Clinical Case Reports International

Case Report
Published: 03 Aug, 2023

# The Metal *vs*. Calcium in Complex Atherosclerosis

*Furtula M[1]*, Ilić I[1,2], Miljković A[1], Đoković I[1], Stojčić M[1], Antonijević M[1] and Dobrić M[1,2]*

[1]*Institute for Cardiovascular Diseases "Dedinje", Heroja Milana Tepića 1, Serbia*

[2]*University of Belgrade Faculty of Medicine, Dr Subotića 8, Serbia*

## Abstract

Coronary stent dislodgement is an infrequent but serious complication during Percutaneous Coronary Intervention (PCI) that can lead to severe complications, including thrombosis, myocardial infarction, and sudden death. We present a complex case of a 72-year-old patient with significant left main disease who underwent PCI with stent placement. Unfortunately, the stent became entrapped in the Left Main artery (LM) during the extraction process, leading to longitudinal deformation and protrusion into the aorta. To optimize the chances of successful and safe stent extraction while minimizing complications, we employed multiple imaging techniques.

The initial attempt to extract the stent resulted in fracture, leaving a portion of the stent trapped within the coronary artery. Subsequent PCI procedures were performed to address the remaining stent, with successful snare extraction from the ascending aorta. Optical Coherence Tomography (OCT) confirmed the presence of a dissection in the proximal Left Anterior Descending artery (LAD) without a previously implanted stent. Further stenting using an "inverted T" technique was performed with favorable outcomes.

This case highlights the challenges of stent retrieval and emphasizes the importance of preoperative imaging assessment and meticulous lesion preparation to prevent complications. Moreover, the successful application of OCT and the use of snare devices in stent extraction demonstrate valuable tools in managing complex scenarios involving stent entrapment.

In conclusion, stent dislodgement during PCI remains a rare but potentially life-threatening complication, and careful consideration of patient-specific factors and imaging modalities is essential to optimize outcomes in such complex cases.

**Keywords: Coronary stent dislodgement; Percutaneous coronary intervention stent entrapment; Snare device; Optical Coherence Tomography (OCT)**

OPEN ACCESS

***Correspondence:***
*Matija Furtula, Institute for Cardiovascular Diseases "Dedinje", Heroja Milana Tepića 1, 11040 Belgrade, Serbia*

**Received Date**: *17 Jul 2023*
**Accepted Date:** *29 Jul 2023*
**Published Date:** *03 Aug 2023*

***Citation:***
*Furtula M, Ilić I, Miljković A, Đoković I, Stojčić M, Antonijević M, et al. The Metal vs. Calcium in Complex Atherosclerosis. Clin Case Rep Int. 2023; 7: 1582.*



## Introduction

Coronary stent dislodgement is a rare occurrence but can have serious implications, including thrombosis, myocardial infarction, disruption of systemic circulation, and coronary dissection, which can ultimately lead to sudden death [1]. The incidence of stent loss ranges widely from 0.32% to 8.3%, while the success rate of retrieval varies between 45% and 100%. Advances in stent technology, with enhanced flexibility and deliverability, combined with increased experience in stent utilization, have contributed to a decreased occurrence of stent loss [2].

Various types of equipment, including stents, guidewires, and catheters, can be inadvertently misplaced or trapped within or outside the coronary artery. Device entrapment poses a more severe complication than device loss. Retrieval of a dislodged stent can be achieved surgically or percutaneously, utilizing different devices and techniques such as a small balloon catheter, a snare loop, the two-wire technique, grasping forceps, or basket retrieval devices [3].

In the present case, we describe a complex scenario involving a patient with significant left main disease who underwent Percutaneous Coronary Intervention (PCI) with stent placement. Unfortunately, during the procedure, the stent became entrapped within the Left Main artery (LM), resulting in longitudinal deformation (elongation) and protrusion into the aorta all the way to brachiocephalic trunk during the stent extraction process. To optimize the chances of a successful and safe stent extraction while minimizing potential complications, a comprehensive assessment was conducted using multiple imaging techniques.

## Case Presentation

A 72-year-old patient with a history of myocardial infarction and a previous primary Percutaneous Coronary Intervention (PCI) on the Circumflex artery (Cx) in 2013 was admitted due to lower limb ischemia and significant carotid disease. The patient presented with rest leg pain and had a medical history of diabetes, managed with insulin, hypertension, dyslipidemia, and normal kidney function (estimated Glomerular Filtration Rate, eGFR). Considering the planned major vascular surgery and risk factors, the patient was referred for preoperative coronary angiography which revealed three-vessel disease with LM stenosis (Figure 1A-1C).

Due to the severe calcification of the aorta (Figure 2), surgical intervention was deemed unsuitable, leading to the recommendation of a staged procedure. The initial approach involved PCI of the LM, followed by vascular surgery, and concluding with PCI of the Right Coronary Artery (RCA).

The procedure was performed using right radial access and a 6F extra backup Guiding Catheter (GC). The chosen strategy employed provisional stenting towards the Left Anterior Descending artery (LAD). After a predilation with a Non-Compliant (NC) 2.5 mm × 15 mm balloon, a second-generation drug-eluting stent 3.5 mm × 18 mm was implanted from the LM towards the LAD (Figure 3A). To optimize the proximal area, a NC 4.0 mm × 6 mm balloon was employed, followed by a "kissing" inflation technique involving a NC 3.5 mm × 15 mm balloon in the LAD and a NC 2.5 mm × 15 mm balloon in the Circumflex artery (Cx). (Figure 3B).

After obtaining an unsatisfactory result in Cx (Figure 3C), we attempted to implant a DES 3.0 mm × 18 mm, but encountered difficulties in crossing it to Cx. Unfortunately, the stent became dislodged from the balloon and got trapped in the LM while the distal third of the stent was in the guiding catheter. To address this issue, we confined the dislodged stent by using a 2.5 mm × 15 mm balloon at the tip of GC, and then removed the entire system along with the wires (Figure 4). During the removal of the system, the stent fracture occurred, so we were able to extract only a small part of the stent that was inside the catheter trapped by the balloon, while with full body fluoroscopy we were unable to find the larger part of the stent. The patient remained stable without any signs or symptoms of embolization, which led us to make the decision to proceed with the PCI procedure. We performed rewiring and modified our approach to a "culotte" stenting technique. Following pre-dilatation with an NC 2.5 mm × 15 mm balloon, we successfully implanted a DES 3.0 mm × 16 mm from the LM to Cx (Figure 5). Although we encountered difficulties in advancing the wire towards LAD, we managed to overcome the issue by using a hydrophilic wire. Subsequently, we performed angioplasty using an NC 3.0 mm × 15 mm balloon, followed by post-dilatation using an NC 4.0 mm × 8 mm balloon (Figure 6A, 6B).

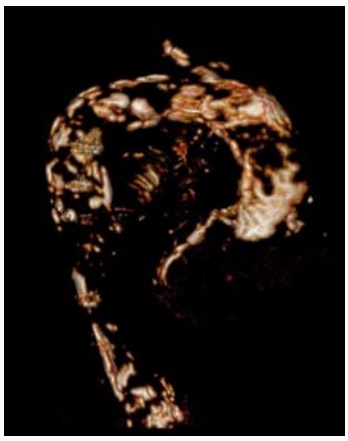

**Figure 2:** Severely calcified aorta.

Two days after the initial procedure on routine echocardiography, a hyperechogenic formation was observed in the aorta. A CT scan revealed a linear formation (possibly metal or calcium) extending from the Left Main (LM) in the ascending aorta towards the brachiocephalic trunk, without any signs of dissection (Figure 7). It was concluded that this could be the larger fragment of an un-implanted stent, and a decision was made to extract it percutaneously.

Dual access was obtained from the left radial and right brachial artery to place a 6F GC in the LM and wire the LAD and Cx arteries to prevent abrupt vessel closure. Optical Coherence Tomography (OCT) revealed a dissection at the proximal LAD without a previously implanted stent and only one stent layer in the LM, confirming that the initially implanted stent from the LM to the LAD was pulled out by the entrapped stent (Figure 8A, 8B).

Using snare device distorted stent was caught in ascending aorta and brought to the right brachial artery (Figure 9), this maneuver completely extracted all previously implanted stents from left coronary artery. The stent from LCx ended in right carotid artery and were further extracted using snare from left radial artery after

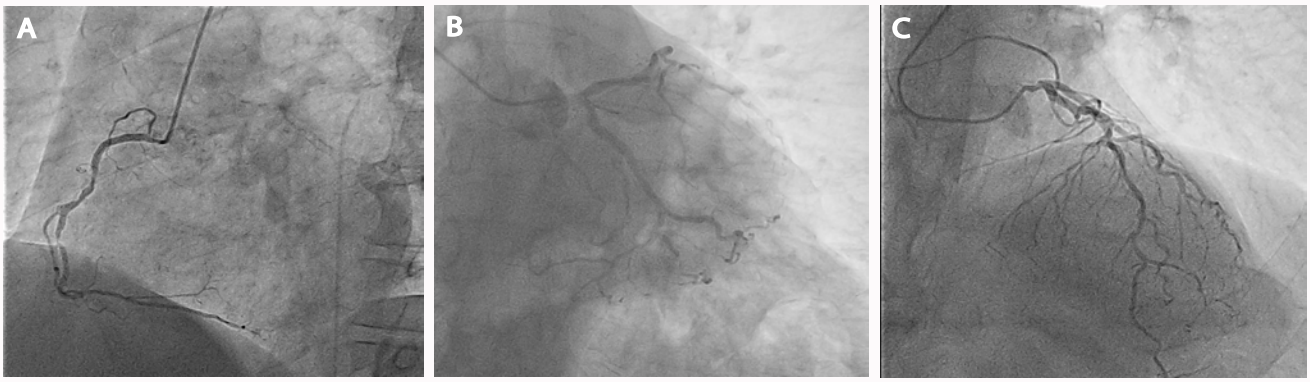


**Figure 1:** A) Baseline coronary angiography RCA: LAO view. B) PA caudal view showing a 70% stenosis in the LCX. C) PA cranial view showing a 70% left main stenosis and 70% middle LAD stenosis.

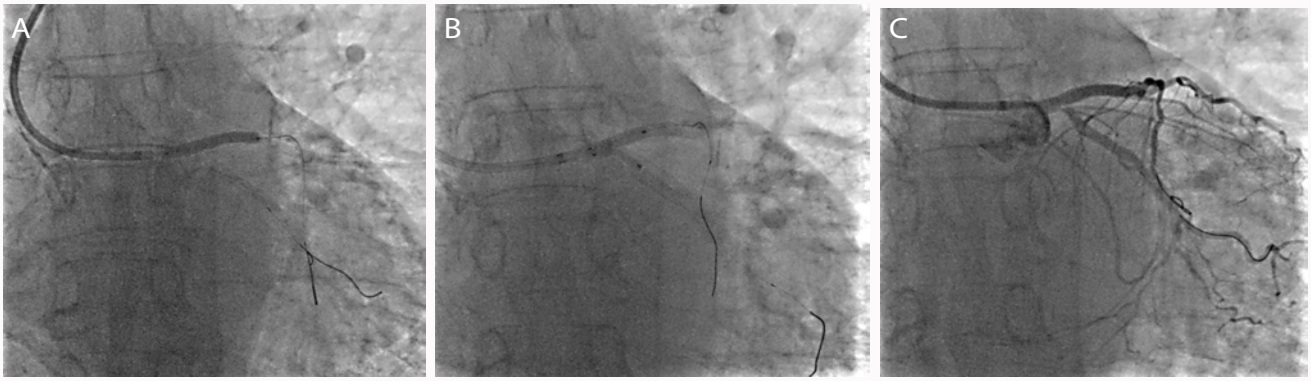


**Figure 3: A:** Provisional stenting from LM towards LAD. **B:** Kissing inflation with NC 3.5 and NC 2.5 mm. **C:** Severely compromised ostium of circumflex artery.

**Figure 4:** Withdrawing the entire system with jailed stent at the tip of GC.

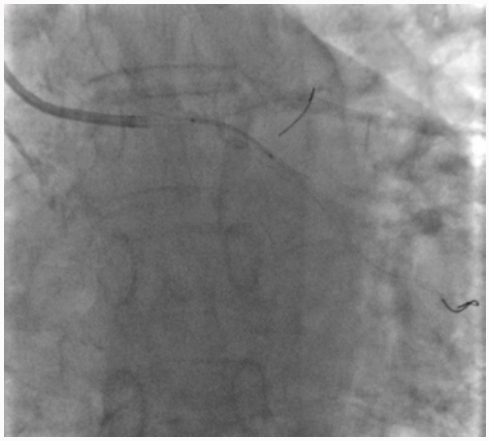

**Figure 5:** Implantation DES 3.0x16mm from LM to LCx.

repeated PCI (Figure 10, 11). The "inverted T" stenting was employed with 3.5 mm × 12 mm stent implanted in Cx, followed by 3.5 mm × 28 mm stent from LM to LAD. POT was done using 4.5 mm × 8 mm NC balloon and after rewiring and angioplasty of Cx ostium with NC 3.0 mm × 12 mm, "kissing" inflation was done with 3.5 mm × 12 mm NC balloons in both arteries. The final result was good, (Figure 12) and patient was discharged three days after the procedure.

## Discussion

The dislodgement of a stent can occur due to various factors, such as extreme coronary angulation, highly calcified coronary arteries, inadequate coronary artery predilation, and direct stenting [3]. Despite the limited number of reports in the literature on the simultaneous removal of a dislodged stent and a previously implanted stent using a snare device, the extraction procedures predominantly targeted stents that were either recently deployed or in the process of being deployed. Conventional balloon expansion tightly secures coronary stents to the vessel wall, making unintentional removal very uncommon [4,5,7-9]. Dislodgement from the delivery system typically happens when the stent-balloon assembly is pulled back into the Guiding Catheter (GC) or when it cannot reach the target lesion due to complex anatomy [6]. Percutaneous stent retrieval can be successfully achieved using various techniques, including the small-balloon technique, double-wire technique, or loop snare [2]. The snare technique has demonstrated its effectiveness for this purpose, although its successful implementation relies on technical proficiency and is influenced by factors such as the size, flexibility, rigidity, and compressibility of the stent [10]. In our particular scenario, we encountered a situation where the stent became entrapped while attempting to navigate through the layer of the previously inserted stent. Now, the pivotal question arises: What measures could we have taken to prevent such an occurrence? We should have initially used imaging techniques to assess the amount of calcium and the true diameters of the Left Main (LM) and its branches. Although we obtained optimal angiographic results by using a 2.5 mm balloon at 12 atm (2.7 mm) and implanting a stent measuring 3.5 mm × 18 mm from LM to the LAD artery, we should have also utilized Intravascular Ultrasound (IVUS) to evaluate stent expansion in the LM, specifically checking for under-deployment or possible strut intraluminal protrusion. When dealing with vessels adjacent to previously stented arteries, operators must exercise utmost caution. In the event of stent advancement difficulties, this issue should raise a red flag, indicating the need to address the problem promptly. Under such circumstances, it is advisable to consider under-expanding the previously implanted stent and, if possible, performing additional balloon dilation. Furthermore, maintaining proper coaxial alignment of the guiding catheter plays a vital role in successfully retrieving a stent that cannot be crossed [5]. Stent extraction carries risks of the stent struts catching onto the endothelial layer, leading to tearing or disruption. Endothelial tearing can result in various adverse outcomes, including acute thrombosis, vessel dissection, or even perforation. Ragosta et al. meticulously documented complications in a comprehensive analysis of seventeen cases involving stent extraction. Among these cases, a total of seven reported complications, with three instances

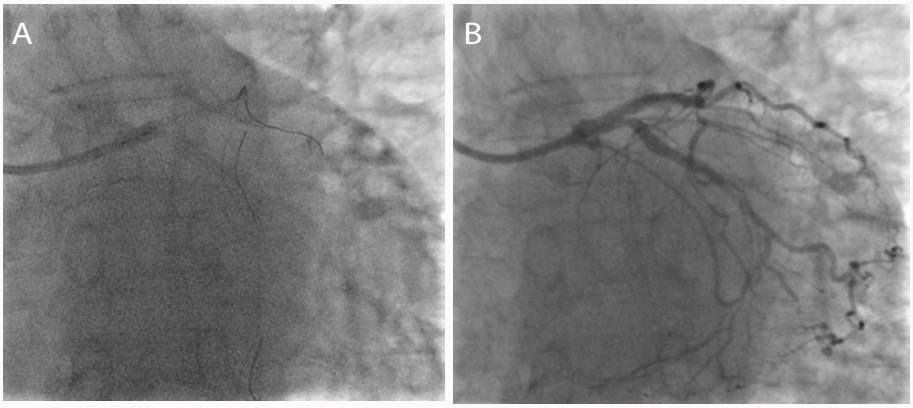


**Figure 6: A:** POT with NC 4.0 mm × 8 mm. **B:** Final result.

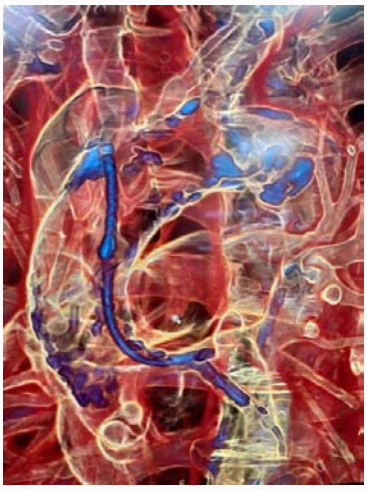

**Figure 7:** Linear formation extending from LM in the ascending aorta towards brachiocephalic trunk (CT scan).

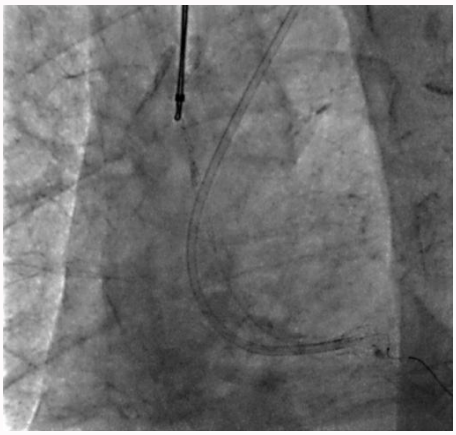

**Figure 9:** Capture of the distorted stent in the ascending aorta with the snare device.

resulting in acute vessel closure and an additional four cases resulting in vessel dissection [11]. To minimize the risk of endothelial tearing during stent extraction, several precautions should be taken. Firstly, a thorough evaluation of the stent's positioning and adherence to the vessel wall should be performed prior to the extraction attempt. This evaluation helps determine the optimal technique and tools required for safe removal. The application of OCT in the extraction of a previously implanted stent provides physicians with detailed information about the stent, the condition of the surrounding tissue, and any potential complications. This allows for precise planning and execution of the extraction procedure, reducing the risk of complications and improving outcomes for the patient. In our case, OCT demonstrated dissection in the LAD prior to stent extraction, but there was no sign of thrombosis or impaired flow. To prevent or quickly resolve unwanted abrupt vessel closure that can occur after endothelial injury, it is important not to lose the position of the distal wire.

## Conclusion

The extraction of previously implanted stents represents a rare

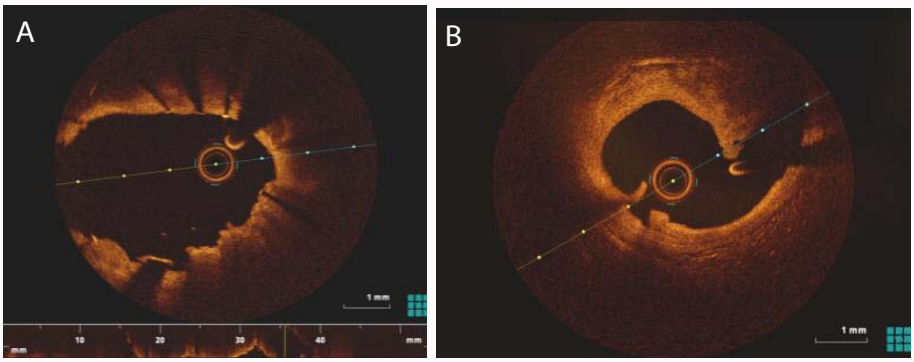


**Figure 8:** A) One stent layer in LM B) Dissection at the proximal LAD without previously implanted stent.

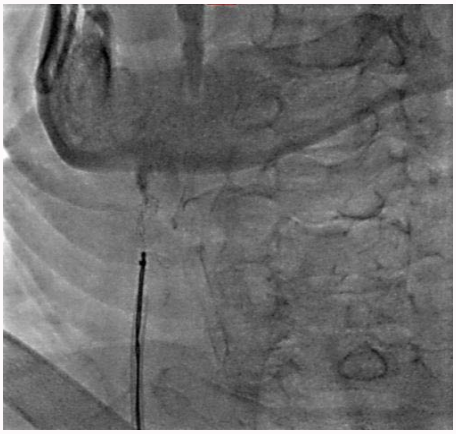

**Figure 10:** Capture of the distorted stent from LCx in right coronary artery with the snare device.

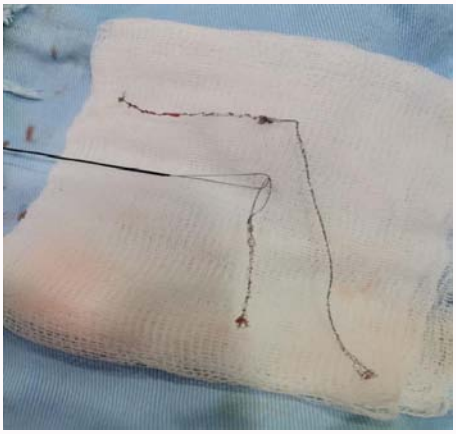

**Figure 11:** All previously implanted stents extracted from body, stent from the LCx caught with snare device in the right carotid artery.

complication in Percutaneous Coronary Intervention (PCI). To mitigate the risk of such events, a crucial preoperative strategy entails meticulous lesion preparation. In our specific case, we showcased the successful implementation of intricate bailout procedures, such as snare extraction of intravascular objects. Nevertheless, it is of paramount importance to exercise extreme caution when executing these procedures in proximity to, or within, previously implanted stents.

## References


1. Khashan A, Talib S, Hamouda M, Kovacs J, Ibrar A, Saini G, et al. Coronary artery stent dislodgement and loss in the bloodstream: A case report and management options. Am J Case Rep. 2022;23:e937598.


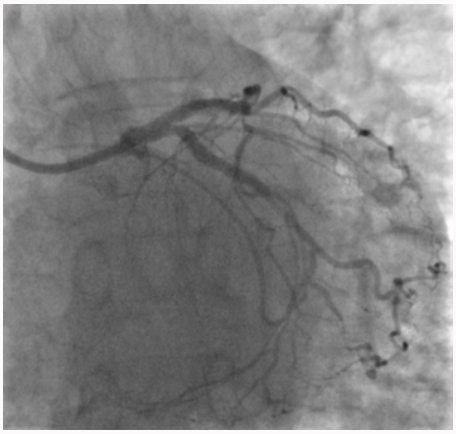

**Figure 12:** Final result after repeated PCI.


2. Brilakis ES, Best PJ, Elesber AA, Barsness GW, Lennon RJ, Holmes DR Jr, et al. Incidence, retrieval methods, and outcomes of stent loss during percutaneous coronary intervention: A large single-center experience. Catheter Cardiovasc Interv. 2005;66(3):333-40.
3. Jang JH, Woo SI, Yang DH, Park SD, Kim DH, Shin SH. Successful coronary stent retrieval from the ascending aorta using a gooseneck snare kit. Korean J Intern Med. 2013;28(4):481-5.
4. Kim JW, Kim W. Unintentional extraction of a coronary stent deployed two months prior during a dislodged left main stent retrieval. Int J Cardiol. 2012;156(2):e45-8.
5. Cheema JK, Shroff AR, Vidovich MI. Unintentional extraction of an endothelializes bare metal stent. Cardiovasc Revasc Med. 2013;14(3):187-90.
6. Holmes Jr DR, Garratt KN, Popma J. Stent complications. J Invasive Cardiol. 1998;10:385-95.
7. Hwang J, Chun K, Lee DS, Lee SY, Chon MK, Lee SH, et al. Extraction of a fully deployed coronary stent during retrieval of another dislodged stent. Korean Circ J. 2016;46(6):862-5.
8. Mukhopadhyay S, Vyas A, Yusuf J. Accidental retrieval of a fully deployed stent: A case report. Catheter Cardiovasc Interv. 2015;86(3):E153-7.
9. Gan HW, Bhasin A, Wu CJ. Complete stent dislodgement after successful implantation- A rare case. Catheter Cardiovasc Interv. 2010;75(6):967-70.
10. Koseoglu K, Parildar M, Oran I, Memis A. Retrieval of intravascular foreign bodies with goose neck snare. Eur J Radiol. 2004;49:281-5.
11. Ragosta M, Boehm R, Shields M, Taylor AM. Intentional removal of erroneously deployed coronary stents: A case series and review of the literature. Catheter Cardiovasc Interv. 2021;97(4):670-74.