

CASE REPORT

Successful Retrieval of a Stalled Rotational Atherectomy Burr.

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Abstract

Background: Rotational atherectomy (Rotablation, RA) is a well-established and time-tested technique to treat calcified coronary arteries through plaque modification. This can be achieved by using Rota burrs of different sizes revolving at speeds in excess of 150,000 revolutions per minute (rpm). A stalled burr is perhaps the most feared complication of this technique.

Case Presentation: We present the case of a 63-year old patient who presented with unstable angina. His right coronary artery was severely calcified with two severe discrete stenosis in the proximal and distal vessel respectively. The left coronary vessels were unobstructed.

Management and Results: We elected to perform up-front RA using a 1.25 mm burr at 180,000 rpm. However, after the first pass across the proximal lesion, the burr came to an abrupt halt. Initially, the burr was pulled manually which proved futile. We then cut the burr shaft and rota wire simultaneously near the advancer hub and stripped off the outer plastic coating. Subsequently, another wire was introduced into the same guide catheter and a 2.0 x 15 mm balloon was inflated across the stalled burr which was successfully released and retrieved. The case was successfully completed with the implantation of two drug eluting stents.

Conclusion: We have described a case report of a stalled burr which was retrieved through the same guide catheter by cutting through and stripping off the outer coating of a burr shaft. To the best of our knowledge, we believe this to be the first described case report from Pakistan describing this novel technique to successfully retrieve a stalled burr percutaneously.

Keywords

Percutaneous Coronary Intervention, Rotational Atherectomy, Drug Eluting Stent, Stalled Burr, Calcified Lesion.

Introduction

Rotational atherectomy (Rotablation, RA) is a time-tested and well-established technique to treat calcified coronary arteries through plaque modification¹. The principle involves using diamond-crested olive-shaped burrs of different sizes that can be introduced into calcified coronary vessels on a dedicated rota wire. These burrs can revolve at speeds in excess of 150,000 revolutions per minute (rpm) and modify the calcified plaque. Despite refinement in the technique and introduction of a new iteration of the RotaPro console, there is a 0.7% risk of burr entrapment (stalled burr) while performing this procedure².

We describe a case where we had the complication of a stalled burr while using RA to treat a calcified coronary vessel. We employed a novel method to successfully retrieve the burr percutaneously and complete the case. To the best of our knowledge, we believe this to be the first case in Pakistan describing this method.

Case Presentation

A 63-year old gentleman presented with unstable angina to our institute. His past medical history included a 40-pack year history of smoking, hypertension and dyslipidaemia. He was not compliant with his medicines. His physical examination was unremarkable.

Diagnostic Assessment

His electrocardiogram demonstrated T-wave inversion in inferior leads. His blood tests were unremarkable and his troponin levels were not raised. An echocardiogram revealed normal left ventricular systolic function with normal valves.

A trans-radial coronary angiogram showed a severely calcified right coronary artery (RCA) with two discrete severe stenoses separately in the proximal and distal vessel (Figure 1). His left coronary vessels were unobstructed.

Therapeutic Intervention

We decided to treat his RCA with up-front RA using a 1.25 mm burr at 180,000 rpm. As the patient had

developed severe radial spasm making catheter manipulation ineffective, we decided to do the percutaneous coronary intervention trans-femorally. A 7 Fr sheath was inserted into the right femoral artery and a 7 Fr JR4 guide catheter (Cordis, Miami Lakes, FL) was used to engage the RCA. Subsequently, a Sion Blue (Asahi Intecc, Japan) wire was successfully advanced into the distal vessel using Finecross microcatheter (Terumo Medical Corp, NJ) support. After this the Sion Blue wire was removed and a RA floppy wire (Boston Scientific, Natick, MA) was introduced into the microcatheter and advanced into the distal RCA. Following this, the microcatheter was withdrawn under fluoroscopic guidance ensuring optimal RA floppy wire position. We then advanced a 1.25 mm RA burr (Boston Scientific, Natick, MA) on the RA floppy wire into the guide catheter up to the proximal RCA under fluoroscopic guidance. Once we were satisfied with the position of our burr, we commenced RA using the 1.25 mm burr at 180,000 rpm. The burr was advanced using a pecking motion however, during its first pass across the proximal lesion and return back to the proximal RCA, the burr came to an abrupt halt still embedded in the proximal lesion (Figure 2). We tried to manually pull the burr in an attempt to dislodge it which proved futile. Therefore, we immediately decided to cut across the RA burr sheath very close to the advancer hub including the RA floppy wire (Figure 3). This was followed quickly by the stripping off of the outer plastic coating of the RA burr which came off easily. Following this the Sion Blue wire was reintroduced into the same guide catheter and advanced into the distal RCA across the stalled burr and the two untreated coronary stenoses (Figure 4). Subsequently, a 2.0 x 15 mm Ryujin Plus (Terumo Medical Corp, NJ) balloon was advanced onto the Sion Blue wire and positioned across the stalled RA burr. Once in place it was inflated to 16 atm and deflated (Figure 5). Thereafter, the RA burr was successfully dislodged and retrieved along with the RA floppy wire (Figure 6). The diseased RCA segment was then predilated with 2.0 x 15 and 2.5 x 15 NC balloons at 18 and 20 atm respectively. Following this, the distal RCA was stented with a 2.5 x 40 mm Orsiro drug eluting stent (DES) at 13 atm using a 6 Fr Guidezilla (Boston

Scientific, Natick, MA) support which was proximally overlapped with a 2.75 x 40 mm Orsiro DES deployed at 16 atm (Figure 7). Finally, the proximal and distal stents were post dilated with 2.75 x 15 mm and 3.0 mm NC balloons at 20 atm (Figure 8).

Follow-up and Outcome

The patient made an uneventful recovery and was discharged the next day. Subsequently, he was reviewed in clinic and remains angina-free and compliant with his medicines.

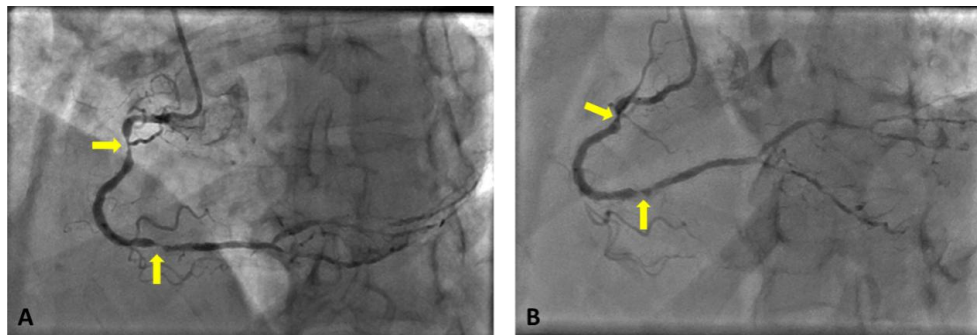


Figure 1 a & b: LAO and RAO views of the right coronary artery depicting severe calcification with two discrete lesions in the proximal and distal segments (arrows).

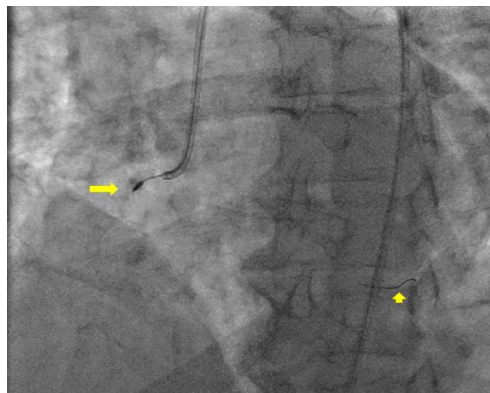


Figure 2: A stalled 1.25 mm burr is seen in the proximal RCA (arrow). Radio-opaque tip of the Rota floppy wire can be visualized in the distal vessel (arrow head).



Figure 3: The drive shaft sheath side of the rotablator advancer (arrow) from where the rota burr shaft emerges is seen. Notably, the Rota burr shaft has been cut through to remove the outer plastic coating (arrow head).

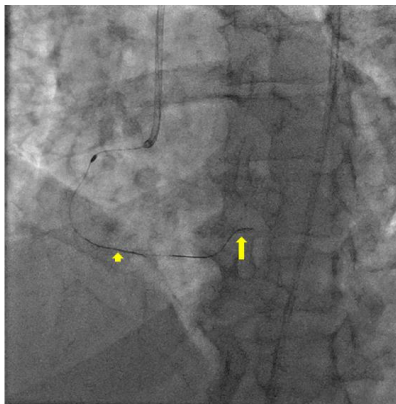


Figure 4: By removing the outer plastic coating of the rota burr, enough space has been created within the guide catheter to introduce a sion blue wire alongside the rota burr into the distal RCA (arrow). The rota floppy wire can also be seen (arrow head).

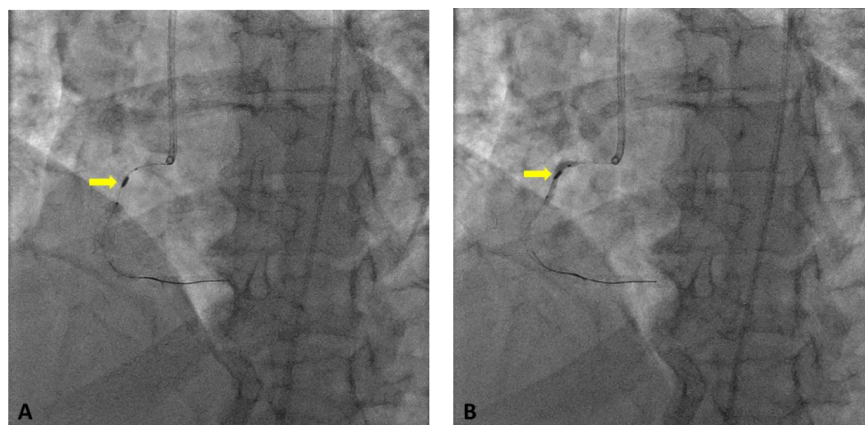


Figure 5: An un-inflated semi-compliant 2.0 x 15 mm balloon is seen advanced into the RCA and positioned adjacent to the stalled burr (A, arrow) and inflated at 16 atm (B, arrow).

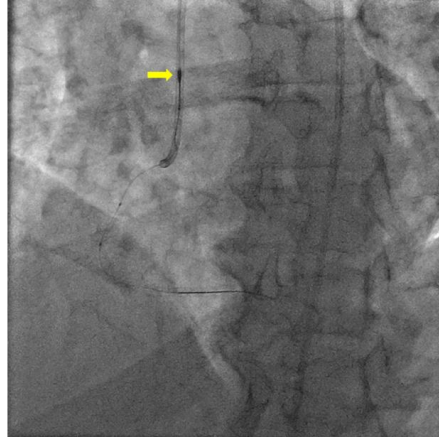


Figure 6: Once the 2.0 x 15 mm semi-complaint balloon is deflated, the stalled rota burr is successfully dislodged and retracted back into the guide catheter (arrow).

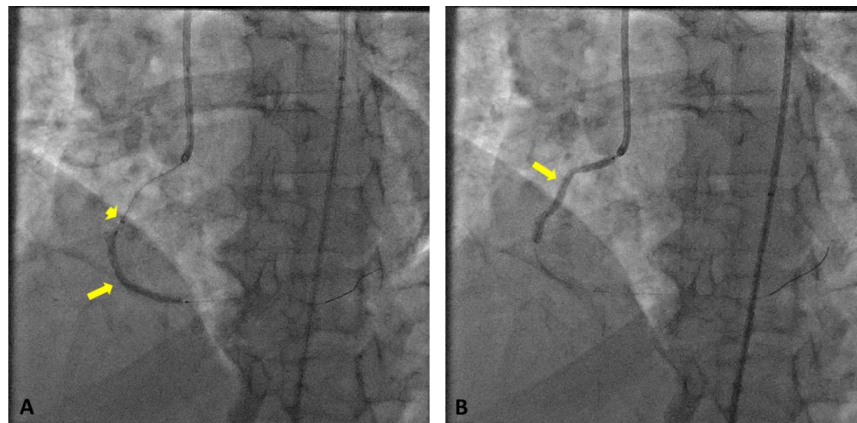


Figure 7: A 2.5 x 40 mm Orsiro drug eluting stent is deployed at 13 atm in the mid RCA (A, arrow). A guidewire extension is also visualized (arrowhead). Another overlapping 2.75 x 40 mm Orsiro DES is deployed at 13 atm (B, arrow).

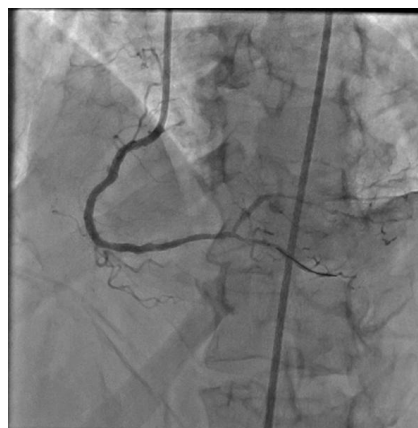


Figure 8: Final result after post-dilatation.

Discussion

A stalled burr is a serious and potentially catastrophic complication of rotational atherectomy and can be encountered in around 0.7% of cases². The options to retrieve a stalled burr include alternate vascular access with another guide catheter, advancing a guide catheter extension onto the RA burr, deep intubation of the guide catheter and then pulling on the RA burr shaft, cutting through the RA burr shaft and stripping off the plastic coating followed by parallel wiring through the same guide catheter and lastly, surgical retraction. There are no case series and most of the options recommended are based on individual and anecdotal experience.

Various steps can be taken to prevent burr entrapment which include slow and gentle pecking motion with gradual advancement of the burr across the lesion, limiting each RA run to less than 15 seconds, avoidance of pushing the RA burr too aggressively, being alert so that the RPM do not decrease beyond 10% as well as the continuous running of the cocktail flush which includes heparin, verapamil and nitroglycerin to prevent vessel spasm thereby increasing the risk of burr entrapment.

Once a burr is stalled, there are mainly four techniques with subtle variations that can be utilized to retrieve the burr percutaneously. Firstly, the operator can obtain an alternate vascular access and introduce another guide catheter³. By positioning it close to the coronary ostium, another guide wire is then introduced into the coronary vessel and advanced across the stuck burr. Subsequently, an appropriately-sized balloon is advanced and positioned across the RA burr and inflated thereby potentially, dislodging the entrapped burr. However, in our opinion this technique is time-consuming and not without additional risks as all such patients are anticoagulated with heparin and may have had additional glycoprotein IIb/IIIa inhibition on board. To subject such patients to an additional vascular puncture and access increases the risk of vascular complications.

Another technique described in the literature is to cut the RA burr shaft including the RA wire close to the advancer hub and then advancing a guide catheter extension over the remaining section of the RA burr inside the guide catheter⁴. Following this, the guide catheter extension is deeply engaged into the coronary vessel as close to the burr as possible and by applying counter traction the stalled burr is pulled while the guide catheter extension is pushed deeper in an attempt to release the burr. If successful, the burr is pulled back however, there are two potential problems with this technique. The RA wire may come back with the burr and if complicated by a dissection either due to the deep engagement of guide catheter extension or sudden dislodgement of the burr, can lead to abrupt vessel closure. One practical point to keep in mind is that different RA burr sizes may have compatibility issue with different Fr-sized guide catheter extensions and any operator would do well to bear this in mind. For example, most 7 Fr guide catheter extensions will be able to accommodate up to 1.5 mm-sized RA burrs but the only 6 Fr guide catheter extension able to accommodate a 1.25 mm RA burr is a Guidezilla (Boston Scientific, Natick, MA)⁵. In one case, using a goose snare in combination with a guide catheter extension has also been described to dislodge a stalled burr⁶.

A third technique includes deep intubation of the guide catheter into the coronary artery close to the stuck burr. Subsequently, the guide catheter is gently pushed deeper into the vessel while the burr is pulled and hence retrieved successfully⁷. In our opinion this technique must not be used especially if a RA burr stalls in the left coronary system as deeply engaging a guide catheter can dissect the left main stem and lead to further catastrophe downstream⁷. Secondly, while deep intubation of a guide catheter may be possible for a RCA, it might not be technically feasible for a stalled RA burr in a left circumflex artery for example.

Finally, a stalled RA burr can be successfully retrieved using the technique that we have described above⁷. In short, once a RA burr is stuck, the burr shaft should be cut including the RA wire

as close to the advancer sheath as possible. Subsequently, the outer plastic coating of the RA burr can be easily peeled off to create more space within the guide catheter to improve manoeuvrability. Then another work horse wire can be introduced into the same guide catheter and advanced into the coronary vessel across the stalled RA burr as distal as possible. After this an appropriately-sized balloon can be introduced on the work horse wire and positioned across the stuck burr where it can be inflated to 12-16 atm. Once the balloon is deflated, the stalled RA burr can usually be dislodged and retrieved along with the RA wire. If this manoeuvre is not successful on the first attempt, the balloon can be inflated a few more times or even changed to a bigger size balloon to try and disrupt the architectural plane of the plaque within which the burr is entrapped to try and dislodge it. This technique is quick and easy to perform. It avoids any additional vascular access thus steering clear of any potential vascular complications on an anti-coagulated patient. Secondly, and perhaps most importantly, with a work horse wire in position, even if the RA wire is also retrieved with a stuck RA burr, which happens often, access to the coronary vessel is maintained especially in the scenario of a dissection which requires prompt stenting.

Conclusion

Stalled burrs present a serious complication of RA. This is not an infrequent complication and all interventional cardiologists performing RA routinely must be aware of the options available for a successful retrieval of a stalled RA burr percutaneously. To the best of our knowledge, we have described Pakistan's first reported case where a stalled RA burr was successfully retrieved percutaneously from a single guide catheter by cutting the RA burr shaft, peeling off the plastic coating of the burr shaft, introducing another workhorse wire with a balloon across the stuck burr into the RCA and releasing the RA burr after the balloon was inflated.

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