

AN AVOIDABLE COMPLICATION OF PERCUTANEOUS CORONARY INTERVENTION—ENTRAPMENT OF STENT AND DISCONNECTED BALLOON CATHETER

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During percutaneous coronary intervention, entrapment of catheter materials is a rare but life-threatening complication that sometimes requires emergency surgical treatment. Coronary artery stents have been developed to prevent acute coronary closure and reduce restenosis after coronary angioplasty. The most frequently reported complications of coronary stents are related to stent thrombosis and anticoagulation problems. This case study describes a 60-year-old female who had stable angina pectoris and underwent stent insertion into the left circumflex artery. Unfortunately, the coronary stent with balloon catheter was entrapped while crossing the angulated segment between the left circumflex and left main coronary artery. The stent catheter was surgically removed, and the patient underwent coronary artery bypass grafting successfully. Physicians should keep in mind that extremely angulated segments may reduce the successful rate of coronary stenting and contribute to the stent entrapment complication.

Key Words: stent, entrapment, percutaneous coronary intervention, complications
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The increasing use of coronary stents in current percutaneous coronary intervention (PCI) has been accompanied by several complications, including groin site bleeding due to aggressive anticoagulation, stent thrombosis, and stent malposition [1]. Stent entrapment has been reported rarely but sometimes requires emergency surgical treatment [2,3]. We report here a patient suffering from such a rare PCI complication. During the procedure the stent was entrapped in the left circumflex and left main coronary artery. Later, the angioplasty balloon with stent became disconnected from the proximal shaft of the balloon catheter.

CASE PRESENTATION

A 60-year-old female visited our cardiovascular clinic complaining of recurrent chest tightness for 2 months. She described the chest discomfort as being an oppressive, left arm-radiating sensation located over the anterior chest wall. It came and went in a crescendo–decrescendo pattern. It occurred with dyspnea while exercising or climbing stairs and subsided after rest. She reported no noticeable increase in severity, duration, or frequency. Her coronary artery disease risk factors were diabetes, hypertension, and hypercholesterolemia. A baseline electrocardiogram disclosed ST-segment depression over V₄₋₆. The thallium-201 myocardial perfusion scan showed significant reversible myoischemia in the left circumflex artery (LCX) area. She was admitted to our cardiovascular ward as highly likely to have coronary artery disease.

The patient's blood pressure was 144/90 mmHg, and her pulse was 84 beats/min upon admission. A grade II

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systolic ejection murmur was heard over the apex. Chest roentgenography showed cardiomegaly. Selective coronary angiography demonstrated disease involving multiple segments: right coronary artery, 80% over segment 2; LCX, 100% over segment 11; and left anterior descending artery, nonsignificant lesion (Figures 1A and B). After crossing the LCX totally occlusive lesion with an intermediate guidewire, sequential balloon angioplasty was performed from distal to proximal LCX (Figure 1C). Because of the long dissection, we planned to treat it with two overlapping stents. We attempted to insert the first stent, Express² (Boston Scientific, Galway, Ireland), 2.75 × 32 mm, at the middle LCX.

This long stent failed to cross the angle at the LCX orifice and became entrapped in the LCX and left main coronary artery (LMCA) (Figure 1D). We tried to push and withdraw the stent catheter but failed. The stent catheter did not move even with forceful manipulation. Finally, the stent and distal balloon catheter became disconnected from the proximal shaft of the balloon catheter. We tried to retrieve the distal angioplasty balloon and stent by using a snare, but in vain. There was no noticeable chest discomfort or electrocardiographic change during the procedure. Emergency surgery was favored to halt the possibility of stent catheter thrombosis. The patient was fully heparinized

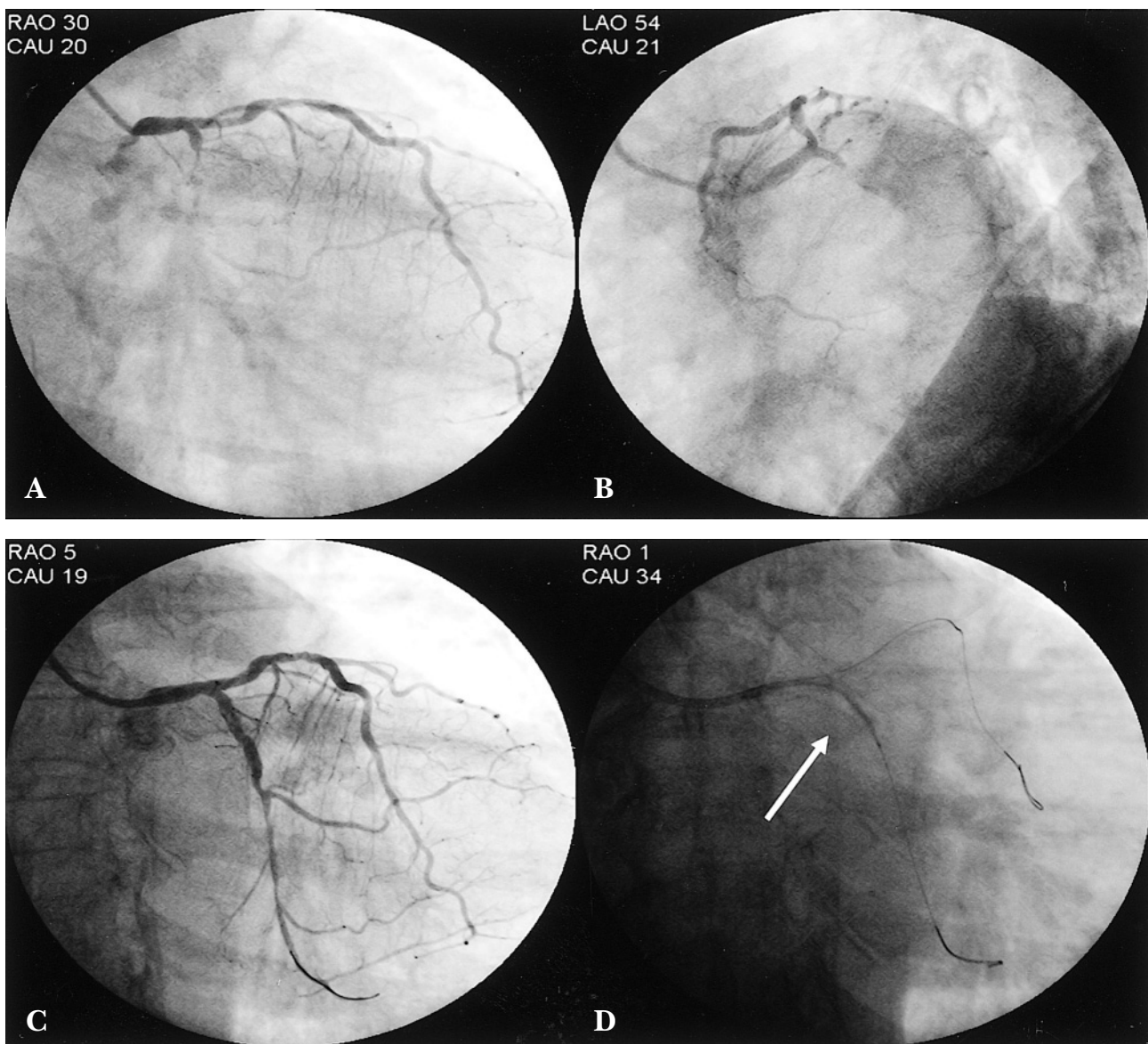


Figure 1. (A, B) Baseline left coronary angiography. (C) Left coronary angiography after percutaneous transluminal coronary angioplasty. (D) Stent entrapment in left main and left circumflex arteries (arrow).

and underwent coronary artery bypass graft surgery in which the left internal mammary artery was grafted to the left anterior descending artery, and one reverse saphenous vein was sequentially grafted to the posterior descending artery and the obtuse marginal branch, respectively. The detached and entrapped angioplasty balloon with premounted stent was easily removed with forceps via the left coronary artery orifice during explorative aortotomy (Figure 2A). The proximal stent was destroyed and the stent strut became open (Figure 2B). Operative procedures were uneventful, and the patient complained of no further chest discomfort after discharge.

DISCUSSION

Entrapment of catheter materials is rare in PCI. Coronary artery stents are designed to prevent acute coronary closure and reduce restenosis after coronary angioplasty. The most frequently reported complications of coronary stenting are related to stent thrombosis, anticoagulation problems, guidewire problems, and complications related to the access site [1,4]. Entrapment of a coronary stent as a complication is rare [2,3,5]. After stenting, retention of a broken catheter has also been rarely reported [6]. These complications are sometimes life-threatening and require emergency surgical treatment.

Some situations that may predispose to stent entrapment include the use of an unmounted stent, a long stent, angulated coronary anatomy, and coronary calcification. Manually crimped stents have also been reported to dislodge and become entrapped [3]. Insertion of such stents without a protective sheath risks their becoming separated from the balloon and entrapped during manipulations. The poor trackability, flexibility, and conformability add to the danger of longer stents becoming entrapped in the coronary artery. Moderately angulated segments and calcification in the

coronary artery tree increase the resistance and therefore influence the deliverability of stents. These are classified as ACC/AHA type B lesions and have a moderate PCI success rate (60–85%) [7]. Therefore, physicians should know methods of avoiding stent entrapment. Strategies such as using the buddy wire technique, or inserting an open-cell or a shorter stent, may improve the success rate of stenting in angulated coronary artery trees.

After stent entrapment occurs, the stent remains closed and constitutes a site for thrombus formation [8]. Usually a transcatheter approach for retrieving the stent is better, faster, and safer than a surgical one [9]. Surgical intervention is another option to remove catheter materials [2,3,6]. Before resorting to surgical intervention, one may attempt alternative methods of overcoming this complication, including stent insertion *in situ* if difficulty is encountered in reaching the lesion. If the stent becomes dislodged from the balloon catheter, physicians may try to retrieve it by snare wire or use another balloon to deploy the stent. In addition, doctors can insert a smaller size balloon down to the distal part of the stent, then apply low-pressure inflation and subsequently try to retrieve the stent. If the transcatheter approach fails, a short, warm-heart bypass and single cross clamping coronary artery bypass grafting procedure provides a good outcome [6]. However, retrieval systems should be available in all interventional catheterization laboratories.

In our case, the patient suffered from stent entrapment in the LCX and LMCA. The possible causes predisposing to this complication could be the long stent and acute angulated angle (about 90°) between the LCX and LMCA, although we cannot exclude coronary calcification. We tried transcatheter retrieval but to no avail. Thereafter, the stent catheter became disconnected from the proximal shaft of the balloon catheter after forceful manipulation. Emergency coronary artery bypass grafting was favored at that time to avoid stent thrombosis. After retrieving the catheter, the surgeon

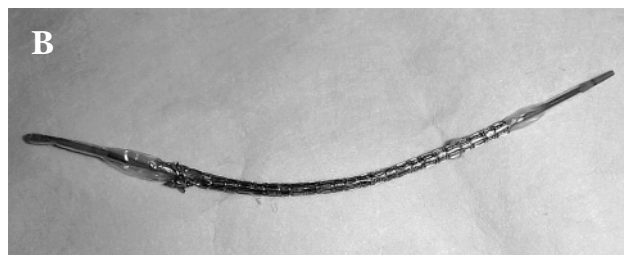
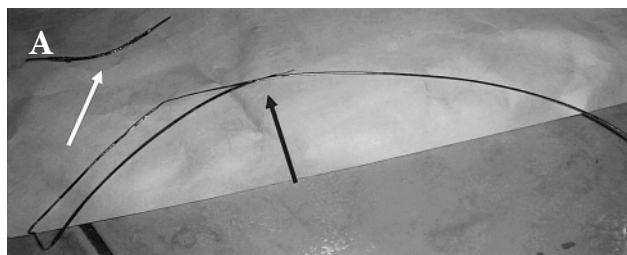


Figure 2. (A) Disconnected parts: distal balloon with stent (white arrow) and proximal balloon catheter (black arrow). (B) Magnified view of distal balloon with premounted stent.

decided to graft the left anterior descending artery because the LMCA might have been traumatized during stent insertion, and this could have led to immediate and late flow limitation and possible development of a new lesion in the LMCA.

In conclusion, entrapment of catheter materials can have catastrophic results. A transcatheter approach with retrieval systems should be considered first. Surgical intervention provides another option to remove catheter materials. Patients should be fully heparinized, and urgent bypass grafting is lifesaving. Physicians should be aware that extremely angulated segments may reduce the success rate of coronary stenting and contribute to stent entrapment complications. Strategies such as using a buddy wire technique, or a shorter or open-cell stent may improve the successful stenting rate in angulated coronary artery trees.

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可預防的心導管治療併發症 — 血管支架 卡住併氣球導管斷裂

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心導管治療時導管材料卡在冠狀動脈十分罕見但有時可能造成致命而需手術治療。血管支架的置放可以避免冠狀動脈急性阻塞及減少血管再狹窄。常見的血管支架置放併發症包括支架造成的栓塞及抗血栓藥物使用的問題。我們報告一位六十歲狹心症女性病人接受血管支架的置放時支架卡在左主幹動脈與左迴旋動脈間的高度轉彎處。病人之後接受成功的繞道手術並取出斷裂的氣球導管。醫生在置放血管支架時對於角度過大的冠狀動脈必須小心，如此的解剖構造易造成支架卡在冠狀動脈上而降低支架置放的成功率。

關鍵詞： 支架，卡住，經皮冠狀動脈介入性治療，併發症

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