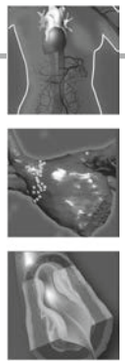

Can the restenosis benefit of drug-eluting and bare-metal stents be predicted?

Evaluation of: Yeh RW, Normand SL, Wolf RE *et al.* Predicting the restenosis benefit of drug-eluting versus bare-metal stents in percutaneous coronary intervention. *Circulation* 124(14), 1557–1564 (2011). Drug-eluting stents (DES) reduce restenosis rates. However, there is the need for prolonged (1 year) dual antiplatelet therapy (DAT). Also, concerns have been raised regarding the higher risk of stent thrombosis, especially with the first-generation DES. Therefore, physicians and interventional cardiologists should select the use of DES or bare-metal stents (BMS), by assessing the risk of restenosis, bleeding associated with prolonged DAT and stent thrombosis in each patient. Yeh *et al.* propose a model predicting target vessel revascularization risk, which include only 3 factors: diabetes mellitus, lesion/stent length and vessel/stent diameter. A target vessel revascularization rate with BMS of <11% is associated with an increase in society-based costs to prevent one repeat procedure of more than US$10,000 and would not be considered a cost–effective use of DES. In the present study, >45% of patients had a predicted rate of restenosis with BMS that was less than this threshold, 78.6% of whom received DES.

KEYWORDS: coronary intervention ■ outcome ■ predictors ■ restenosis ■ stent

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Drug-eluting stents (DES) reduce restenosis rates and improve outcomes for patients with coronary artery disease treated with percutaneous coronary intervention (PCI) [1–3]. Concerns have been raised over the higher risk of stent thrombosis (ST), especially with the first-generation DES [4–6]. The restricted duration of dual antiplatelet therapy (DAT; less than 6 months) in early trials has been associated with the reported increased risk of death [7]. This forced physicians to prolong DAT for at least 12 months. Data from registries and meta-analyses have indicated that there is no difference in the risk of early (<30 days) and late (>30 days, <365 days) ST between DES and bare-metal stents (BMS), but an excessive risk emerges after 1 year of follow-up (very late ST) [3,6,8,9]. DAT with clopidogrel and aspirin substantially reduces the risk of ST. However, a low efficacy of antiplatelet therapy has been reported due to:

- Low response to clopidogrel;
- Poor patient compliance [10–12].

The need for nonthrombogenic or safer stents has caused the development of the second-generation DES, where much more attention has been paid to the polymer and the kinetics of drug release. Lately, the stent platform has experienced a renewed interest [13,14].

In order to clarify whether DES should be liberally implanted or, on the contrary, they should be selected for a subgroup of patients, Yeh *et al.* developed and validated a model to predict target vessel revascularization (TVR) [15]. In a large statewide registry (National Cardiovascular Data Registry) of 27,107 patients undergoing PCI, Yeh *et al.* found that TVR at 1 year occurred in 6.7% of patients treated with DES and 11% of patients treated with BMS. The absolute TVR reductions associated with DES use ranged from 1.2 to 15.9%, with an interquartile range of 3.5–6.3%. The predicted number needed to treat (NNT) to prevent one TVR with DES compared with BMS ranged from six to 80 patients, depending on the clinical and angiographic characteristics. Similar results were observed for the nonangiographic model, with the NNT ranging from eight to 61 patients. The proposed model predicting TVR risk included only 3 factors: diabetes mellitus, lesion/stent length and vessel/stent diameter. This model provides the opportunity to prospectively indentify and use DES in patients who stand to derive greater benefit from DES, while considering BMS in patients with low anticipated benefit. When the risk of restenosis with BMS is ≤10%, the NNT exceeds 25. Prior economic analyses have suggested that a TVR rate with BMS of <11% is associated with an increase in society-based costs of more than US$10,000

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to prevent one repeat procedure and would not be considered a cost–effective use of DES [16]. In the present study, >45% of patients undergoing PCI had a predicted rate of restenosis with BMS that was less than this threshold, 78.6% of whom received DES. This result should be analyzed in the context of the risk for bleeding associated with prolonged DAT and ST. Although this model may help physicians in stent selection, we should highlight some important aspects:

- DES and BMS in this study have been analyzed together (as a group). However, several data support the potential differences between different BMS [13] and DES [6,17,18]. In particular, second-generation DES showed a strong antirestenotic power and a low risk of ST [19,20]. Studies performed with optical coherence tomography suggest the extent and time for re-endothelialization is quite different between first- and second-generation DES [21];
- Stent implantation technique has an important role. Recent data suggest that intravascular ultrasound-guided stent implantation allows operators to achieve a larger final minimal lumen diameter [22];
- DAT has an important role in preventing ST and future adverse cardiac events after PCI. Several studies have demonstrated that a proportion of patients are low-responsive to clopidogrel, implying a high on-treatment residual platelet reactivity [23]. This high residual platelet reactivity has been associated with a higher rate of ST. The availability of point-of-care tools and new drugs may impact future approaches in DAT in patients after PCI [23].

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Executive summary

- Although drug-eluting stents (DES) are more effective than bare-metal stent (BMS) in reducing restenosis rate, there is the need for a prolonged dual antiplatelet therapy.
- Furthermore, concerns have been raised on the higher risk of stent thrombosis after DES implantation.
- Debate exists whether DES should be used liberally or, on the contrary, they should be implanted only in patients at high risk for restenosis with BMS. This may have important clinical and economic impacts. Indeed, DES are more expensive than BMS.
- Yeh *et al.* propose a model predicting target vessel revascularization risk, which include only 3 factors: diabetes mellitus, lesion/stent length and vessel/stent diameter. In this model, a target vessel revascularization rate with BMS of <11% is associated with an increase in society-based costs of more than US$10,000 to prevent one repeat procedure and would not be considered a cost-effective use of DES.

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