APPENDIX. CONFERENCE DISCUSSION

Dr M. Kostelka (Leipzig, Germany): I commend you for your courage in using a new product designed for a completely different purpose, but which works well.

My first question is, what are your indication criteria because you have patients with a moderate stenosis and moderate insufficiency, a mean of 1.8 and a mean gradient of 54?

Dr Nosál: Typically our patients have a mixed aortic valve pathology, so the median aortic insufficiency at the time of indication is around 2 with a gradient of 55. If we have a patient with an isolated stenosis, the indication is based on the gradient across the aortic valve and on the progression of the left ventricular hypertrophy. On the other hand, in a patient with pure aortic insufficiency, the indication is based on the amount of insufficiency and the progression of left ventricular end systolic diameter on echocardiographic measurement.

Dr Kostelka: Do you have any proof that the mechanical characteristics of this very tiny, awkward 1 mm membrane are superior to autologous pericardium? Did you test it in vitro in any way?

Dr Nosál: We did not test this valve in vitro, but tests have been performed. From personal communications with people who were involved in testing those PTFE valves, we know that this is quite a stress-resistant material, this PTFE membrane. But those were pure PTFE valves. We have previously had a pretty large experience with around 35 patients who underwent this type of operation with glutaraldehyde-treated pericardium, so we can compare with this group, but this group is still a little bit small.

Dr Kostelka: Do you expect different behaviour in the aortic position under systemic pressure above 100 in comparison to the right side? There are well-known papers from one group in Florida, and another group in Japan, with a trileaflet pulmonary valve reconstruction, or bileaflet, because they are under a pressure of 22 mm and there is 122. Did you see any changes in the mobility of the cusp during the time of the follow-up?

Dr Nosál: I think this situation is a little bit different than the complete PTFE valve in the pulmonary position because, as you saw in the video, a significant portion of the valve remains in situ, so we just extend the leaflets.

And as for the echocardiographic follow-up, we do not have a special method to assess the mobility of the leaflets. Honestly, it is more difficult to assess these valves, I mean, to see the leaflets on the echo because the echogenicity of these PTFE extensions is different. But we follow the patients closely, and if the valves tend to fail, they fail because of increased insufficiency. So it is clearly seen on the echocardiographic follow-up.

Dr Kostelka: Do you think also that anticoagulation for just six months is sufficient for thromboembolic prophylaxis?

Dr Nosál: We routinely put our patients on antplatelet therapy with aspirin. We have not had any issues or any signs of thromboembolism, but we put them on it as a preventative measure.

Dr Kostelka: And the last question, how do you advise the young patient (they are a mean age of 14 years) regarding physical activity? Because then the pressure is rising to the 200. So do you keep them calm or how do you advise these young patients?

Dr Nosál: Yes, we keep them calm. For at least the first months, we advise not much physical activity, and they come back for check-up at six months and at one year. We always base our recommendations on the left ventricular measurements, and if the left ventricle improves and the patient is one or one and a half years after the operation, we would advise mild, but very mild, physical activity.

Dr J. Calhoon (San Antonio, Texas): Have you decided what the proper height or the amount of leaflet coaptation that should be created with your prostheses? And secondly, is there a size at which the annulus is too small for you to apply this? All yours had normal annular sizes. Is there a cut-off for that?

Dr Nosál: For the length of the leaflet, we would measure the free edge of the particular leaflet by a silk tie. For the height of the leaflet, at the start of the operation we just put a simple ruler into the left coronary sinus, and we measure the height of the native left coronary leaflet, and this is the height we apply. We do not have any other specific measurements for this.

I would probably not use this technique in small infants and neonates, and in very small aortic annuli. In my opinion it does not make much sense. Although we did have one small patient who was 22 months old and got this type of plasty, but he had endocarditis on both valves, on the aortic and pulmonary valves.

Dr. V. Hraska (Sankt Augustin, Germany): I have just a very brief comment. There is an overall tendency to reconstruct nearly every valve. Seeing the results from the Ross, the reason is obvious. We are very good in reconstruction. We know how to do it, consequently the immediate results are very encouraging. However, the mid-term and long-term outcome is questionable because we have not been able to find durable material which lasts longer, therefore I think it is extremely important to have data like this.

I would like to commend the authors for these results and for really a great step forward in using a different type of material for aortic valve reconstruction.

EDITORSIAL COMMENT

Polytetrafluoroethylene leaflet extensions for aortic valve repair

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In this issue of EJCTS, Nosál et al. [1] have published their initial experience with polytetrafluoroethylene (PTFE) leaflet extensions for aortic valve (AV) repair in congenital patients. Although this is a small series, the authors must be congratulated on their excellent results.

The main objective in AV repair is to restore the matching between the quantity of cusp tissue and the valve orifice in order to achieve good and durable coaptation. To avoid recurrence of aortic insufficiency (AI) and/or stenosis after AV repair, a systematic surgical approach determined by leaflet as well as aortic disease (the functional aortic unit—FAA) must be adhered to [2]. In pure AI, due to the dilatation of the FAA, generally there is enough tissue to achieve this goal without addition of tissue. Hence, one should be cautious in applying leaflet extensions liberally to situations where there is sufficient quantity of cusp tissue. However, in paediatric population, rheumatic
valves and in some cases of endocarditis, our goal is accomplished by adding tissue to reconstruct the valve. Leaflet extensions are likely to be required in asymmetric (type 1) restrictive bicuspid valves where management of the restrictive raphe is a key component of leaflet repair [3].

This paper is of great interest in the above group of patients where the search for the ideal material continues. Leaflet extensions (autologous pericardium [fresh, glutaraldehyde-treated], bovine pericardium, fascia lata, duramater, etc.) have been used for a long time for AV repair. Although used at other sites in the heart, the use of PTFE for AV repair has not been reported. Moreover, the thickness of the PTFE extension used by the authors is much less when compared with a similar extension used in the mitral position. This may ensure greater pliability and possibly a lesser thrombogenic risk.

Technically speaking, any patch material could be used to perform AV repair. However, maintenance of AV leaflet coaptation requires adequate mobility in a high-pressure area over a longer period of time. PTFE is a durable monofilament plastic polymer that has unique physical characteristics including greater flexibility, remarkable breaking strength, negative charge like native endothelium and biostability. However, the issues of structural degeneration, calcification, thrombogenicity and infection should be borne in mind to ensure long-term durability of valve repair. There is little published information concerning natural tissue responses to long-term use of PTFE grafts in humans. In a recent study on explanted cardiovascular PTFE grafts [4], the authors found that interstitial calcification was associated with graft disruption which may play a role in eventual graft failure. Hayabuchi et al. [5] reported that most of the patients with surgically repaired congenital heart disease displayed evidence of calcification in PTFE cardiac grafts with multidetector computed tomography. Dystrophic calcification with fracture/rupture of PTFE sutures has also been noted to cause recurrent mitral insufficiency in patients with long-term indwelling neochordae [6]. In an experimental study performed in an animal model, PTFE valves were inserted in the tricuspid position [7]. In half of the patients, the leaflets were stiffened and also showed thrombosis, margin eversion and mineralization. Gross calcification always involved the commissural areas. Another promising option is tissue engineering where de novo living tissue is fabricated to replace diseased AVs. The new valve designed from a living cellular component facilitates biological integration, adaptation, remodelling and growth [8]. This process has enormous potential for the future management of young patients with AV disease requiring valve growth while avoiding the valve-related complications of current non-living prosthetics.

Although a promising option, whether PTFE leaflet extensions for AV repair are reliable in the long term remains to be seen. Imaging studies may help predict which grafts are predisposed to failure by calcification. More studies are undoubtedly required to understand the progression and consequences of PTFE degeneration which may lead to therapies to prevent re-interventions after AV repair with PTFE leaflet extensions.

REFERENCES