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Minimally invasive coronary angioscopy: observation using a new non-occlusive fibrescope through a 4 Fr guiding catheter

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KEYWORDS

- imaging
- plaque
- stent
- thrombus

Abstract

Aims: Coronary angioscopy (CAS) is a robust tool for the qualitative evaluation of atherosclerotic plaque, thrombus, and vascular healing after stent implantation. However, adequate visualisation by CAS requires balloon occlusion and a larger than 6 Fr compatible guiding catheter for complete replacement of coronary blood with transparent fluid. The invasive and complex procedures limit the wide utilisation of this imaging device. We attempted less invasive observation by CAS with a slender fibrescope catheter.

Methods and results: The culprit lesion in a patient with stable angina pectoris in the proximal right coronary artery was observed using a non-occlusive fibrescope through a 4 Fr guiding catheter. The coronary lumen was adequately observed before and after stent implantation.

Conclusions: Angioscopic observation through a 4 Fr guiding catheter was possible without deterioration of image quality. Minimally invasive procedures of CAS may be practical for patient care.

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Introduction

Coronary angioscopy (CAS) provides morphological information on atherosclerotic plaque, thrombus, and vascular healing after stent implantation[1-3]. However, adequate observation by CAS requires balloon occlusion and a larger than 6 Fr compatible guiding catheter for complete replacement of coronary blood with transparent fluid. The invasive nature and complexity of the procedures limit the wide utilisation of this imaging device. Herein, we present a novel method of CAS using a slender fibrescope catheter.

Case description

A 78-year-old female with stable angina pectoris received coronary angiography (CAG) via the right radial artery. Focal stenosis was found in the proximal right coronary artery, and catheter intervention was performed using a 4 Fr Judkins Right guiding catheter (Kiwami™; Terumo Corp., Tokyo, Japan). We attempted to observe the target lesion using a new type of slender fibrescope (Smart-i™ type S11; iHeart Medical Co., Ltd, Tokyo, Japan). The tip of the catheter traversed the lesion along a 0.014 inch guidewire, and a manual pullback image of CAS was recorded during continuous infusion of contrast media by autoinjector (4 mL/sec, total 12 mL) **(Figure 1, Moving image 1, Moving image 2)**. After implantation of a drug-eluting stent (Resolute Integrity™ 2.75/12 mm; Medtronic, Minneapolis, MN, USA), the lumen was visualised using the same method **(Figure 2, Moving image 3)**. This non-occlusion catheter consists of a radiopaque metal tip and a flexible shaft including optical fibres. Only the tip has a guidewire lumen and the length of the monorail port is 2.5 mm. The diameters of the tip and shaft are 0.8/1.2 mm and 0.6 mm, respectively **(Figure 3)**. The slender fibrescope provides high crossability and a large flush lumen from the guiding catheter. Although the use of a larger size of guiding catheter would permit better images than the current method, the less invasive nature of the procedure would be lost.

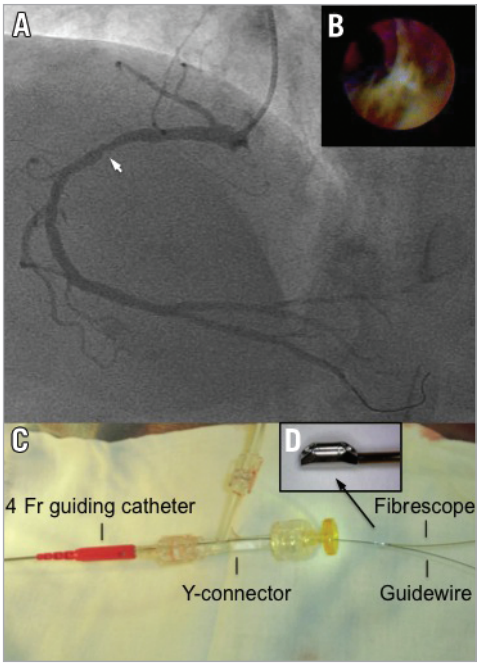

Figure 1. *Angiographic and angioscopic findings at baseline and image of the catheter system. A) Coronary angiography showed the culprit lesion in a case of angina pectoris (arrow) in the proximal right coronary artery (RCA). B) Yellow plaque and mural red thrombi were recognised by coronary angioscopy (CAS). C & D) A short monorail type of fibrescope was advanced along a 0.014 inch guidewire through a 4 Fr guiding catheter.*

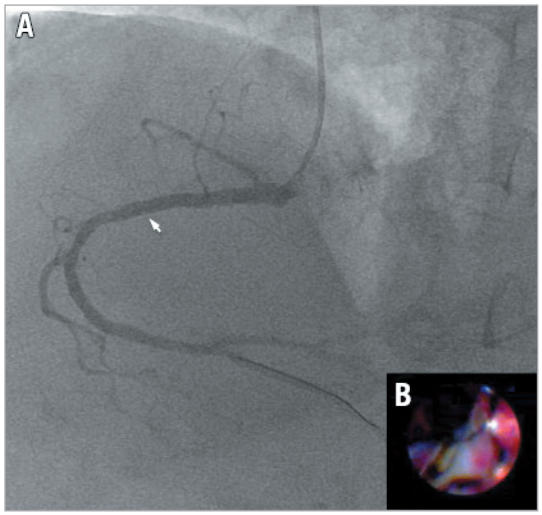

Figure 2. *Angiographic and angioscopic findings after coronary intervention. A) Stenosis of the RCA completely disappeared after stent implantation (arrow). B) CAS showed the attachment of the implanted stent to the vessel wall.*

Conclusion

For the first time, this case has shown the possibility of angioscopic observation through a 4 Fr guiding catheter without deterioration of image quality. Direct visualisation of the plaque surface by CAS can identify vulnerable plaque, including thin-cap fibroatheroma, as intense yellow plaque[4], something which is helpful to pinpoint

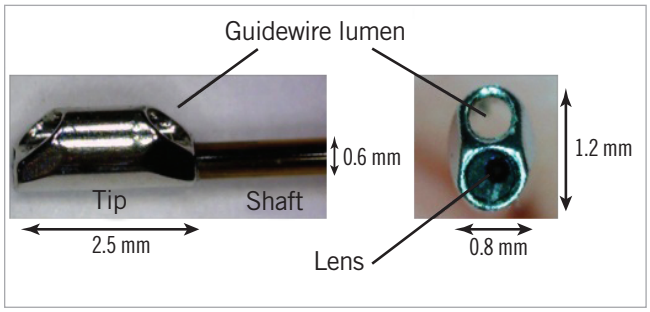

Figure 3. *The tip of the angioscopic catheter. The rigid tip (0.8/1.2 mm in diameter) has an object lens and guidewire lumen, and the flexible shaft (0.6 mm in diameter) contains 3,000 pixels of optical fibres. The length of the tip is 2.5 mm, and this portion serves as a radiopaque marker and monorail port.*

a vulnerable patient. Both plaque characteristics and also healing response after stenting are validated by angioscopic observation. Diagnostic or stent follow-up CAG using a 4 Fr transradial approach is now prevalent. Therefore, minimally invasive and simple procedures of CAS are practical, and the findings may contribute to the improvement of patient care.

Impact on daily practice

This novel angioscopic method through a 4 Fr guiding catheter is less invasive and is simple, and may be beneficial for patient care.

Conflict of interest statement

M. Takano has received a consultancy fee from iHeart Medical. The other authors have no conflicts of interest to declare.

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Online data supplement

Moving image 1. Fluoroscopy during angioscopic observation. The tip of the angioscopic catheter was slowly moved from distal to proximal to the target lesion during flushing of contrast media.
Moving image 2. Angioscopic image at baseline. CAS revealed the presence of atherosclerotic yellow plaque and mural red thrombi in the culprit lesion.
Moving image 3. Angioscopic image after stent implantation. Stent struts adequately attached to the plaque and thrombi. Angioscopic observation provided satisfactory image quality for quantitative evaluation of the coronary lumen.