APPENDIX. CONFERENCE DISCUSSION

Dr M. Hazekamp (Leiden, Netherlands): Especially in situations where the pulmonary valve is small and cannot be used for arterial switch, sometimes it’s very difficult to decide beforehand what will be the best option - Rastelli, REV, Nikaidoh operation or univentricular palliation. And I think it’s important that you tried to make a complexity score of LVOTO and get some system into it. I think that’s very worthwhile for the individual surgeon. It seems that in many instances, particularly with a small and not usable pulmonary valve, Nikaidoh seems to be the best option, but I think you should not forget to mention the REV or the modified REV operation which, in the multicentre study that we did with the European Congenital Heart Surgeons Association, came out as also a very good option. And while for some reason it’s only used in French-speaking countries, probably for historical reasons, it merits attention because it’s a good operation as well.

I agree with you fully that when the pulmonary valve is reasonably big, not too dysplastic, in almost all cases you can do an arterial switch operation with resection of the outflow tract obstruction.

I have several comments. I also agree with you that whenever the right coronary artery crosses in front of the aortic valve, then probably it’s better not to do a Nikaidoh operation because you may get into big problems.

I thank you for using the Leiden classification of coronary anatomy, but maybe in your manuscript you should change it slightly, because when you talk about a right coronary crossing over the aortic valve z-score minus 5.6 and this limitation of the complexity score.

Sometimes it’s difficult to exactly measure the pulmonary valve in the setting of complex LVOTO. In fact, in the OR, the pulmonary valve was a reasonable size, but still you can go for the worst side of surgery. Opposed to that, you may have a patient with everything else can be okay, but you are unable to do biventricular repair, so you can go a Nikaidoh operation because you may get into big problems.

You also describe in your manuscript that this complexity score has one weak point and that’s something you didn’t mention here but I think it’s very important to name it, because if you have, for example, mal-attachment of the tension apparatus of the mitral valve, you have only one point in the complexity score because everything else can be okay, but you are unable to do biventricular repair, so that you go to the worst side of surgery. Opposed to that, you may have a patient with points on the pulmonary valve, on the septum, etc, etc, but still you can go for biventricular repair. So that must be addressed. So these were the two questions, pulmonary valve z-score minus 5.6 and this limitation of the complexity score.

Dr Kotani: Regarding your first question, that patient had a very small pulmonary valve measured at about z-score minus 5 on preoperative echo. Sometimes it’s difficult to exactly measure the pulmonary valve in the setting of complex LVOTO. In fact, in the OR, the pulmonary valve was a reasonable size with a z-score of minus 2, which allowed us to proceed with the switch operation.

For the second question, I totally agree with your comment regarding the limitations of this scoring system. The patient with mild multi-level obstruction, and the patient with one significant single-level obstruction could end up with the same score, so I think we need to refine the complexity score.


Honjo and co-workers, from the Toronto group, proposed an anatomical complexity score of the left ventricular outflow tract obstruction (LVOTO) to help in choosing between a variety of surgical corrections in face of dextro-transposition of the great
arteries (d-TGA) and LVOTO [1]. The decision on the best repair in the presented series of 28 patients was actually made in a standard fashion— with preoperative and intraoperative assessments—and the results were simply fantastic, apparently with no error of judgement. The proposed echocardiographically-derived scoring system was applied retrospectively and was subsequently correlated to the surgical procedure chosen. Not surprisingly, a correlation between the echocardiographic findings and the surgical option applied was found and coefficients of obstruction were further set.

Will this new scoring system truly help us? We are not sure. The critical decision in this group of patients is mostly whether an arterial switch operation (ASO), with opening of the outflow tract, can still be achieved instead of an ‘intracardiac repair’, like the ‘Réparation à l’étagé ventriculaire’ (REV), Rastelli or Nikaidoh procedures. The choice between these operations or a single ventricle pathway will continue to be guided by an ‘eyeballing’ of the LVOT in echocardiographic views and will ultimately be influenced by intraoperative findings, as acknowledged by the surgical results of this study [2–4]. The preoperative echocardiography (with or without an obstruction scoring system) gives a clue—often a strong one—as to the possible options. Its value is certainly the clear definition of the multiple components of the obstruction, but a surgeon needs more than a crude anatomy to definitively plan his operation. He needs information on the resectability of these components, something that often appears only during surgery. A straddling papillary muscle will get a low obstructive score but will cause more trouble than an extensive tissue tag formation or a bulging conal septum.

The two opposing philosophies in the repair of TGA-LVOTO relate to the choice of the second-best option after the ASO, namely either the REV/Rastelli procedure or the Nikaidoh procedure and its variant ‘the double root rotation’ [2–5]. Strong proponents of the Nikaidoh procedure, such as the Toronto group, do not really need a scoring system for the obstructive components as, per definition, they will reposition the aortic root beneath them. As a matter of fact, the decision between the two procedures in the presented study was not influenced by the obstructive components, but by the pattern of the coronary arteries alone. Strong proponents of the REV/Rastelli procedure consider that the relief of the obstructive components can be achieved in virtually all patients with an operation performed at the right time. To them, the Nikaidoh procedure is indicated mostly in cases of a restrictive ventricular septal defect, of a small right ventricle or when the whole ‘double root’ can be rotated, and the scoring system will merely remain an academic tool [5]. In their experience, the gap of the mitro-aortic discontinuity correlates more with the magnitude of the intracardiac repair (to ensure a wide open left outflow tract) than with the pattern of the obstructing components [6]. In this controversy, only surgeons undecided between these two schools of thought might take an interest in the scoring system [7].

Still, the scoring system is a valuable new tool, mostly in cases where it can identify these patients with a potential complete or partial function of the pulmonary valve. As for any scoring system established retrospectively, it must now be validated prospectively and further fine-tuned—especially in respect of the characteristics of the sub-pulmonary area and the pulmonary root and leaflets—because this is the component of the proposed complexity score that will reveal the patients for whom a successful ASO is still possible or on whom a ‘double root rotation’ can be performed [5].

Conflict of interest: none declared.

REFERENCES