Introduction
Everolimus-eluting bioresorbable vascular scaffolds (BVS) represent a novel treatment option for coronary artery disease (CAD). Initial and recent clinical results have been promising, although late lumen loss seems to be somewhat higher with BVS compared to everolimus-eluting cobalt chromium stents. In stable patients free of complex coronary lesions, clinical events reported for BVS at six and 12 months resemble those seen with modern drug-eluting stents (DES). Thus, while the short-term efficacy and safety of BVS seem to be comparable with modern DES, they may ultimately prove safer. More physiologic vessel healing may translate into decreased rates of late complications such as neoatherosclerosis, late acquired malapposition or very late stent thrombosis due to uncovered stent struts. Undoubtedly, BVS have different handling and mechanical properties than current DES. Advanced intravascular imaging modalities such as optical coherence tomography (OCT) can provide important insights into the specific properties of BVS, and thus facilitate their use. The use of OCT pre- and post-implantation of BVS as well as in long-term follow-up will be reviewed in this paper.

OCT in Pre-implantation Planning
BVS struts (e.g., 156 μm) are approximately two thirds thicker than those of modern DES. The ring structure of a BVS stent is also up to 30 % tighter. These differences make deliverability and side branch management more challenging. In addition, the possibility to overexpand BVS is limited, necessitating more precise device sizing compared with DES. Therefore, a special focus should be placed on the assessment of vessel calcification with BVS procedures. The presence of circumferential calcium but also focal calcium spots usually deserves special consideration with regard to vessel preparation (e.g., the use of rotational atherectomy, scoring balloons). The use of metal stents should also be considered, especially if OCT reveals significant remaining calcium bridges after vessel preparation. In the presence of larger calcium deposits, pronounced recoil or inadequate device expansion is more common in BVS compared with DES (see Figure 1). In some cases these problems can only be fixed with the use of an additional metallic stent (stent in BVS).

Figure 1: Suboptimal Bioresorbable Vascular Scaffold Expansion in a Calcified Lesion

With its ability to provide exact and automatic measurement of lesion length and vessel size, OCT can aid in optimising the use of BVS. Overexpansion of BVS is limited compared with modern DES. Based on the authors’ experience, it is possible to dilate a modern DES stent 1.0–1.5 mm over the specified diameter. However, a BVS can only be dilated 0.5–0.8 mm over the specified diameter. Exceeding these limits increases the risk of ring fractures with consecutive strut protrusion and reduced radial strength, potentially triggering late complications such as stent thrombosis or target vessel restenosis. In regards to the choice of stent length, BVS provides a new rationale for more complete plaque sealing especially in the presence of a thin-cap fibroatheroma at the site or edges of haemodynamically significant lesions (see Figure 2). More precise knowledge of the lesion length can aid in the process.
OCT can also be used to compensate for difficulties in accessing side branches when using BVS. When using BVS, it seems advisable to have a closer look at the plaque characteristics near the origin of important side branches and to consider additional preparation or strategy adjustments. OCT, which enables near histologic plaque characterisation, can be used to assess side branches prior to BVS placement.

**OCT in Post-implantation Assessment**

Post-implantation follow-up of BVS necessitates unique considerations for which OCT may be particularly advantageous. Because more intensive lesion preparation is usually required when using BVS, special attention is required to avoid inducing vessel complications such as residual edge dissections outside the scaffold (see Figure 3) or intrascaffold dissections with propagating intramural haematoma, which can potentially lead to improper BVS expansion (see Figure 4). In cases where side branch intervention is necessary after BVS implantation, stent apposition should be carefully determined. Guidewire manipulation with many of the currently available workhorse guidewires is more challenging with BVS than with DES. Reentering the side branch between the BVS and the vessel wall instead of through a BVS cell may occur. In addition, special caution should be taken in case of possible strut fractures.

Since the usual metallic strut shadows are not present with BVS, stent apposition can be assessed easily with OCT (see Figure 5). Although the conformability of BVS is usually excellent, the trade-off is that of somewhat reduced radial expansion, especially in areas of focal resistance such as calcium spots. The usual formula used to determine adequate DES gross-expansion (minimal lumen area > 90% of the reference vessel area) does not work in the case of BVS. Instead, we propose use of the radial diameter ratio at the site of minimal BVS expansion as a potential marker for uniform radial expansion.
expansion. Due to the tighter ring structure of BVS compared with modern DES, the problem of plaque prolapse should be essentially the same or even less pronounced with BVS. However, if large residual thrombi or plaque tissue is visible with OCT, post-dilatation is advisable to avoid acute or subacute stent thromboses.

**OCT in Long-term Follow-up**
The optimal duration of dual antiplatelet therapy after BVS implantation has yet to be determined. There are no data demonstrating that dual antiplatelet therapy can be shortened to three months, as is the case with newer generation DES. Thus, in addition to routine assessment, follow-up of BVS should include OCT evaluation of the percentage of covered struts, the extent of neointima formation and examination of potential recoil patterns. These assessments can serve to increase the knowledge of the long-term performance of this new device and to better define its role in modern percutaneous coronary intervention.

**Conclusion**
With its unique high image resolution capabilities, OCT can be used to reliably evaluate vessel and lesion-characteristics both pre- and directly after BVS implantation, as well as during long-term follow-up. This information can help us to improve BVS implantation and to better understand the potential advantages and limitations of this promising device.

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<th>Summary of Key Findings</th>
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<tr>
<td>• BVS have different handling and mechanical characteristics versus current DES.</td>
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<td>• With its high resolution and ability to characterise plaque, OCT can facilitate the use of BVS.</td>
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<td>• Overexpansion of BVS is limited compared with DES. OCT can be used to precisely measure the lesion length and vessel size.</td>
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<td>• Proper vessel preparation is important to the successful use of BVS. OCT can be used to assess side branches and plaque characteristics near the origin of important side branches in order to aid in decisions on the necessity of further vessel preparation.</td>
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<tr>
<td>• Metallic shadows are not present with BVS. OCT can be used to easily assess stent apposition, possible strut fractures, residual thrombi and plaque prolapse during post-implantation assessment.</td>
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<tr>
<td>• OCT can be used during long-term follow-up to assess strut coverage, neointima formation and recoil patterns.</td>
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