



Possible risk factors for tip rupture of orbital atherectomy system

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Orbital atherectomy system (OAS) is effective for treatment of severely calcified coronary lesions [1]. On the other hand, tip rupture of OAS sometimes relates to critical vessel injury such as vessel rupture or dissection. Thus, we have to consider risk factors of this phenomenon. We examined consecutive four cases (9.5%, 4/42 lesions) which occurred OAS-tip rupture. All cases had acute bend (a cut-off value of ≤ 120.8 degree was calculated by receiver operating characteristics curve analysis, Supplement data 1 to 4) and nodular calcification at the target lesion (Fig. 1a, c, e, h). Debulking with OAS was performed at 80,000 rpm with backward advancement in three cases and forward advancement in one case (Case 2). Tip rupture was occurred within ten times OAS activation in all cases and ruptured tip was

successfully and easily retrieved using the illustrated method in Case 1 to 3 (Fig. 2; Supplement Movie 1 and 2). All ruptured sites were observed at just proximal portion of the crown (Fig. 1g). In case 4, we advanced the crown beyond the target lesion with GlideAssist mode and started sanding at 80,000 rpm with backward advancement. Because we detected a radiolucent band just proximal portion of the crown (Pre-rupture sign) during an initial activation (Fig. 1i), we removed the OAS carefully and identified the prolonged OAS shaft (Fig. 1j). Vessel tortuosity and nodular calcification may lead to unevenness of rotation between crown and proximal shaft (Fig. 1k). For safety procedure with OAS, it is important to be aware of these risk factors and pre-rupture sign.

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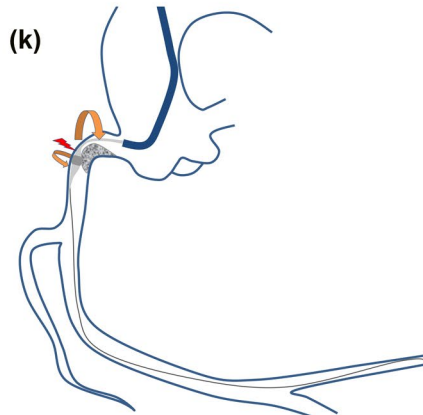
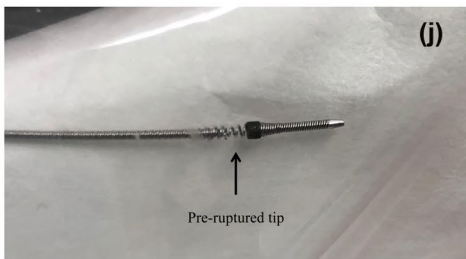
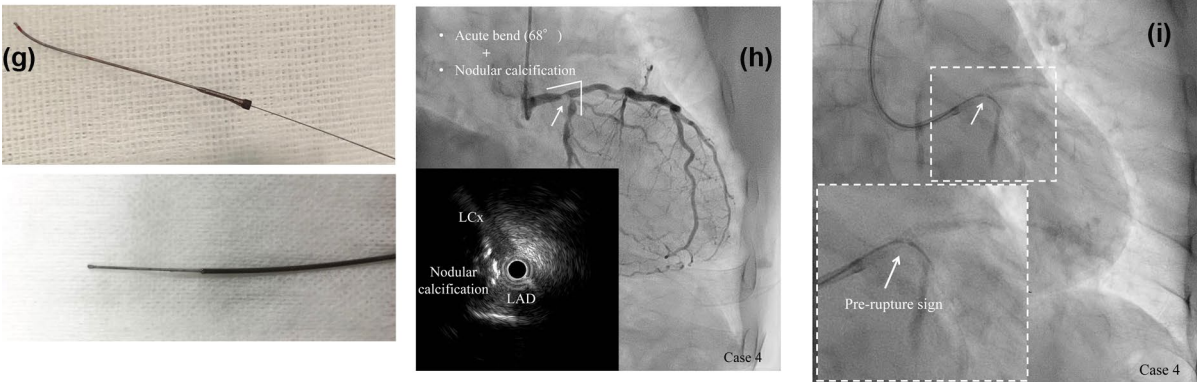
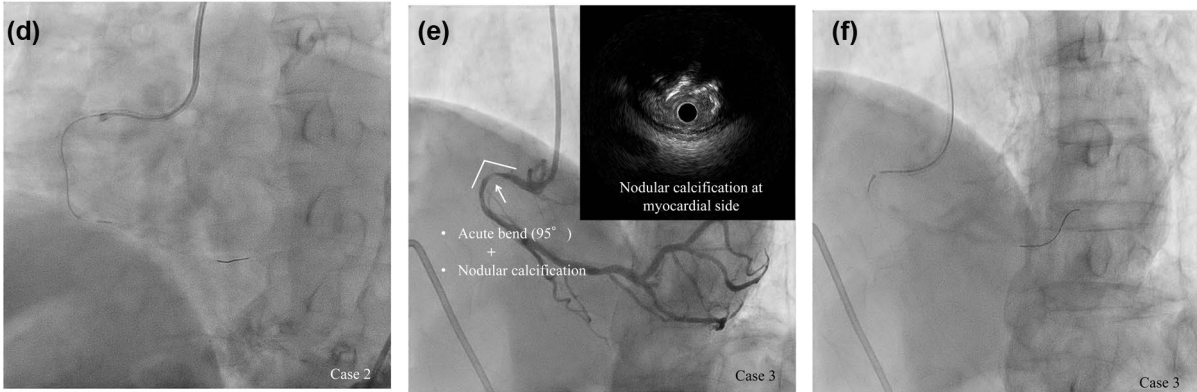
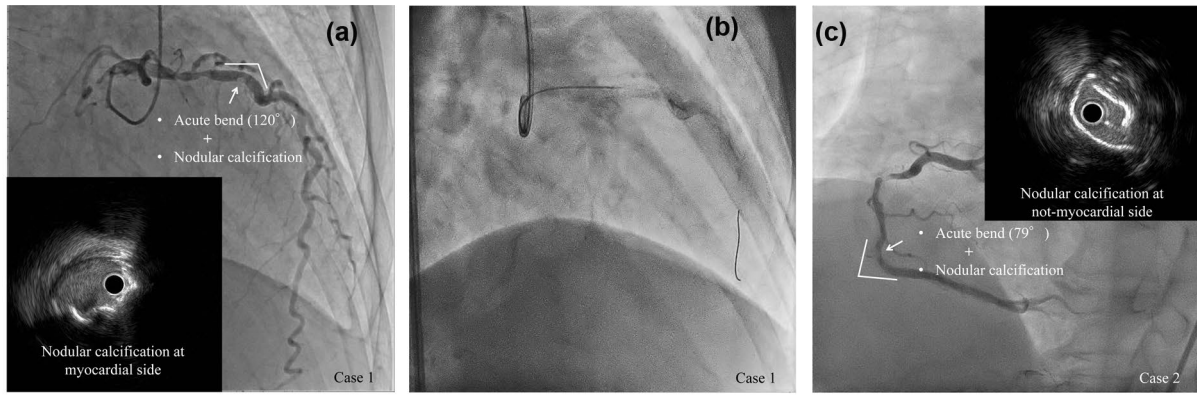


Fig. 1 OAS tip rupture cases and a speculation of this phenomenon. **a** Initial angiogram and IVUS image of case 1 (white arrow points to nodular calcification). **b** Rupture of OAS tip (Case 1). **c** Initial angiogram and IVUS image of case 2. **d** Rupture of OAS tip (Case 2). **e** Initial angiogram and IVUS image of case 3. **f** Rupture of OAS tip (Case 3). **g** Ruptured tip of OAS and its shaft. **h** Initial angiogram and IVUS image of case 4. **i** Radiolucent band reveals pre-ruptured tip of OAS. **j** Pre-rupture of OAS tip (Case 4). **k** Speculation over causes of OAS tip rupture. IVUS, intravascular ultrasound; OAS, orbital atherectomy system

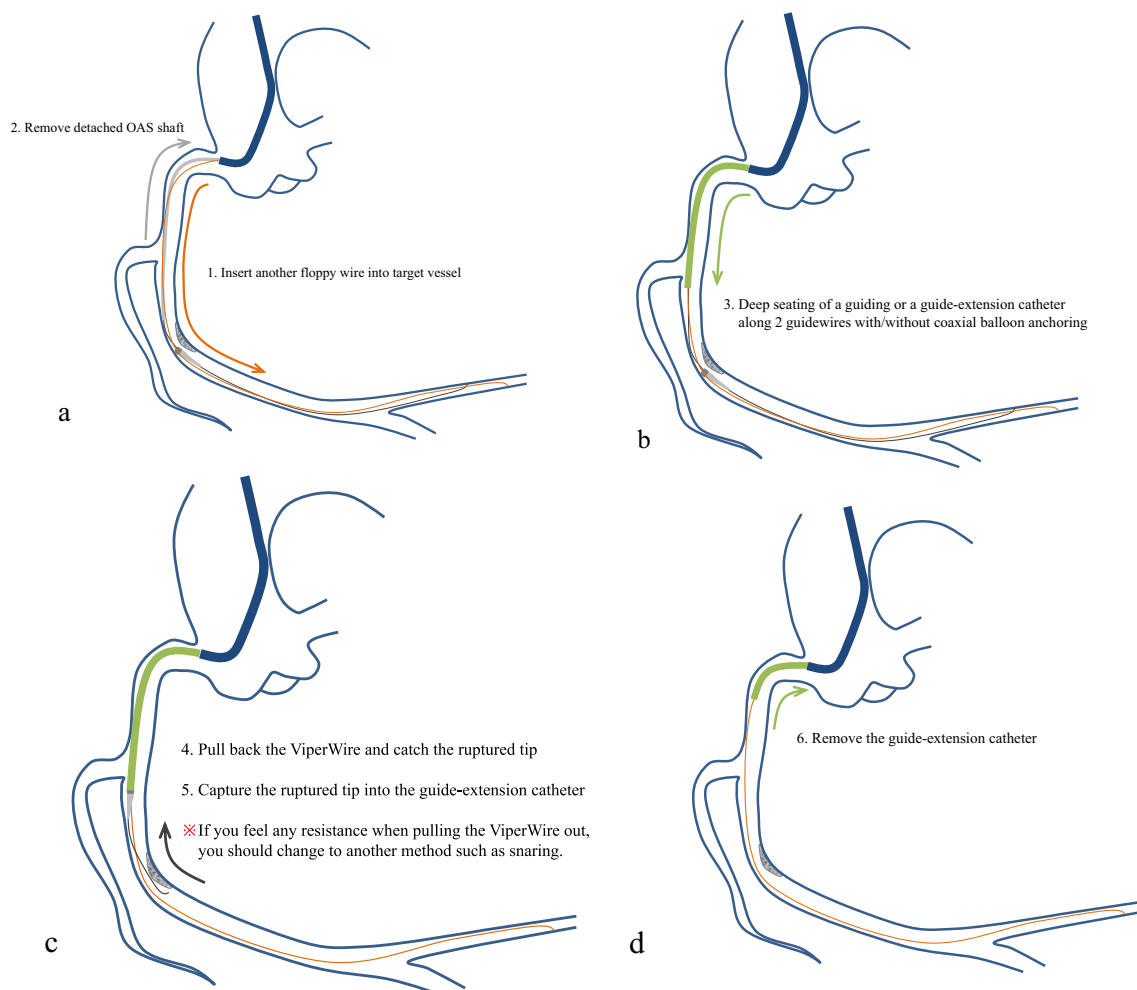


Fig. 2 How to retrieve the ruptured tip. Step 1. Insert another floppy guidewire into the target vessel. Step 2. Remove detached OAS shaft. Step 3. Deep seating of a guiding or a guide-extension catheter along two guidewires with or without coaxial balloon anchoring technique. Step 4. Pull back the ViperWire Advance Flex Tip (Medikit, Tokyo,

Japan) and catch the ruptured tip. Step 5. Capture the ruptured tip into the guide-extension or the guiding catheter. ※If you feel any resistance when pulling the ViperWire out, you should change to another method such as snaring

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Declarations

Conflict of interest The authors have no conflicts of interest to declare.

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