Editorial: Is there any difference between coronary stent thrombosis and peripheral arterial stent thrombosis?

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Coronary late stent thrombosis following drug-eluting stent (DES) implantation is one of the concerns in percutaneous coronary intervention [1]. Late stent thrombosis is more frequently observed in the first-generation DES such as the sirolimus-eluting stent (Cypher, Cordis Corp., Miami Lakes, FL, USA) and paclitaxel-eluting stent (Taxus, Boston Scientific, Natick, MA, USA) as compared to the second-generation DES such as the everolimus-eluting stent [2,3]. Furthermore, mechanism of stent thrombosis is different between the sirolimus-eluting stent and paclitaxel-eluting stent [4]. Human autopsy studies revealed that hypersensitivity reaction was the unique cause of late stent thrombosis with sirolimus-eluting stents, whereas excessive fibrin accumulation was mainly observed in paclitaxel-eluting stents [4]. On the other hand, there are few reports regarding human pathology of late stent thrombosis following DES implantation in peripheral artery disease.

In this issue of Journal of Cardiology Cases, Soga et al. report a case of late stent thrombosis after paclitaxel-eluting stent implantation for superficial femoral artery disease [5]. Their stents were self-expandable nitinol stents with 3 μg/mm² polymer-free paclitaxel coating on the outer surfaces (Zilver PTX, Cook Medical, Bloomington, IN, USA) [6]. The main difference between Taxus and Zilver PTX is the presence of polymer, which can induce prothrombotic environment leading to late stent thrombosis [7,8]. Therefore, polymer-free Zilver PTX is considered to be safe for peripheral artery disease [9]. Also, the randomized clinical trial showed superiority of Zilver PTX over percutaneous transluminal angioplasty and provisional bare-metal stent placement [10]. Nevertheless, the pathology of stent thrombosis in their report is similar to the pathology of Taxus stent thrombosis, showing excessive fibrin accumulation around stent struts (Fig. 1) [4]. Excessive fibrin accumulation causes stent malapposition and delayed arterial healing, leading to stent thrombosis. Furthermore, their case had developed stent thrombosis under the continuation of dual-antiplatelet therapy and anticoagulation therapy (prothrombin time-international normalized ratio = 3.13).

Being “polymer-free” may not be enough to prevent stent thrombosis, because paclitaxel itself can prevent arterial healing. Paclitaxel has a dose-dependent inhibitory effect on human arterial smooth muscle cell, and the antiproliferative potential of paclitaxel is sustained over 14 days even after a brief single contact (20 min) [11]. Although Dake et al. reported that the local paclitaxel levels in the arterial wall can be sustained for 56 days in normal porcine arteries [9], there are no data regarding the local paclitaxel levels in the human atherosclerotic arterial wall in the chronic phase. The pharmacokinetics of local paclitaxel in atherosclerotic human arteries would be different from that in normal porcine arteries. Moreover, vascular endothelial cells normally provide an efficient barrier against thrombosis, lipid uptake, and inflammation, whereas endothelium that has regenerated after stent implantation, especially DES, is incompetent in terms of its integrity and function, with poorly formed cell junctions, reduced expression of antithrombotic molecules, and decreased nitric oxide production [12].

As compared to stent thrombosis in coronary artery disease, detection and diagnosis of stent thrombosis in peripheral artery disease would be more difficult. While probable, possible, and definite coronary stent thrombosis are classified based on the Academic Research Consortium criteria [13], there are no standard criteria regarding stent thrombosis in peripheral arterial disease. In addition, pathological assessment of stent thrombosis is rarely performed, because retrieving stented segments can be done only when the patient’s limb was amputated. The case report by Soga et al. is valuable to help vascular interventionists to understand the underlying pathophysiology of stent thrombosis in superficial femoral artery disease. Excessive fibrin accumulation around stent struts caused by polymer-free Zilver PTX stent was similar to the pathology of coronary stent thrombosis by Taxus stent.
Disclosures

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