Algorithmic Approach for Optical Coherence Tomography–Guided Stent Implantation During Percutaneous Coronary Intervention

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KEYWORDS

- Optical coherence tomography • Intravascular imaging • Percutaneous coronary intervention • Stent

KEY POINTS

- Intravascular imaging plays a key role in optimizing outcomes for percutaneous coronary intervention (PCI).
- Optical coherence tomography (OCT) utilizes a user-friendly interface and provides high-resolution images.
- Incorporating a standardized, algorithmic approach when using OCT allows for precision PCI.
- OCT can be used as part of daily practice in all stages of an intervention: baseline lesion assessment, stent selection, and stent optimization.

INTRODUCTION

Angiography remains the primary method of imaging the coronary arteries to guide clinical decision making and treatment strategy in percutaneous coronary intervention (PCI). Angiography has several well recognized limitations, however. Angiography provides 2-D lumenography of a complex 3-D structure, neglecting the vessel wall in which atherosclerosis manifests. Adjunctive use of intravascular imaging may overcome some of these limitations and can provide clinical benefit. Multiple meta-analyses, including both registries and randomized trials,

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have suggested the benefit of intravascular imaging-guided PCI in reducing death, target lesion failure, major adverse cardiac events (MACEs), and stent thrombosis.[1–5]

Optical coherence tomography (OCT) is an imaging modality initially developed for ophthalmologic use and later adopted for intracoronary imaging. OCT utilusesizes light-based technology to obtain 360° cross-sectional images of a coronary artery with a continuous pullback image of an arterial segment with resolution not previously available. Compared with intravascular ultrasound (IVUS), which incorporates soundwave technology and has a resolution of 40 μm to 200 μm, OCT has a higher axial resolution of 10 μm to 20 μm. The improved resolution allows accurate identification of the three layers of the normal arterial wall, delineation of plaque morphology, and highly sensitive identification of post-PCI complications.[1–8] Moreover, the improved resolution reduces interobserver and intraobserver variability of measurements on OCT compared with IVUS, facilitating operator training.[9]

Despite accumulating data supporting the benefit of intravascular imaging on PCI outcomes, adoption has been limited, especially for OCT. Central among the reasons for restricted adoption has been the lack of a standardized protocol for using intravascular imaging in contemporary practice. This review provides an overview on how to use OCT, summarizing the data supporting its clinical utility in the setting of a simple, user-friendly, "how to" OCT algorithm that may be implemented universally in the catheterization laboratory.

Optical Coherence Tomography Set-up

The only OCT catheter currently available in the United States for commercial use is the Dragonfly OPTIS imaging catheter (Abbott, St. Paul, Minnesota) (Fig. 1). Additional OCT imaging catheters are widely available outside the United States that differ in their utilization of optical frequency domain imaging but are largely based on the same fundamental technology. The Dragonfly OPTIS catheter is a rapid exchange, dual-lumen imaging catheter with a tip that tapers to a 2.7-F diameter. It is compatible with a 6-F or larger guiding catheter and offers fast acquisition, with automated pullback 2 sedonds to 3 seconds in duration. There are 3 radiopaque markers on the imaging catheter: The distal marker located 4 mm from the tip of the catheter, the lens marker located 2 mm proximal to the lens, and a third marker located 50 mm proximal to the lens marker (length marker) that can be used to approximate the imaging segment.

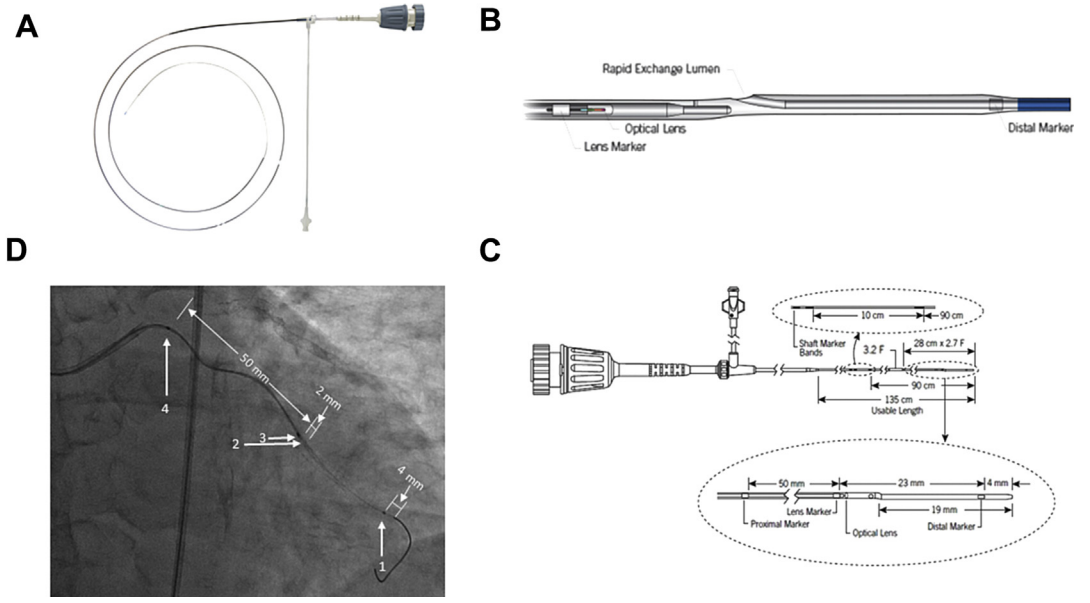

Fig. 1. Dragonfly OPTIS OCT imaging catheter. (*A*) The Dragonfly OPTIS catheter; (*B*) depiction of the longitudinal cross-section of the catheter; (*C*) dimensions of catheter components; and (*D*) angiogram with the Dragonfly imaging catheter with 3 radiopaque markers: (1) distal marker: a fixed marker located 4 mm from the tip of the catheter; (2) lens marker: located 2 mm proximal to the lens; (3) optical lens: located 2 mm distal to the lens marker; (4) proximal length marker: located 50 mm proximal to the lens and can be used to approximate the imaging segment. ([*A–C*] *From* Dragonfly, OPTIS and St. Jude Medical are trademarks of St. Jude Medical, LLC or its related companies. *Reproduced with permission of* St. Jude Medical, ©2018. All rights reserved.)