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Accordion Phenomenon: A Rare Cause of Acute Total Occlusion During Percutaneous Coronary Intervention

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CHOW ET AL.: ***Accordion Phenomenon: A Rare Cause of Acute Total Occlusion During Percutaneous Coronary Intervention*****.** Placement of stiff guidewires through tortuous coronary arteries allows smooth advancement of stents during coronary intervention. However, the straightening of coronary vessels leads to a mechanical alteration and induces vessel wall shortening. The transient effect of such coronary pseudo-stenosis is referred as "accordion phenomenon". This case described the accordion phenomenon after placement of a stiff guidewire through a tortuous right coronary artery leading to acute total occlusion with ST elevation during coronary intervention. *(J HK Coll Cardiol 2014;22:38-41)*

Accordion phenomenon, pseudo-stenosis, stiff guidewire, ST-segment elevation

摘要

經皮冠狀動脈介入治療時在彎曲的冠狀動脈處放置剛性導絲有助於支架的順利安置。然而，冠狀動脈的被動伸直會導致機械性改變，致使血管牆縮短。此類冠狀動脈假性狹窄的短暫效應被稱爲「手風琴現象」。本案例記錄了經皮冠狀動脈介入治療時在彎曲的冠狀動脈處放置剛性導絲後導致冠狀動脈急性完全性梗阻並伴有ST段上抬的手風琴現象。

關鍵詞：手風琴現象、假性狹窄、剛性導絲、T段上抬

Case Report

A 63-year-old gentleman who was an ex-smoker had history of diabetes mellitus, hyperlipidemia, and hypertension. He was admitted for inferior ST elevation myocardial infarction (STEMI) treated with tenecteplase (TNK). Peak Troponin I was 90.67 ug/L. He initially refused coronary intervention and was treated medically. He presented again with inferior STEMI a year later and was complicated with heart failure. He was treated with TNK within 3 hours. Peak Troponin I was 87.52 ug/L. The gentleman finally agreed for early invasive procedure in view of repeated myocardial infarctions.

During diagnostic angiogram through the right radial approach, there was difficulty in advancing a 5 French Tiger II catheter. Angiogram confirmed high radial artery remnant. Coronary angiogram showed normal left main artery, proximal left anterior descending artery (LAD) 90% stenosis, middle LAD 90% stenosis, distal LAD 70% stenosis, and the left circumflex artery was small in calibre. The right coronary artery (RCA) ran a very tortuous course with middle RCA 90% stenosis and posterior left ventricular branch (PLV) 80% stenosis (Figure 1).

Percutaneous coronary intervention (PCI) to RCA was performed. Because of the tortuosity of the RCA and high radial remnant, an ASAHI 6.5 French shealthless Amplatz 1 guiding catheter and a Finecross

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MG microcatheter (Terumo, Japan) were used for supporting the 0.014-in. Runthrough guidewire. (Terumo, Japan). The distal RCA was wired with difficulty and was later exchanged to a 0.014-in. ASAHI GRAND SLAM (Abbott Vascular, USA) through the finecross catheter for better support.

Electrocardiogram suddenly showed ST elevation over lead II and patient complained of severe chest pain. Angiogram showed acute total occlusion of flow in middle RCA (Figure 2). The Grand Slam guidewire was withdrawn half way with the floppy part of the guidewire in middle RCA and the flow was improved to TIMI III with improvement of symptoms (Figure 3). A 3.0*15 mm stent (Energy®, Biotronik, Germany) was deployed at middle RCA lesion at 14 atm after predilatation with 2.0*10 compliance balloon (Tazuna®, Terumo, Japan) at 14 atm. The PLV branch was rewired with the Runthrough guidewire with finecross support and later exchanged with 0.014-in. Sion Blue guidewire (Asahi, Japan). However, a 2.5*18 stent (Energy®, Biotronik, Germany) failed to advance through the first bend of RCA through the Sion blue guidewire. There was frequent backing of the guidewire due to the vessel tortuosity during exchange of guidewires through the Finecross catheter. Therefore, a Crusade catheter (Kaneka, Japan), a double-lumen multifunctional probing microcatheter, was used to exchange for the Grand Slam guidewire. Not only did the Crusade catheter allow the exchange of guidewires, the catheter also allowed both the Grand Slam guidewire and Runthrough guidewire to act as buddy wires. The Grand Slam guidewire was withdrawn partially prior the delivery of the stent to the PLV branch to avoid the accordion effect, so an accurate road map can be recorded for the location and size of the PLV stent. The 2.5*18 stent (Energy®, Biotronik, Germany) was finally advanced to PLV and was deployed at 14 atm. Post dilatations with to middle RCA stent and PLV stent were done with 3.5*10 non-compliant balloon (Hiryu®, Terumo, Japan) up to 14 atm and 2.5*8 non-compliant balloon (Pentera Leo®, Biotronik, Germany) up to 14 atm respectively.

PCI to middle LAD was done with ASAHI 6.5 French shealthless Judkins Left 3.5 guiding catheter. Distal LAD was wired with Sion Blue guidewire. A 3.0*15 (Multilink®, Medtronic, USA) was deployed at 16 atm to middle LAD lesion through buddy wire technique with Grand Slam guidewire. A 3.5*12 stent (Multilink®, Medtronic, USA) was deployed at 14 atm at the proximal LAD lesion.

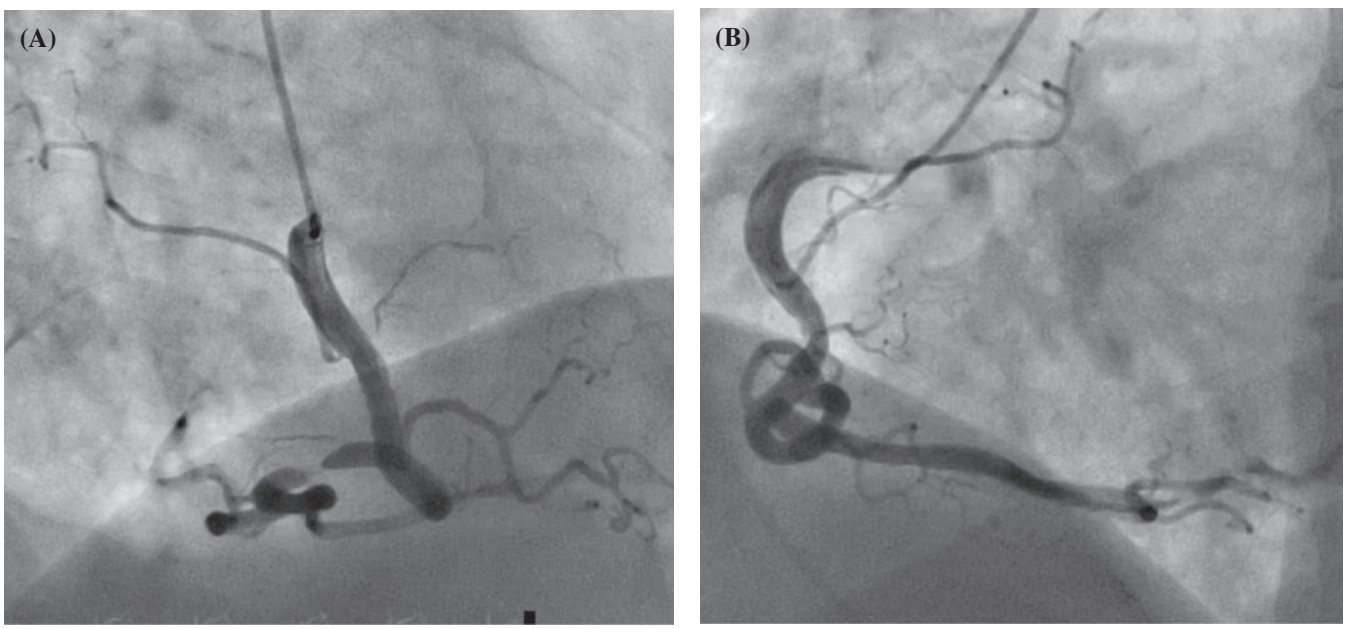

Figure 1. *Angiogram of right coronary artery (RCA) showed a tortuous RCA anatomy. (A) Right Anterior Oblique (RAO) view of RCA; (B) Left Anterior Oblique (LAO) of RCA.*

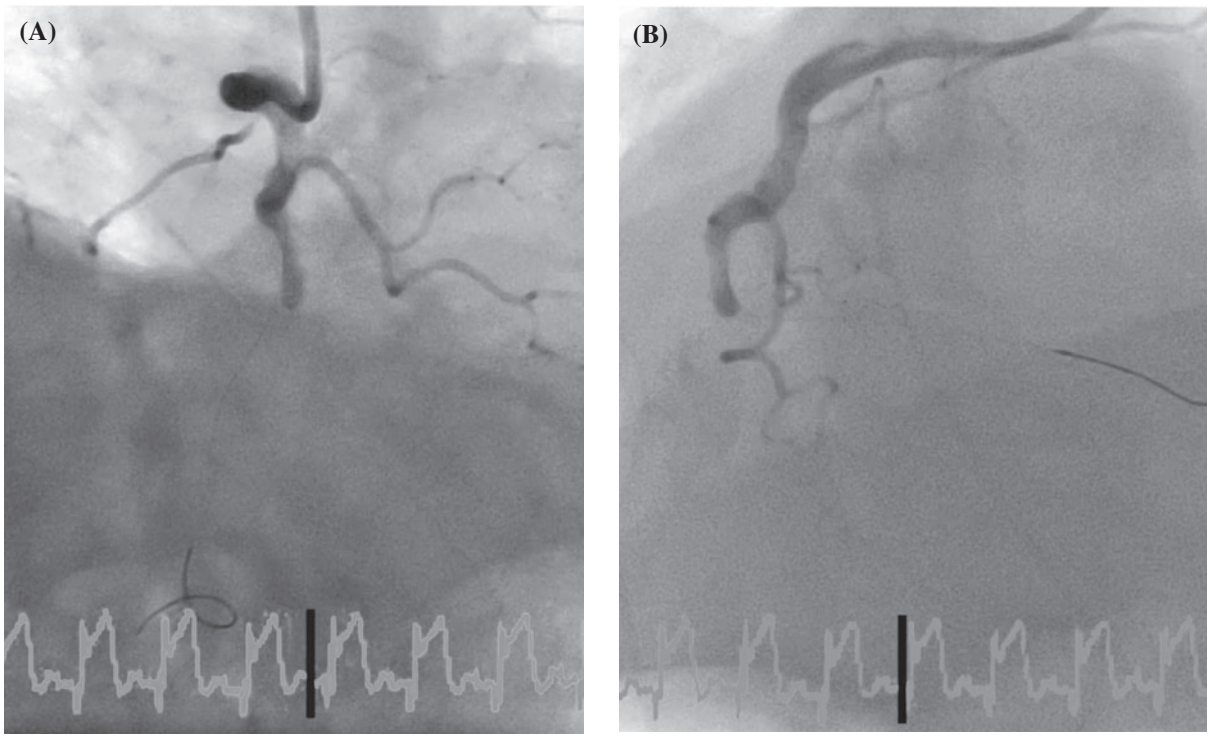

Figure 2. *Angiogram of right coronary artery (RCA) after wiring with GRAND SLAM guidewire showing acute total occlusion of middle RCA. Underlying electrocardiogram showed ST elevation. (A) Right Anterior Oblique view of RCA with GRAND SLAM guidewire; (B) Angiogram of Left Anterior Oblique view of RCA with GRAND SLAM guidewire.*

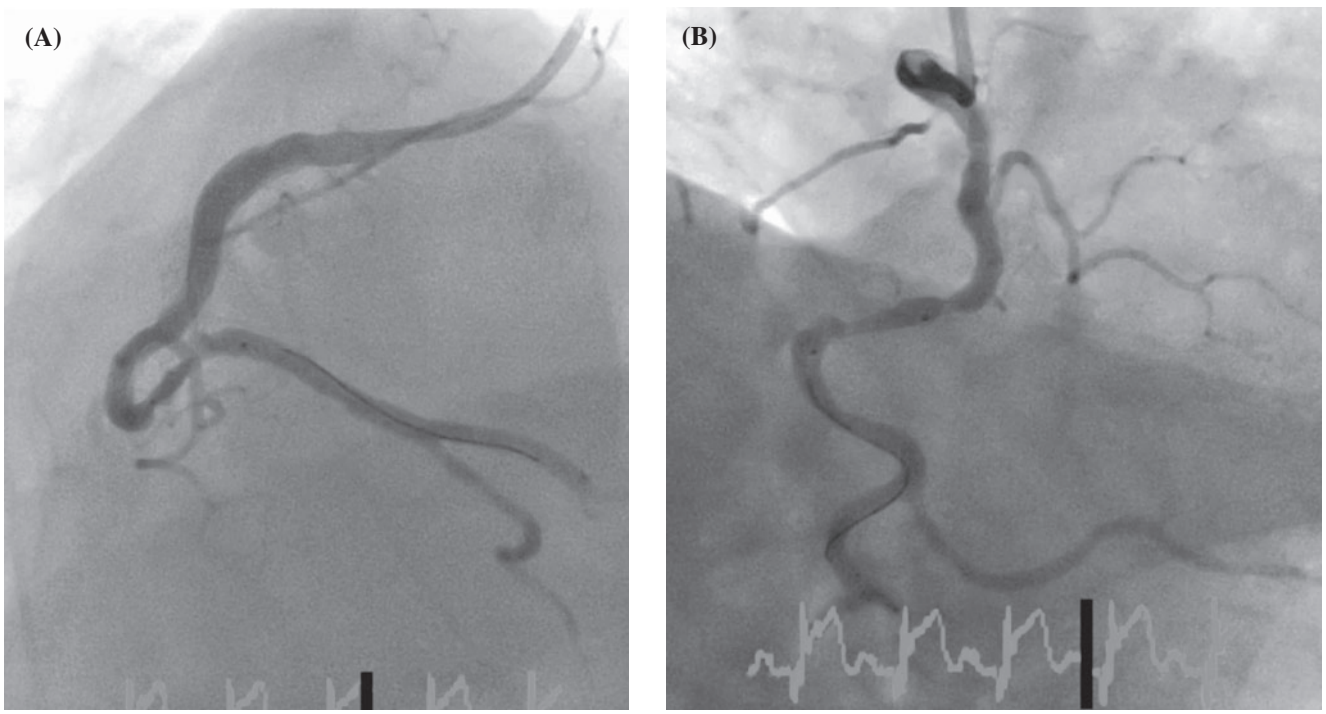

Figure 3. *(A) Left Anterior Oblique and (B) Right Anterior Oblique view of right coronary artery after withdrawal of GRAND SLAM wire showed recovery of TIMI III flow.*

Discussion

This case demonstrates the importance to recognize the effect of "accordion" or "concertina" phenomenon. The use of sheathless guiding catheter allows its advancement a small, high radial remnant artery without perforation. With the use of an extra support guidewire, the angiographic geometry was altered, resulting in straightening of the curvature of a tortuous RCA (Figure 4). Previous case reports[1-3] demonstrated invagination of vessel wall during angiogram. If the phenomenon is not recognized early, unnecessary stent deployment may occur. Accordion causing ST elevation with acute total occlusion is rare. Differential diagnosis of acute vessel closure during PCI include dissection, spasm, and embolization. Despite the fact that accordion phenomenon is a well-recognized effect of stiff guidewires, the use of stiff wires to gain support through tortuous vessels to allow smooth advancement of stents is sometimes inevitable. Delivery of stent to PLV branch would be extremely difficult in this case without a good guiding catheter support, strong guidewire, and a well-prepared proximal passage. This is supported in the case when the stent failed to advance through the bend through non-stiff guidewires (Sion Blue) during the PCI to PLV branch. Therefore, the middle RCA lesion was stented prior the delivery of the stent to the PLV branch. A special point of note is that the accordion effect did not recur despite the use of a stiff guidewire during the delivery of the PLV stent, illustrating slight anatomical change can alter the accordion outcome.

To differentiate the accordion phenomenon from other differential diagnosis, it is recommended to withdraw the guide wire while keeping the floppy part of the wire in vessel.[4] Withdrawal of the guidewire will allow coronary blood flow to improve. However, one must document clearly the desired stent placement location upon withdrawal of the guidewire as the accordion effect will recur once the stiff guidewire is advanced for the stent deployment. Totally removing the guidewire is discouraged because the operator may not be able to rewire the lesion if the cause of the acute vessel closure is due to dissection or distal embolism.

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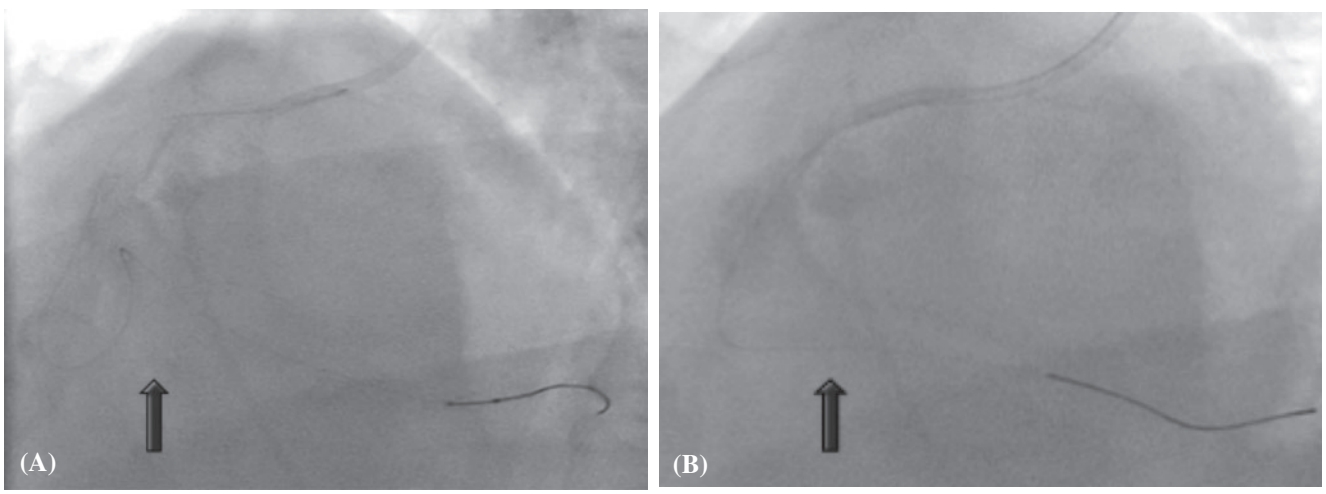

Figure 4. *(A) The anatomy and tortuosity of right coronary artery (RCA) is preserved with non-stiff Sion Blue guidewire. (B) Use of GRAND SLAM stiff guidewire straightened tortuosity of the RCA. The arrow highlighted the straightened bend of the original RCA anatomy.*