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Incidence, predictive factors, and clinical impact of stent recoil in stent fracture lesion after drug-eluting stent implantation

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ABSTRACT

Background: Stent fracture (SF) after drug-eluting stent (DES) implantation was reported to be associated with target lesion revascularization (TLR). We have noted abnormal late acquired stent axial deformation in lesions after DES implantation, especially in SF lesions, and defined it as stent recoil (SR). We evaluated the incidence, predictive factors, and clinical impact of SR in SF lesions.
Methods: Between 2003 and 2012, 5456 patients (11,712 lesions) underwent DES implantations and follow-up angiography within one year after the index procedure. SR was defined as an axial recoil deformation less than 80% of the stent diameter and SF was defined as the separation of stent segments or stent struts. SF and SR were confirmed by follow-up angiography. The primary endpoint was defined as clinically driven TLR.
Results: SF was observed in 494 lesions (4.2%) and SR in 138 of SF lesions (27.9%). According to multinomial logistic regression analyses, severe calcification and ostial lesion in the right coronary artery were stronger predictive factors of SF with SR lesions. The cumulative incidences of any and clinically driven TLR at 5 years were both significantly higher in the SF with SR group than in the SF without SR group (51.7% versus 35.0%, $P < 0.001$; 22.2% versus 12.8%, $P = 0.019$; respectively).
Conclusions: SR in SF lesions after DES implantation could be related to the lesion characteristics. SF with SR was highly associated with subsequent TLR compared with SF without SR.

1. Introduction

Drug-eluting stents (DES) significantly reduce the rates of in-stent restenosis (ISR) and subsequent target lesion revascularization (TLR) compared with bare-metal stents [1]. However, the widespread use of DES in percutaneous coronary intervention (PCI) on larger numbers of patients with more complex lesion characteristics led to various ISR-provoking problems, one of which is a mechanical complication known as stent fracture (SF). The incidence of SF after first generation DES implantation was reported to range from 0.84% to 7.7% [2–4], and SF has become a critical issue because of its potential association with ISR, TLR, and stent thrombosis (ST) [5,6]. The use of second generation DES was recently reported to reduce the incidence of SF; however, when SF occurred, it was associated with a higher rate of major adverse cardiac events [7,8]. Furthermore, chronic stent axial deformation, another relatively rare mechanical complication, can be observed following neointimal hyperplasia, and this deformation contributes to late luminal loss [9,10]. In our clinical practice, we have noted that in some angiographies, an abnormal late acquired stent axial deformation, especially in SF lesion after DES implantation, and defined it as stent recoil (SR). In the current study, we investigated the incidence and predictive factors of SR in SF lesions after DES implantation. Furthermore, we compared the difference in the clinical outcomes between SF lesions with and without SR after DES implantation.

2. Methods

2.1. Patient population

Between July 2003 and November 2012, we performed PCI with DES for 6173 consecutive patients with 14,395 lesions. Among them, 5456 patients (88.4%) with 11,712 lesions underwent follow-up angiography within one year after the index procedure. Deployed DES were CYPHER (sirolimus-eluting stent, Cordis, Johnson & Johnson, Miami, Florida, USA), TAXUS (paclitaxel-eluting stent, Boston Scientific, Natick, Massachusetts, USA), Endeavor (zotarolimus-eluting stent, Medtronic, Santa Rosa, California, USA), XIENCE (everolimus-eluting stent, Abbott Vascular, Santa Clara, California, USA), BioMatrix (biolimus-eluting stent, Biosensors, Morges, Switzerland), Nobori (biolimus-eluting stent, Terumo, Tokyo, Japan), and PROMUS Element (everolimus-eluting stent, Boston Scientific) stents. We enrolled 446

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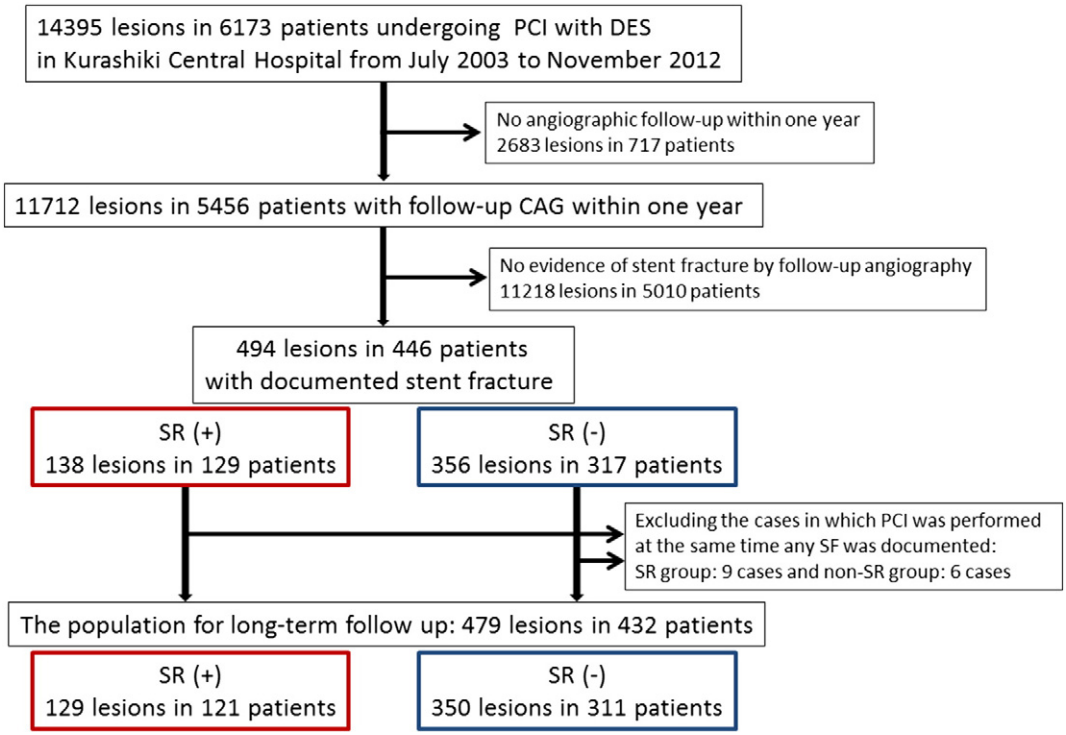

Fig. 1. Study flow chart. CAG, coronary angiography; DES, drug-eluting stent; PCI, percutaneous coronary intervention; SF, stent fracture; SR, stent recoil.

patients with 494 SF lesions in this retrospective single-center study. We excluded cases in which SF was documented and emergency PCI was performed from long-term clinical follow-up, so as not to become a cross-sectional study. The study flow chart in Fig. 1 describes the selection procedure of the study sample. The study was done in accordance with the provisions of the Declaration of Helsinki and the guidelines for epidemiological studies issued by the Ministry of Health, Labor, and Welfare of Japan. Informed consent was provided for both

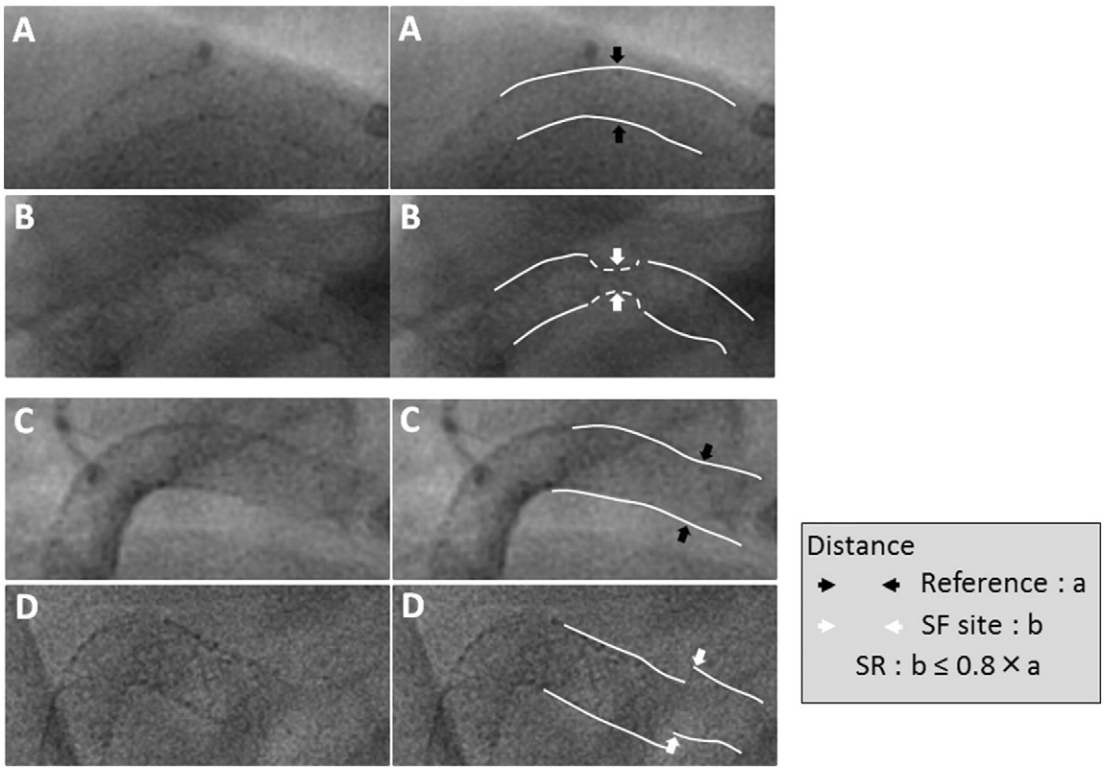

Fig. 2. The definition of SF with SR and SF without SR by coronary angiography. (A) Final angiography after successful deployment of a TAXUS paclitaxel-eluting stent at the proximal RCA. B) Follow-up angiography after DES implantation. SF with SR at the stent mid-portion is confirmed. (C) Final angiography after successful deployment of a CYPHER sirolimus-eluting stent at the proximal RCA. (D) Follow-up angiography after DES implantation. SF without SR at the stent proximal-portion is confirmed. SF, stent fracture; SR, stent recoil; RCA, right coronary artery; DES, drug-eluting stent.