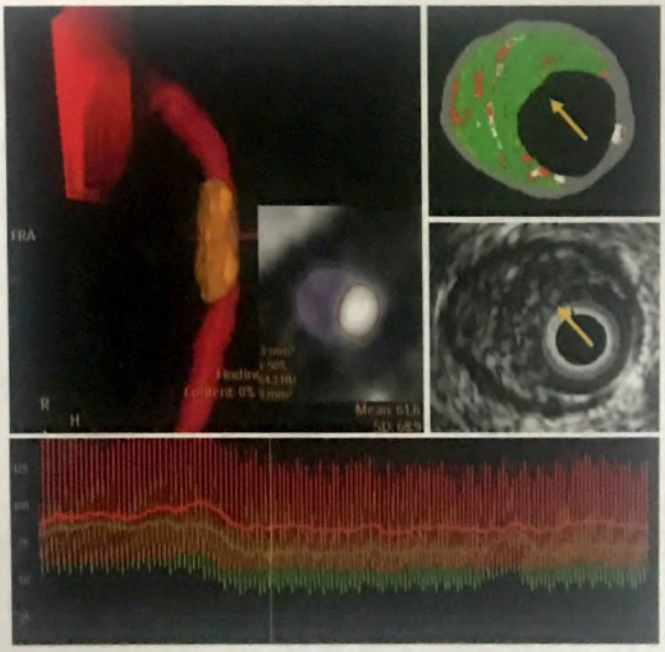
EuroIntervention textbook series

CORONARY STENOSIS
IMAGING, STRUCTURE AND PHYSIOLOGY



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Website exclusive contents: images and/or videos

CHAPTER 34

Coronary stenosis in transplant graft vasculopathy

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This chapter includes accompanying supplementary data published at the following website:
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Summary

After a few initial years of disappointing results, human heart transplantation (HTx) became a well established therapy for end-stage cardiac disease in Western countries. According to the Registry of the International Society for Heart and Lung Transplantation (ISHLT), more than 85,000 procedures have been performed worldwide from 1982 to 2009 with results in terms of survival and quality of life that exceed by far those of other therapies available at the time. However, a quarter century later, we must admit that the clinical course of HTx recipients is not comparable to that of the general population, and only half of them are alive 10 years after the procedure [1]. Many advances have been achieved in the clinical management of these patients over the last decades. In fact, episodes of acute cellular rejection and opportunistic infections are nowadays much less frequent and lethal than they were twenty years ago. However, three complications of HTx are still frequent and cause significant lethality: primary graft failure remains the main cause of death during the early post-transplant period, while cardiac allograft vasculopathy (CAV) and malignancy occur in the late follow-up. Generally speaking, CAV is the main cause of morbidity and mortality among 1-year survivors after HTx, thus constituting one of its major limitations.

Basic concepts in cardiac allograft vasculopathy

In simple terms, CAV is the disease that affects the vessels of the transplanted heart. Obvious as it may seem, this definition was not always accepted, since some authors tried to differentiate between atherosclerotic plaques (either "imported" with the graft at the time of HTx or acquired thereafter) and transplant vasculopathy characterised by the growth of the intimal layer. Nowadays, we tend to think that there exists only one CAV with at least three components that interact in a dynamic way over time: atherosclerotic lesions, progressive growth of the intima and other layers of the vascular wall, and vascular remodelling (change in the external dimensions of the vessel in response to different stimuli), the importance of which was evidenced in serial intravascular ultrasound studies [2-5].

The above comment refers to epicardial coronary arteries, more accessible for decades to anatomical and physiological studies. However, the involvement of other vascular compartments such as intramyocardial arteries, arterioles or capillaries, which not always develop at the same time as proximal artery disease, is the rule in CAV. Microvascular involvement has become more and more evident as new tools for its study have become available. In some cases, microvascular disease leading to severe graft failure is the only expression of CAV. For this reason we must keep an open mind in order to incorporate the knowledge derived from the use of new technologies for microvascular study [6-8].

We can certainly say that, from the middle of the twentieth century, Western countries are living an "atherosclerosis era". This disease is so prevalent that its origin, risk factors, symptoms, consequences and prevention are well known not only to health workers, but also among the general population. Therefore, the characteristics of graft vessel disease are best described by a comparison between CAV and atherosclerotic disease [9]. We will discuss different aspects of CAV from this perspective, which is summarised in **Table 1**.

Temporary course

Atherosclerosis usually requires several decades for its maturation, from the initial signs (fatty streak) in the second decade of life to the development of advanced obstructive lesions causing symptoms in the fifth and following decades. As an average, atherosclerotic disease in women shows a delay of approximately 10 years as compared with males. In contrast, intimal growth may be already evident in the first months after transplantation, and by 1 year, up to 75 % of the patients show some degree of CAV [10]. Obstructive coronary lesions and their clinical consequences are fully developed 10 to 15 years after HTx in most cases. While atherosclerosis is a typical "degenerative" disease whose prevalence increases with age in the general population, CAV develops more frequently in young adults [11], although