Case Reports

Retrograde dissection during percutaneous coronary intervention: sealing of the entry site by covered stent implantation

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Summary

We present a case of iatrogenic aortic haematoma, developed during percutaneous coronary intervention, treated with covered stent implantation followed by a conservative approach characterised by the integration of both clinical and multimodal imaging information. This complication can lead to overt aortic dissection (28–47%), rupture (20–45%) or death (21%). In 10% of the cases it can completely regress. Guidelines for its treatment are debated because of the unpredictable natural history of intramural haematoma. Nowadays, a close follow-up with multimodal imaging is considered a valid strategy for the appropriate management of this severe condition. On the basis of the patient's clinical condition and the information obtained by multiple imaging tests (angiography, transthoracic and transesophageal echocardiography and multidetector CT scan) we decided to treat our patient with medical therapy. To date, a 1-year follow-up negative for cardiac events is recorded.

BACKGROUND

Aortic intramural haematoma (IMH) is considered as a precursor of dissection, originating from ruptured vasa vasorum in medial wall layers or, less commonly, as a result of an intimal fracture of an atherosclerotic plaque.^{1 2} The distinguishing feature of this entity is the absence of the intimal disruption that characterises classic aortic dissection.³ In comparison with aortic dissection, IMH might regress spontaneously with time and fewer severe cardiovascular complications are documented.² IMH may occur as a primary event; however, some cases developed during percutaneous coronary intervention (PCI) are reported.^{3–5} Predisposing factors are represented by older age, history of hypertension and the calcification of the aortic root.^{2 6} Evolution of the IMH in the acute phase may be highly dynamic. The significant advances in imaging techniques could allow a prompt and proper diagnosis and management of this severe condition. A close follow-up with multimodal imaging is emerging as the best strategy for the appropriate management in selected cases. We describe a case of iatrogenic IMH developed during PCI treated with covered stent implantation and a conservative follow-up approach characterised by the integration of both clinical and multimodal imaging information. We think that this report is of interest for readers on two issues: the first is the importance to remind that a coronary dissection during PCI causing an acute aortic syndrome can be properly treated with a rapid covered stent implantation; the second is the presentation of a method based on the integration of different clinical and imaging information to better define the patient outcome during follow-up.

CASE PRESENTATION

A 73-year-old woman with a history of effort-induced angina (Canadian Class II) and a positive exercise test

was referred to our Institution for coronary angiography. Among the cardiovascular risk factors systemic hypertension and previous smoking habit were described.

INVESTIGATIONS AND TREATMENT

A coronary angiography, performed by an experienced physician through the femoral approach, revealed a mild disease of the left coronary system and a critical stenosis of the proximal right coronary artery (RCA; videos 1 and 2). On the basis of the anatomy and clinical situation we proceeded to a percutaneous coronary intervention on the RCA lesion. During the manipulation of the guiding

Video 1 Angiography of Left Coronary Artery.

Video 2 Right Coronary Artery Angiography.

catheter into the RCA ostium (six French Judkins right) a severe dissection of the proximal and mid part of the right coronary artery with a retrograde extension to the right sinus of Valsalva and the ascending aorta was observed (figure 1A and video 3).

A sudden chest pain with an ST-segment elevation in inferior leads of the electrocardiogram and haemodynamic instability occurred. Inotropic support was promptly administered and three M-Guard stents (Inspire-MD, TelAviv, Israel) were implanted to seal the coronary dissection (videos 4–7). The coronary blood flow to the distal part of the RCA was rapidly restored, and the haemodynamic conditions improved. The transesophageal echocardiographic examination showed a mild pericardial effusion and the presence of a large intramural haematoma of the aorta without aortic valve regurgitation (figure 1B). A multidetector CT scan confirmed the presence of a large type A IMH extending for 5 cm length from the aortic valve. IMH thickness measured 10 mm and the aorta diameter was of 47 mm (figure 1C,D). On the basis of the fact that our patient did not show predictors of adverse outcome both clinically and in terms of

Figure 1 (A) Angiographic visualization of the dissection of the proximal and mid part of the right coronary artery with retrograde extension to the right sinus of Valsalva and ascending aorta (red arrows). (B) Visualization of the intramural haematoma of the aorta (red arrow) during transesophageal echocardiographic examination. (C and D) Intramural haematoma of the aorta (red arrows) during, respectively, CT scan with and without contrast.

Video 3 Right Coronary Artery PCI.

information obtained by multiple imaging tests (table 1) we decided to treat her with medical therapy.

OUTCOME AND FOLLOW-UP

The patient was transferred to the coronary care unit. An inferior myocardial infarction (CK peak value: 350 UI/l) with a left ventricular ejection fraction of 45% was documented. She was discharged at day 12 without any other complication. To date, a 1-year follow-up negative for cardiac events is recorded.

DISCUSSION

Acute intramural haematoma accounts for 5–20% of all the acute aortic syndromes. It can lead to a classic aortic dissection in 28–47% of the cases, a risk of rupture in 20–45% of the cases and a complete regression in 10%.¹ This condition is associated with a death rate of 21%.³

Video 4 First MGUARD Stenting.

Video 5 Second MGUARD Stenting.

The most common clinical manifestations are severe initial chest and/or back pain. Additional clinical findings include variable electrocardiographic changes, acute myocardial infarction, aortic regurgitation and pericardial or pleural effusion.³ Despite the similarity of its clinical manifestations (chest and/or back pain, cardiac tamponade and aortic valve insufficiency) to those of the classic aortic dissection, it is considered a distinct entity because of a different and variable natural history.³

The IMH is anatomically classified in relation to the aortic segment involved, as the classic aortic dissection is. Accurate classification is important as it drives decisions regarding surgical versus non-surgical management.¹

Using the Stanford classification we can describe a type A IMH involving the ascending aorta and type B IMH that does not involve ascending aorta.¹

Video 6 Last MGUARD Stenting.

Video 7 Final Aortic Angiography.

In patients with uncomplicated type B IMH, medical treatment is recommended. The initial treatment strategy for type A IMH remains controversial instead.

Two meta-analysis from Asian and Western series with an inclusion of more than 300 type A IMH cases, showed that patients sent for early surgery had slightly lower in-hospital mortality than those treated with early medical treatment, respectively, 10.1–10.4% and 14.4–18.4%.^{7 8} Song *et al*⁹ published the largest series of type A IMH collected from a single centre (101 patients). In their study the authors confirmed that early medical treatment, with closely monitored follow-up, is a reasonable option in the treatment strategy of ‘stable’ type A IMH. In this study, urgent surgery was recommended for hemodynamically unstable patients, while a timed surgical intervention was performed only for the patients with complications according to clinical assessment and follow-up imaging studies.⁹ Therefore, a critical point for its treatment is the definition of ‘stability’. It is obvious that an asymptomatic patient with stable haemodynamic defines a ‘stable’ situation but other parameters must be considered for a correct timing of the surgical approach. The risk of death is, in fact, increased in patients who develop complications.¹ In a study published in 2010, including 30 patients with type A IMH, Sawaki *et al*¹⁰ demonstrated that the

outcome of medical treatment for this condition was acceptable during both the early and the late periods, but patients with a relatively large aortic diameter (≥ 48 mm) or an intimal defect in the ascending aorta have a high probability of adverse outcome and must be considered for surgery. In the Song’s study the initial aorta diameter >55 mm and haematoma thickness >16 mm were independent predictors of complications.⁹ The diagnosis and the characterisation of the IMH with imaging therefore become of fundamental importance. Nowadays, we can use different approaches to define IMH. Transesophageal echocardiography and CT seem to be the better imaging modality in this condition.^{3 11} They present different advantages and disadvantages but the integration of these techniques could give a complete information for a correct decision-making in type A IMH. We adopt a conservative approach after an integration of clinical and different imaging modalities. Other studies have reported similar clinical behaviour.^{4 12} However, the unpredictable natural history of IMH with the possibility to develop complications even some months after the acute episode, independently from haematoma imaging characteristics, makes long-term surveillance necessary.^{13 14} Studies with greater populations using standardised follow-up imaging protocols to determine what percentages of haematoma stabilise, regress and resolve are needed.

Learning points

- ▶ A coronary dissection during percutaneous coronary intervention can lead to acute aortic syndrome.
- ▶ An early-covered stent implantation can seal the dissection and stop the progression of the aortic complication allowing a non-surgical approach.
- ▶ A follow-up based on the integration of both clinical and multimodal imaging information can completely avoid a surgical approach in selected cases.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. Nienaber A, Powell JT. Management of acute aortic syndromes. *Eur Heart J* 2012;**33**:26b–35b.
2. Evangelista A, Eagle KA. Is the optimal management of acute type A aortic intramural hematoma evolving? *Circulation* 2009;**120**:2029–32.
3. Chao CP, Walker TG, Kalva SP. Natural history and CT appearances of aortic intramural hematoma. *Radiographics* 2009;**29**:791–804.
4. Minicucci F, Galizia G, Ascione L, *et al*. Iatrogenic aortic haematoma during primary PTCA: diagnostic value of transesophageal echocardiography in cath lab. *Eur J Echocardiogr* 2006;**7**:390–3.
5. Shirodaria C, Van Gaal WJ, Banning AP. A bleeding kiss: intramural haematoma secondary to balloon angioplasty. *Cardiovasc Ultrasound* 2007;**5**:21.
6. Maehara A, Mintz GS, Bui AB, *et al*. Incidence, morphology, angiographic findings, and outcomes of intramural hematomas after percutaneous coronary interventions: an intravascular ultrasound study. *Circulation* 2002;**105**:2037–42.
7. Pelzel JM, Braverman AC, Hirsch AT, *et al*. International heterogeneity in diagnostic frequency and clinical outcomes of ascending aortic intramural hematoma. *J Am Soc Echocardiogr* 2007;**20**:1260–8.
8. Kan CB, Chang RY, Chang JP. Optimal initial treatment and clinical outcome of type A aortic intramural hematoma: a clinical review. *Eur J Cardiothorac Surg* 2008;**33**:1002–6.

Table 1 Predictors of adverse outcome in acute type A intramural haematoma (IMH)^{1–2 10 11}

Variables	Predictors of adverse outcome
Clinical presentation	(1) Hemodynamic instability (2) Hypotension or cardiac tamponade (3) Age ≥ 70 years old (4) Kidney failure (5) Signs or symptoms of myocardial or brain malperfusion
Transthoracic, transesophageal echocardiography and multidetector CT	(1) Pericardial effusion (2) Regional wall motion abnormalities (3) Aortic regurgitation (4) Aortic diameter >50 – 55 mm (5) IMH thickness between 10 and 15 mm or >16 mm

9. **Song JK**, Yim JH, Ahn JM, *et al*. Outcomes of patients with acute type a aortic intramural hematoma. *Circulation* 2009;**120**:2046–52.
10. **Sawaki S**, Hirate Y, Ashida S, *et al*. Clinical outcomes of medical treatment of acute type A intramural hematoma. *Asian Cardiovasc Thoracic Ann* 2010;**18**:354–9.
11. **Meredith EL**, Masani ND. Echocardiography in the emergency assessment of acute aortic syndromes. *Eur J Echocardiogr* 2009;**10**: i31–9.
12. **Fang HY**, Wu CJ. Migrating type A intramural hematoma after repair of an anomalous right coronary artery aortocoronary dissection with a covered stent. *Catheter Cardiovasc Interv* 2011;**78**:573–6.
13. **Nienaber CA**, von Kodolitsch Y, Petersen B, *et al*. Intramural hemorrhage of the thoracic aorta. Diagnostic and therapeutic implications. *Circulation* 1995;**92**:1465–72.
14. **Sawhney NS**, DeMaria AN, Blanchard DG. Aortic intramural hematoma: an increasingly recognized and potentially fatal entity. *Chest* 2001;**120**:1340–6.

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