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Iatrogenic Coronary Fistula in Post Transplant Patients: Pathogenesis, Clinical Features and Therapy

S. Gasser, R. Gasser, N. Bareza, W. Klein

Iatrogenic coronary artery fistulae in post transplant patients occur in approximately 8 % of cases. This aspect of posttransplant complication has received little attention so far and there is no review in all the literature which focuses on this particular aspect. The impact of such coronary fistulae on NYHA stage and life expectancy seems to vary considerably and quite likely depends on the type of fistula, its site of drainage, its shunt volume and other preexisting cardiac conditions like coronary artery disease or congestive heart failure. The observation that the life-span is generally shortened in patients with congenital coronary fistulae argues in favour of closing post-endomyocardial biopsy fistulae. The additional risk of decreased LV ejection fraction resulting from rejection would also support this approach. The fact that coil embolisation is successful, simple and complications have not been reported in literature would suggest this method as an appropriate means, especially if an obviously large flow into the right ventricle is seen. Here, we try to summarize the cases reported in literature and look at this feature of cardiac transplantation under the particular aspect of treatment options. *J Clin Basic Cardiol 2003; 6: 19–21.*

Key words: heart, transplantation, coronary fistula, coil embolisation

T he first description of anomalous coronary arteries with fistulae derives from the Austrian anatomist Hyrtl and dates back to 1841 [1]. As can be seen, this theme has not lost any of its actuality since (eg [2–4]). While various types of congenital coronary artery fistulae constitute a common anomaly in patients and are frequently seen in diagnostic angiography, iatrogenic coronary artery fistulae can be regarded as a rather rare complication of endomyocardial biopsy [5–7], PTCA [8], mitral valve replacement [9, 10] and may also occur spontaneously [11].

Secondly, coronary artery fistulae to endomyocardial biopsy occur in 8 % of transplant patients, while such fistulae are only seen in 0.2 % of the general population [5, 12, 13]. However, we do not know the outcome of these iatrogenic coronary fistulae in transplanted patients. There is not enough data available, demonstrating the effect on left ventricular function and prognosis *quod ad vitam*. Conclusiveness of data in this context is difficult to reach since enhanced progression of arteriosclerosis and the effect of chronic rejection cannot be excluded.

Degradation of left ventricular ejection fraction due to wall motion disturbances may occur in this context. The reason for this could be a steal-effect and chronic ischaemia in those areas which are supplied by the part of the artery which is distal to the insertion of the fistula. However, such a local disturbance in wall-motion could be a form of hibernating myocardium. Alternatively, chronic myocardial ischaemia together with a moderate rejection could enhance the local loss in wall contractility.

Clinical Features

Simple auscultation at regular intervals using a stethoscope [14], especially weeks or even months after endomyocardial biopsy certainly constitutes a practical means of identifying this particular complication of endomyocardial biopsy. Murmurs arising from coronary fistulae are usually continuous and more pronounced during systole than during diastole and sometimes may entail a thrill. The site of maximal intensity of the murmur is related to the site of drainage and usu-

ally is different from the second left intercostal space – the classic site of the characteristic murmurs of persistent ductus arteriosus – except when the fistula drains into the pulmonary artery or the right ventricle [1]. In the latter situation the murmur is louder in diastole because of compression of the fistula by contracting myocardium [12]. The sudden occurrence of this particular pattern of murmur is practically diagnostic for iatrogenic post-biopsy fistulae.

Colour-flow Doppler echocardiography may provide additional evidence for iatrogenic fistula in transplant patients. Figures 1 and 2 demonstrate such an iatrogenic fistula as seen in a patient after cardiac transplantation [15–18]. Transesophageal echocardiography may serve as an additional diagnostic tool in this context [9, 19]. Coronary angiogram, LV-laevogram (Fig. 3), as well as left and right ventricular catheterisation will supply additional information concerning the source of the fistula (LAD, LCX, RCA), the degree of opacification



Figure 1. Transthoracic echocardiographic image of the right ventricle (RV) and the huge, dilated left coronary artery (left anterior descending branch; LAD) in a post transplant patient suffering from left coronary artery fistula into the right ventricle

From the Department of Cardiology, University of Graz, Austria

Correspondence to: Prof. Robert Gasser, MD, PhD, Medizinische Universitätsklinik, Auenbruggerplatz 11, A-8036 Graz, Austria; e-mail: robert.gasser@uni-graz.at

of the right ventricle as well as the shunt volume, oxygen saturation, etc. This information will be of significant value in deciding which therapeutic option to choose. Figure 3 shows such a typical angiogram of a long term persisting fistula deriving from the anterior descending branch of the left coronary artery, entering the right ventricle.

Therapeutic Strategies

Local diminution of contractile force suggests that at least under certain circumstances, which cannot always be clearly predicted, fistulae arising from endomyocardial biopsy could lead to haemodynamically unfavourable effects. The latter could possibly be avoided through timely correction.



Figure 2. Post biopsy coronary fistula in a cardiac transplant patient. Colour flow imaging shows the drainage through the fistula into the right ventricle (white area above arrow which indicates insertion of the fistula). Transthoracal echocardiography constitutes an easily applicable means for the detection of post-biopsy coronary fistulae in transplant patients.



Figure 3. Dilated left anterior descending branch with small aneurysm and preinsertion stenosis draining into the right ventricle; the intensive flow through the fistula can be derived from a marked opacification of the right ventricle

Approaches

Regular Observation Without Intervention

Pande et al. [20] suggest that the haemodynamic significance of such fistulae is rather negligible and does not warrant any treatment. Sandhu et al. report of a follow up of 11 such fistulae, 3 became larger, 3 remained unchanged, 2 became smaller and 3 had resolved [5]. During a mean follow up of 28 months no complications of these fistulae were observed. This "wait and see strategy" is supported by numerous other authors (eg [21]) like Lefevre [22] who demonstrates that the shunt is negligible and has no haemodynamic consequences.

Percutaneous Transluminal Closure

Observations regarding a steal phenomenon [23], as well as reports on sudden cardiac deaths [24, 25] and myocardial infarction [17] in patients with congenital coronary artery fistulae give rise to the idea that closure of the latter would be beneficial. Coil embolisation of a coronary artery fistula in a post-transplant patient [26] led to an improvement of the patient's symptoms. Similar data have been reported on other occasions [26–29]. Coil embolisation has proven to be a safe and successful therapy for post-biopsy coronary fistulae and was generally accompanied by an improvement of symptoms. A similar approach was presented by Hartog [30], who closed such a fistula successfully with a detachable balloon.

Surgical Interventions

Uchida and colleagues [31] described a direct closure of the fistula with simultaneous coronary artery bypass grafting from the proximal to the distal LAD, which alleviated the patient's symptoms. Further surgical approaches in order to close coronary artery fistulae are described by other authors [4, 32–34].

Conclusion

There is no sufficient data in order to favour any of these approaches. The impact of coronary fistulae on NYHA stage and life expectancy seems to vary considerably and quite likely depends on the type of fistula, its site of drainage, its shunt volume and other preexisting cardiac conditions like coronary artery disease or congestive heart failure etc. One endpoint in the quality of life scale may be marked by an example of an asymptomatic marathon runner with a large coronary fistula between the left main coronary artery and the right atrium which we recently reported [2]. The other endpoint may be constituted by congestive heart failure [26] or sudden cardiac death [4, 25]. Under certain circumstances, a degradation of left ventricular function and congestive heart failure may occur. The observation that the lifespan is generally shortened in patients with congenital coronary fistula [24, 34] argues in favour of closing post-endomyocardial biopsy fistulae. The additional risk of decreased LV ejection fraction resulting from rejection would also support this approach. The fact that coil embolisation is successful, simple and complications have not been reported in literature would suggest this method as an appropriate means, especially if an obviously large flow into the right ventricle is seen [22]. Since we cannot expect statistically relevant data on this subject in the near future, we will have to take decisions following common sense rather than evidence based medicine.

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