Management of Coronary Artery Aneurysm

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- Aneurysmal dilation of coronary arteries is observed in up to 5% of patients undergoing CAG.

- The presence of coronary aneurysm or ectasia has been associated with poor long-term outcomes.

- A focal dilation of coronary segments of at least 1.5 times the adjacent normal segment is described as CAA, whereas the term CAE is used to define similar, but more diffuse, lesions. CAAs are then divided to saccular aneurysms if the transverse diameter exceeds the longitudinal diameter, and to fusiform aneurysms in the opposite case.

- The RCA is usually the most affected artery (40%) Atherosclerotic and vasculitic CAAs usually affect more than 1 artery, whereas congenital and iatrogenic CAAs are typically confined to a single vessel.

- The strong association between CAA and coronary artery disease implies a possible common underlying etiology. There is a high prevalence of non-coronary aneurysmal disease in patients with

CAA and vice versa, suggesting another mechanism distinct from atherosclerosis that causes generalized arterial dilation.

- Local wall injury following intracoronary manipulation has been shown to provoke the formation of CAA.

- Clinical symptoms can develop due to one of the following reasons:

    - 1) the presence of concomitant obstructive atherosclerotic disease
    - 2) Local thrombosis in the lumen of large aneurysms may lead to distal embolization and myocardial infarction.
    - 3) massive enlargement of some CAAs and SVGAs can result in compression of adjacent structures
    - 4) aneurysm rupture, albeit rare, can cause acute cardiac tamponade and
    - 5) Stress induced myocardial ischemia due to microvascular dysfunction.

- Dilated coronary segment often hamper optimal imaging during angiography. A forceful and prolonged injection may be necessary to avoid misinterpreting slow aneurysmal filling as insitu thrombosis, especially in giant aneurysms. In these cases, IVUS can be extremely helpful.

Management:

- The importance of aggressive risk factor modification in these patients cannot be overemphasized.

- There is no high-quality evidence to support or contradict the use of an escalated antiplatelet or antithrombotic regimen in these patients.

- A recent study suggested a possible advantage of anticoagulation in patients with CAE and acute coronary syndrome. CAE patients who were treated with oral anticoagulation and achieved a time-in-therapeutic range >60%, had 0% occurrence of MACE, compared with 33% in patients not on anticoagulation.

- There may be a potential role for ACEIs in preventing or slowing the progression of CAA, vasodilators such as nitrates have been shown to exacerbate myocardial ischemia in patients with an isolated large CAA or CAE, and therefore their avoidance is recommended.

- Patients who survive STEMI after a PCI of an aneurysmal/ectatic vessel have higher mortality and higher rates of definite stent thrombosis, target vessel revascularization, and MI during intermediate-term follow-up. Due to the higher associated thrombus burden, PCI in ectatic and aneurysmal arteries is frequently aided with thrombectomy and glycoprotein IIb/IIIa inhibitors. The decision to intervene on CAA in patients without acute coronary syndrome is rather complex, due to the lack of supportive data.

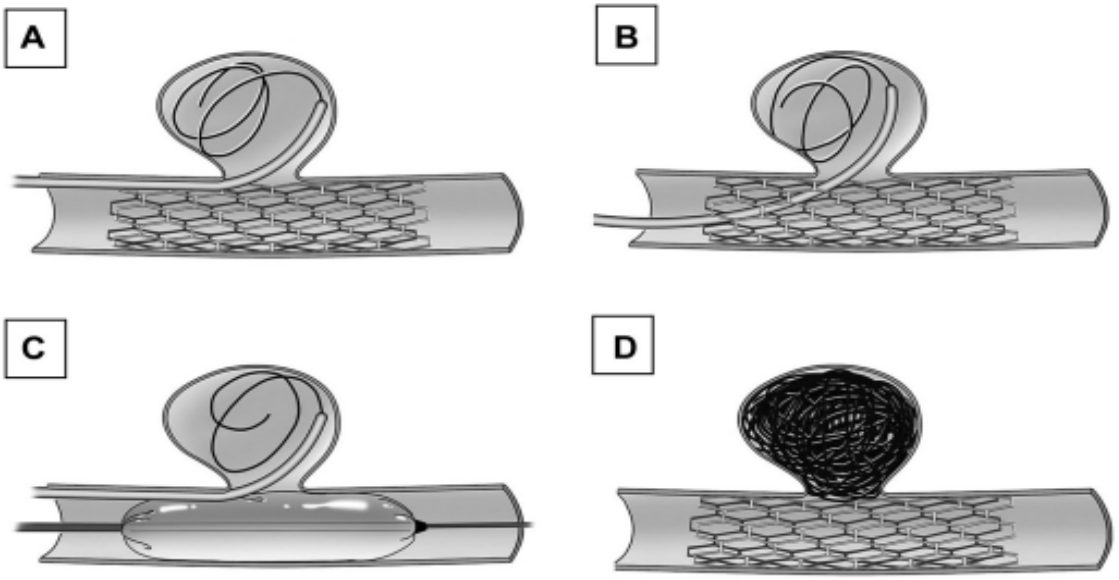
- The treatment modality differs according to the shape and the extent of the aneurysm:
    - 1) saccular aneurysms and small pseudoaneurysms not involving a major side branch can be treated with covered stent exclusion saccular or fusiform aneurysms that involve a major side branch can be treated with balloon or stent-assisted coil embolization, or with surgical exclusion.
    - 2) For CAA involving the left main coronary artery, multiple or giant (>20 mm, or >4reference vessel diameter) CAAs, and for SVGAs, surgical resection is considered the first-line therapy.
    - 3) In patients with large or rapidly expanding SVGAs or in those causing symptomatic external compression, percutaneous closure with Amplatzer occluders or coil embolization with or without PCI of the native grafted vessel is a feasible alternative to surgery.

- Sizing and landing zone assessment: Proper sizing of the CAA is key to reducing the risk of stent thrombosis and stent migration. However, partially thrombosed CAA can result in underestimation of the true size of the aneurysm.

- In such cases where covered stent placement is not possible due to severe tortuosity, calcification, or fear of side branch compromise, the stent-assisted coil embolization technique can be used. A microcatheter is usually placed in the aneurysm before stenting. Coronary stent is then deployed in the aneurysmal segment at low pressure, and coils can then be passed through the microcatheter.

Post-dilation of stent is then performed. Additional coils can be advanced via the stent struts if needed.

FIGURE 7 Illustration of the Stent-Assisted Coiling Technique



(A) A microcatheter is advanced into the aneurysm, jailed by a noncovered stent, followed by coil delivery via the microcatheter. A final post-dilation of the stent is often performed. **(B)** Coils are delivered through the stent struts after initial stent deployment. **(C)** A microcatheter is advanced into the aneurysm, jailed by a coronary balloon, followed by coil delivery via the microcatheter. A noncovered stent deployment usually follows. **(D)** Final result of stent-assisted coil embolization. Reprinted with permission from Spiotta AM, Wheeler AM, Smithason S, Hui F, Moskowitz S. Comparison of techniques for stent assisted coil embolization of aneurysms. J Neurointerv Surg 2012;4:339–44.

FIGURE 6 **A Suggested Algorithm for Management of Patients With CAA**