DOI: 10.1111/j.1540-8183.2011.00671.x

# The Guideliner™ Catheter for Stent Delivery in Difficult Cases: Tips and Tricks

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***Introduction:*** *Stent delivery in complex coronary anatomy with severe calcification and tortuosity is still a common cause of percutaneous coronary interventions (PCI) failure. Recently, a new support rapid exchange catheter, the Guideliner, has been designed specifically for device delivery.*
***Methods:*** *From June 2010 to December 2010, we performed 10 cases using the Guideliner catheter to improve backup support and facilitate stent delivery: 2 emergent PCI for ST elevation myocardial infarction, and 8 stable elective PCI. In 3 cases the operator chose the femoral access, in 2 cases crossover from radial to femoral access was needed, and the other cases were performed radially. In 2 cases PTCA with drug-eluting balloon was performed; in the other cases second-generation drug-eluting stent was implanted.*
***Results:*** *One case, the first one, failed, as stent could not be delivered to the target lesion. The other 9 cases were performed successfully. Three proximal dissections were detected and sealed with stent implantation. In 2 cases, we had stent damage due to the passage of the stent through the Guideliner metal collar. Another stent had to be used.*
***Conclusions:*** *In our experience, the Guideliner catheter is safe to use and helps device delivery in difficult settings. We describe here our experience with the Guideliner catheter for stent delivery and backup support; we discuss its utility and drawbacks in acute and stable clinical settings. Moreover, the aim of this article is to help interventional cardiologists using the device in difficult lesions to avoid potential complications.* (J Interven Cardiol 2011;24:450–461)

## Introduction

Over the last decade, numerous advancements in percutaneous coronary interventions (PCI) have been achieved. However, the interventional cardiologist often deals with difficult scenarios, like complex coronary anatomy with severe calcification and tortuosity, where the operator may still be unable to deliver a stent to the target lesion. Several new devices and techniques have been developed to overcome this problem, including more supporting guiding catheters, newer stents with lower profile and better delivery systems, the "buddy" wire to improve guiding catheter coaxiality, or buddy balloon techniques,[1] and the anchor technique, as examples. In particular, for the transradial approach, stent delivery is improved with 5 or 6 French guiding catheter deep-intubation.[2] More recently sheathless catheters have been commercialized, with an outer diameter approximately 1.5 F sizes smaller than the corresponding radial sheathes to overcome the limitations due to radial smaller diameter (6.5 or 7.5 French, Asahi, Intecs, Aichi, Japan). From the methodological point of view in some situations, especially in elderly hypertensive patients, the choice of transradial left despite right approach is associated with higher procedural success.[3] Mamas et al.[4] described the 5F Heartrail II catheter (Terumo, Tokyo, Japan) within a standard 6F guiding catheter (so called ''five-in-six'' system, or "mother and child") which was initially developed for use in chronic total occlusion PCI.[5] Recently a new support catheter, the Guideliner catheter (Vascular Solutions, Minneapolis, MN, USA) has been developed specifically for device

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delivery. The Guideliner catheter consists of a short guiding catheter extension connected to an introducer rod; it is essentially a rapid exchange equivalent of the "five in six" Heartrail II catheter, being potentially easier to use. The device received CE marking in September 2009. First-in-human experience with this device was described by Mamas et al.,[5] the same group then extended its series performing transradial cases for coronary bypass graft interventions.[6] We describe here our initial experience with the Guideliner catheter for stent delivery and backup support, and we discuss its utility and drawbacks in acute and stable clinical settings (Table 1).

## Device Details

The Guideliner catheter is a coaxial guide extension with the advantage of rapid exchange. In difficult and challenging interventions, guiding catheters have a tendency to back out of the artery whereas the Guideliner allows guiding catheter extension into the vessel for deep seating. The catheter has been described elsewhere.[7] Briefly, it is composed of a flexible 20-cm soft tipped catheter connected via a metal "collar" with a 115-cm stainless steel shaft to a proximal positioning tab (Fig. 1). It is currently available in three sizes: 5-in-6 (0.056'' internal diameter (ID)), 6-in-7 (0.062''ID) and 7-in-8 (0.071" ID). The extension is 20-cm long (although a maximum intubation of 10 cm is recommended, in order to place the collar in a straighter portion of the catheter) and has silicon coating for lubricity. The extension section is a component built tube, with good flexibility and adequate radial strength; the external layer is made of the same material as a guiding catheter. There is a radio-opaque marker located at 2.66 mm from the tip. Two positioning white markers on the push tube, at 95 cm (single) and 105 cm (double), assist catheter placement through the guide.

At any time, following placement of the mother guide catheter and coronary guidewire in the target vessel, the Guideliner catheter can be advanced over the wire through the hemostatic valve without the need to disconnect the valve from the mother guide. The catheter tip is then advanced beyond the tip of the mother guide into the coronary vessel by pushing on the proximal tab. The interventional procedure is performed in the usual manner through the hemostatic valve.

The Guideliner has two indications for use: deep seating for added back-up guiding catheter support in challenging cases to facilitate device delivery, and coaxial alignment when a difficult coronary ostium takeoff prevents guiding catheter placement. It is contraindicated in vessels with less than 2.5- mm diameter. Herein follows a description of some cases illustrating the advantages and potential drawbacks of this new device. Case 1 was the only failure in our series, the Guideliner catheter being extremely helpful in the other cases; cases 3 and 6 illustrate the advantages of the Guideliner catheter; case 4 is a case of stent damage while being advanced into the Guideliner catheter; and finally, cases 5 and 10 show coronary dissections related to the device.

## Case 1

An 80-year-old female patient with unstable angina and transient ST segment elevation in inferior leads was admitted to our center. She was on chronic anticoagulation treatment because of chronic atrial fibrillation (INR 1.2). Coronary angiography showed a dominant right coronary artery (RCA) with severe calcification all along the vessel, with a 90% proximal stenosis as the culprit lesion; and a small diameter (1.8 mm) posterior descendent artery (PDA), with a severe proximal stenosis (90%) (Fig. 2). PCI was programmed 7 days after the diagnostic coronary angiography. Oral anticoagulation was discontinued, and femoral access PCI was chosen because of negative bilateral Allen test and small radial pulses. Access for PCI was through right femoral artery. A 6F Judkins Right guiding catheter was chosen. A 0.014'' Balance Middle Weight Universal guidewire (Abbott Vascular, Abbott Laboratories, Abbott Park, IL, USA) was positioned in the distal PDA. Proximal lesion was predilated using a 3.0 × 10 mm Flextome Cutting Balloon (Boston Scientific, Natick, MA, USA). Afterward, different balloons were used to try to dilate the PDA lesion (1.25 × 15 mm Nimbus Pico PTCA balloon catheter, ClearStream Technologies Ltd, Wexford, Ireland; 1.25 × 15 mm Ryujin Plus—RX PTCA Balloon Catheter, Terumo Europe N.V., Leuven, Belgium) but none could cross the lesion, which was tight and hard. The operator then introduced the Guideliner, carefully across the hemostatic valve, deeply down to the acute marginal angle of the RCA, with particular attention to device friction inside the coronary artery. At this point device coaxiality is very important to decrease risk of dissection. Dilation with several small balloons was attempted again, but none of them could cross the lesion. The operator decided to conclude the procedure, as the PDA, a

**Table 1.** Case Details with Patient's Age, Arterial Access, Guideliner Catheter Indication, Depth of Intubation, Kind of Stent Implanted, and Complications

| Case | Age | Access | Vessel | Lesion Type | Indication for GL | Intubation Depth | Stent Deployed | Stent Damage/ Failure | Complication |
|---|---|---|---|---|---|---|---|---|---|
| Case 1 | 80 | R/F | RCA | Severe calcification Type B | Balloon and stent delivery | 40 mm | N/A | N/A | Failure |
| Case 2 | 75 | F | Circ-DPA | Type C | Balloon delivery | 60 mm | Drug eluting balloon DIOR | N/A | N/A |
| Case 3 | 79 | R/F | RCA | Severe tortuosity Type C | Stent delivery | 30 mm | 2.0 × 25-mm drug eluting balloon DIOR PTCA catheter | N/A | N/A |
| Case 4 | 68 | F | LMS-Circ | Extreme tortuos-ity/angulation Type C | Stent delivery | 20 mm | 2.25 × 14 mm Endeavor Resolute 2.75 × 24 mm Endeavor Resolute 3.5 × 30 mm Endeavor Resolute | 2.25 × 18 Endeavor Resolute | N/A |
| Case 5 | 80 | R | LAD | Extreme tortuosity Type C | Stent delivery | 40 mm | 2.5 × 23 mm Multi Link 8 2.75 × 18 mm Multi Link 8 3.0 × 28 mm Multi Link 8 3.5 × 13 mm Hexacath Titan 2 | 2.5 × 5 mm Multi Link 8 | Proximal dissection |
| Case 6 | 81 | R | RCA-CTO | Severe calcification, distal lesion Type C | Balloon and stent delivery | 25 mm | 2.5 × 30 mm Endeavor Resolute 3 × 30 mm Endeavor Resolute | N/A | N/A |
| Case 7 | 52 | R | RCA/DP/PL | Long lesion, distal, severe calcification | Balloon and Stent delivery | 100 mm | 3 × 38 mm Endeavor Resolute | | N/A |

*Continued*

**Table 1.** Continued.

| Case | Age | Access | Vessel | Lesion Type | Indication for GL | Intubation depth | Stent Deployed | Stent Damage/ Failure | Complication |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Type C | | | 3.5 × 38 mm Endeavor Resolute | | |
| | | | | | | | 2.5 × 14 mm Endeavor Resolute | | |
| | | | | | | | 2.25 × 18 mm Endeavor Resolute | | |
| Case 8 | 60 | R | RCA | Very tortuous and calcified Type C | Stent delivery | | 3.0 × 12 mm Endeavor Resolute | N/A | Proximal dissection |
| | | | | | | | 3.0 × 15 mm Endeavor Resolute | | |
| | | | | | | | 3.0 × 30 mm Endeavor Resolute | | |
| | | | | | | | 2.5 × 24 mm Endeavor Resolute | | |
| Case 9 | 61 | F | Circ-OM2 | Angulated Circ origin Type C | Stent delivery | 20 mm | 2.25 × 24 mm Promus Element | N/A | N/A |
| | | | | | | | 2.5 × 20 mm Promus Element | | |
| Case 10 | 72 | R | Circ CTO | Extreme tortuosity | Stent delivery | 30 mm | 2.25 × 20 mm Promus Element | N/A | LM-LAD Dissection |
| | | | | Type C | | | 2.25 × 28 mm Xience Prime | | |

R = radial; F = femoral; R/F = switch from radial to femoral; GL = guideliner catheter; N/A = not applicable; RCA = right coronary artery; DP = descending posterior artery; PL = posterior-lateral; Circ = circumflex; LMS = left main stem; LAD = left anterior descending artery; lesion type = ACC/AHA classification.

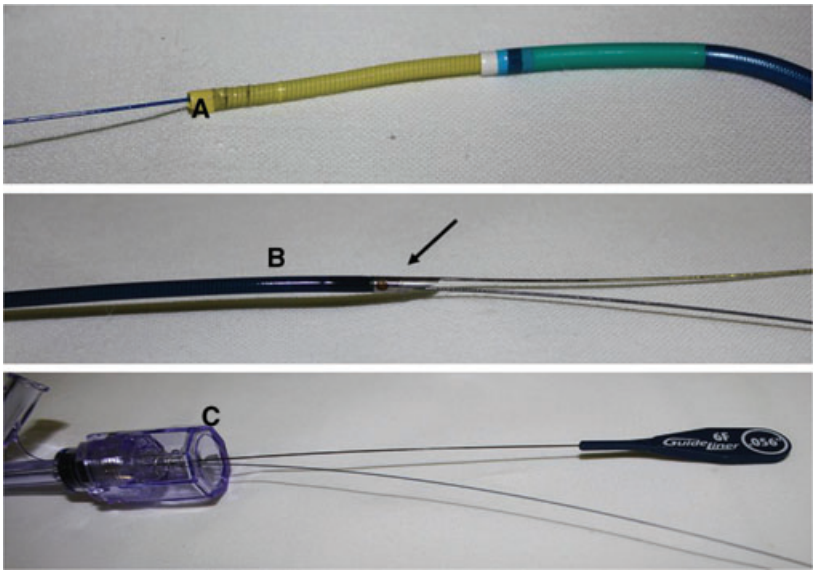


**Figure 1.** The 5F Guideliner catheter. (A) Guideliner flexible 20-cm distal segment, the guide extension, made of an inner polytetrafluoroethylene liner, a middle stainless steel coil, providing maximum flexibility while retaining radial strength, and an outer polyether block amide (Pebax) polymer extrusion, same material as a guide catheter. (B) The Guideliner metal collar (arrow) connecting the flexible catheter extension with a 115-cm stainless steel shaft to a proximal positioning tab. (C) The proximal end of the Guideliner while used inside the catheter through the hemostatic valve, like a regular balloon.

small diameter vessel, was not suitable to rotablation. The proximal lesion was then treated with a 2.75 × 30-mm drug-eluting Dior PTCA catheter balloon (Eurocor GmbH, Bonn, Germany), avoiding stent placement since the patient was on chronic anticoagulation treatment.

## Case 3

A 79-year-old female patient with Killip I inferior ST elevation myocardial infarction (STEMI) was admitted to our center for primary PCI. Initially the right radial access was attempted, and left radial pulse was absent, but due to severe subclavian artery tortuosity the operator shifted to right femoral access. The coronary angiography showed RCA proximal occlusion (Fig. 3). With a 6F Judkins Right guiding catheter a Balance Middle Weight Universal guidewire (Abbott Vascular, Abbott Laboratories) was placed distally. Manual thrombectomy was attempted with the Pronto thrombectomy catheter (Vascular Solutions) but it could not cross the lesion. A Pronto LP extraction catheter (Vascular Solutions) was then used allowing recanalization of the artery. A long, severely

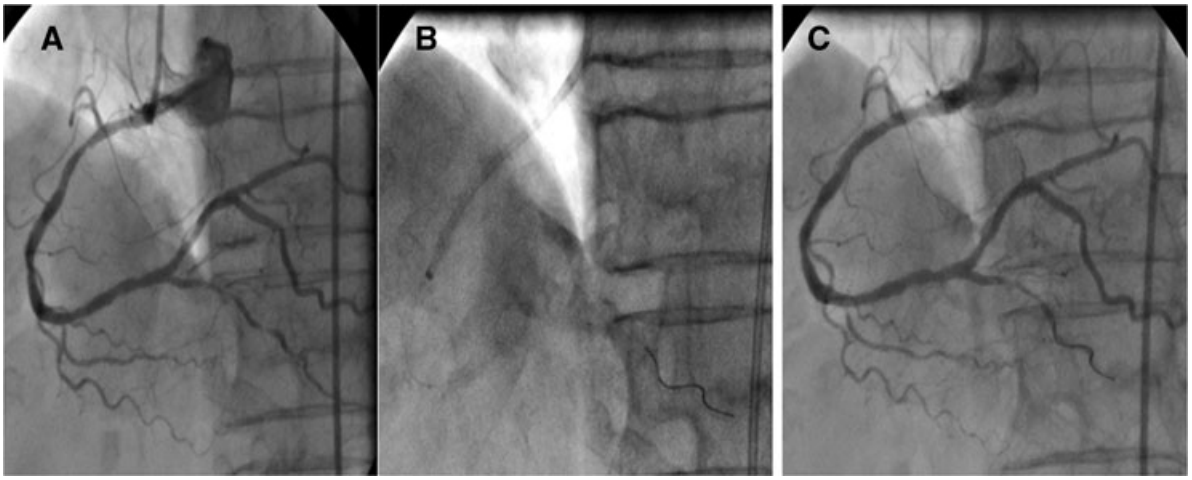


**Figure 2.** Case 1. (A) Baseline angiography. (B) Guideliner catheter deep intubation. (C) Final result. This case was failed.

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