JACC: CASE REPORTS VOL. 1, NO. 2, 2019

EDITORIAL COMMENT

Catheter-Induced Coronary Dissection

Keep Calm and Don't Inject*

Scott A. Harding, MB ChB, Sarah L. Fairley, MB BChBAO, PhD

Catheter-induced dissection is an infrequent, but potentially severe complication that may occur during diagnostic coronary angiography or percutaneous coronary intervention. Whereas minor degrees of dissection are usually straightforward to treat, management of more complex dissections are often challenging. Immediate stenting is usually the preferred treatment in most cases. This includes coronary dissections with retrograde involvement of the aorta as long as the aortic dissection is not extensive (1). It is essential to have a clear algorithm for treating this complication should it occur (**Figure 1**). In this issue of *JACC: Case Reports,* Hashmani et al. (2) provide valuable insights into the management of catheter-induced coronary artery dissection and highlight the usefulness of intravascular ultrasound (IVUS) in managing this complication.

SEE PAGE 108

One of the most important aspects of management of significant dissection once recognized is to avoid any further antegrade injections. Antegrade injections of any form will pressurize the artery causing hydraulic dissection into the distal vessel and may also extend the dissection retrogradely into the aorta. Depending on the severity of the dissection and the territory of myocardium supplied by the affected vessel, hemodynamic support may be required. It is important to choose a guide catheter that avoids deep coronary engagement and reduces bias toward the false lumen. Short-tip Judkins right- or left-guide catheters are often good choices in this circumstance. A nonhydrophilic workhorse guidewire with a low tip load should be chosen to attempt wiring of the true lumen as this will provide more tactile feedback reducing the chance of extending the dissection with the guidewire.

The presence of resistance to guidewire progress, particularly if the dissected artery does not have atheromatous disease, or formation of a sigmoid or knuckle shape by the guidewire suggests the guidewire is in the false lumen or subintimal space. Conversely, if the wire passes distally without resistance and is able to enter multiple side branches, this suggests the wire is in the true lumen. However, in extensive dissections or if there is pre-existing atheroma, it may be very difficult to know whether the wire is in the true or false lumen.

As highlighted by Hashmani et al. (2), IVUS is extremely valuable in managing coronary dissections. IVUS is able to confirm the dissection entry point and confirm whether the guidewire is in the true or false lumen. If the guidewire is in the false lumen, then the IVUS can be left in place on the original wire and parallel wiring performed. This has the benefit of providing greater stability if the guide is disengaged to allow wiring of ostial dissection and also allows real-time IVUS guidance to confirm the second wire is in the true lumen. Once the true lumen wiring has been achieved, then IVUS can be used to assess the length of dissection, stent sizing, and optimization following stent placement. It is important to appreciate that stent placement can compress and propagate the intramural hematoma. Therefore, it is important to have an adequate stent margin, usually at least 5 mm, when planning stent length.

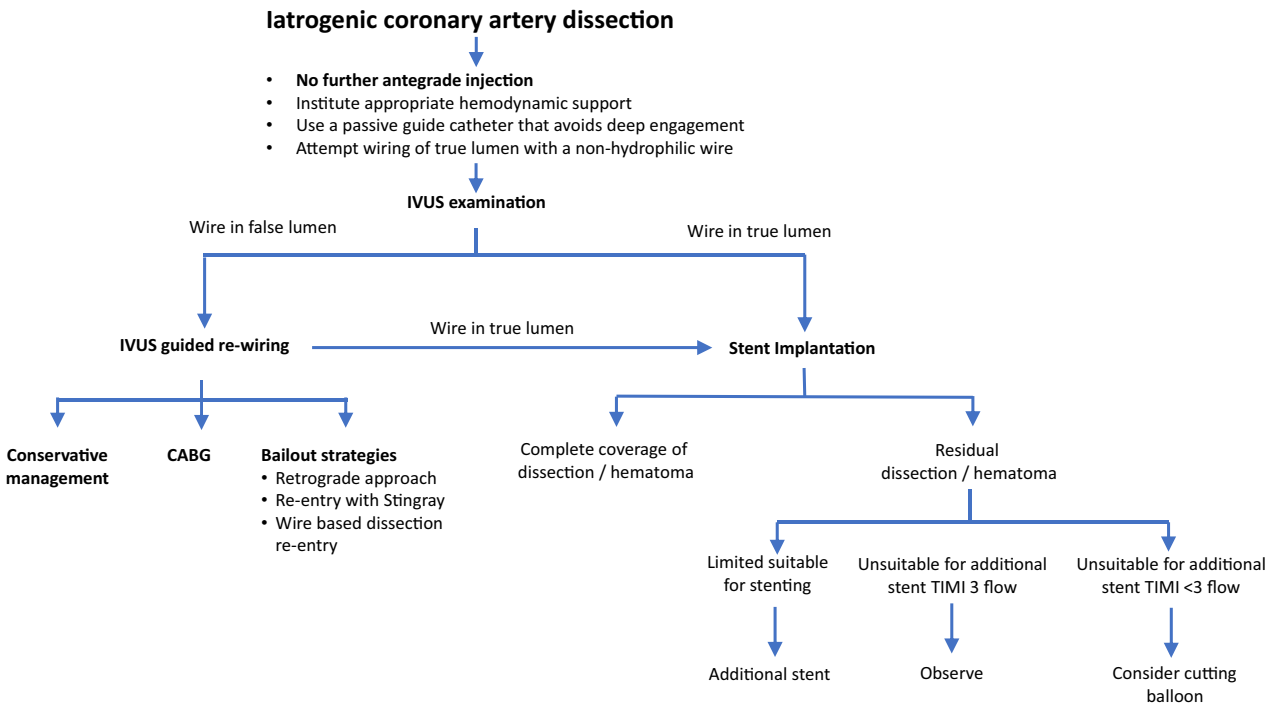
Optical coherence tomography is recommended by Hashmani et al. (2) as an alternative to IVUS to image the extent of the dissection and confirm wire placement. However, use of optical coherence tomography

*Editorials published in *JACC: Case Reports* reflect the views of the authors and do not necessarily represent the views of *JACC: Case Reports* or the American College of Cardiology.

From the Department of Cardiology, Wellington Hospital, Wellington, New Zealand. Prof. Harding has received honorarium for speaking and proctoring for Boston Scientific. Dr. Fairley has reported that she has no relationships relevant to the contents of this paper to disclose.

ISSN 2666-0849 https://doi.org/10.1016/j.jaccas.2019.07.002

FIGURE 1 Algorithm for Management of Catheter-Induced Coronary Artery Dissection



The flow chart presents an algorithm for managing catheter-induced coronary artery dissection. CABG = coronary artery bypass graft; IVUS = intravascular ultrasound; TIMI = Thrombolysis In Myocardial Infarction.

should generally be avoided in cases of catheter-induced dissection as this modality requires forceful antegrade injection to clear blood to allow imaging that may lead to dissection extension. Alternate techniques such as distal tip injection through an over-the-wire balloon or a dual lumen microcatheter has been advocated for confirming whether the guidewire is in the true lumen. Although these techniques are better than antegrade injection through the guide catheter, they still may cause propagation of the dissection if the guidewire is in the false lumen. For this reason and the additional benefits discussed, use of IVUS, if available, is preferred.

If attempts at antegrade wiring into the true lumen are unsuccessful, then other bail-out techniques should be considered. The strategy chosen will depend on a number of factors including operator skill, equipment availability, anatomy, and degree of hemodynamic compromise. Use of the retrograde approach has been described for the treatment of catheter-induced dissection (3). However, this technique relies on crossing collateral channels that are unlikely to have developed unless there was a pre-existing severe stenosis in the dissected artery. It is possible to surf and cross invisible septal channels, but this is difficult and unpredictable. Once the wire has crossed retrograde, direct wire crossing into the antegrade catheter should be possible. Use of the Stingray system (Boston Scientific, Marlborough, Massachusetts) for re-entry from the subintimal space for catheter-induced dissection has also been described (4). Use of the Stingray system for re-entry in this setting is challenging because of the presence of extensive intramural hematoma. It may be necessary to extend the dissection with the CrossBoss (Boston Scientific) or a wire and microcatheter and perform hematoma aspiration. The lack of visualization of the distal vessel means that attempts at Stingray re-entry will require a “double blind stick” or bidirectional blind puncture (5). Care should be taken to perform re-entry proximal to major side branches. Other dissection re-entry techniques such as IVUS-guided wire re-entry, subintimal tracking and re-entry (STAR), or limited antegrade subintimal tracking (LaST) can be used but are less predictable and may result in loss of side branches (6). Emergency

coronary artery bypass grafting is an effective alternative treatment (7). However, there are often significant delays that may result in irreversible myocardial damage.

Catheter-induced coronary artery dissection is a rare but potentially life-threatening complication. Operators should be familiar with techniques that minimize dissection extension and facilitate wiring and stenting of the true lumen.

ADDRESS FOR CORRESPONDENCE: Dr. Scott Harding, Department of Cardiology, Wellington Hospital, Private Bag 7902, Wellington, New Zealand. E-mail: scott.harding@ccdhb.org.nz.

REFERENCES

1. Tanasie C, Chandonnet M, Chin A, et al. Catheter-induced aortic dissection after invasive coronary angiography: evaluation with MDCT. AJR Am J Roentgenol 2011;197:1335–40.

2. Hashmani S, Tuzcu E, Hasan F. Successful bail-out stenting for iatrogenic right coronary artery dissection in a young male. J Am Coll Cardiol Case Rep 2019;1:108–12.

3. Costello-Boerrigter LC, Salomon C, Bufe A, Lapp H. The novel use of retrograde CTO PCI techniques as a rescue strategy for an acute right coronary artery occlusion due to iatrogenic dissection. J Cardiol Cases 2018;7:89–91.

4. Ierovante N, Sanghvi K, Varghese V. Emergent distal vessel re-entry technique for iatrogenic coronary artery dissection. Cath Lab Digest 2019 Feb [E-pub ahead of print].

5. Christopoulos G, Kotsia AP, Brilakis ES. The double-blind stick-and-swap technique for true lumen reentry after subintimal crossing of coronary chronic total occlusions. J Invasive Cardiol 2015;27:E199–202.

6. Carlino M, Al-Lamee R, Ielasi A, et al. Treatment of iatrogenic occlusive coronary dissections: a novel approach. EuroIntervention 2011;7:106–11.

7. Verevkin A, von Aspern K, Leontyev S, Lehmann S, Borger MA, Davierwala PM. Early and long-term outcomes in patients undergoing cardiac surgery following iatrogenic injuries during percutaneous coronary intervention. J Am Heart Assoc 2019;8:e010940.

KEY WORDS angioplasty, coronary artery, dissection, intravascular ultrasound