damage to the iliac or IVC and echo showed no damage to the heart structures. The patient was observed overnight and discharged the next morning. He was then screened for a self-expanding pulmonary valve and underwent an uncomplicated placement of a Harmony TPV 25 (Medtronic Minneapolis, MN) 3 months later.

3 | Discussion

The $\bar{O}\bar{N}\bar{O}$ retrieval system was successfully used to remove a large caliber covered CP stent. Since the system has a 35 mm diameter basket, it was able to easily capture the 24 mm diameter CP stent that had foreshortened to approximately 2 cm in length. This allowed for the stent to easily fit within the basket of the $\bar{O}\bar{N}\bar{O}$ in either direction, and in our case, sideways. The compressive forces applied via the $\bar{O}\bar{N}\bar{O}$ were able to crimp the stent down to a small enough size to safely remove the stent from the patient without causing any vascular or structural damage to the heart (Figure 1).

4 | Conclusion

The $\bar{O}\bar{N}\bar{O}$ retrieval system should be considered an option for stent retrieval when necessary.

Conflicts of Interest

The authors declare no conflicts of interest.

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