Letter to the Editor

Does the Nakata index predict outcome after Fontan operation?

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Keywords: Fontan operation; Pulmonary artery indices

We read with interest the article by Adachi et al. ‘Preoperative small pulmonary artery did not affect the midterm results of Fontan operation’ [1].

One of the main messages of the article is that Fontan operation can be successfully performed in patients with a preoperative PA index smaller than 250 mm²/m². Further, the authors note that decreased pulmonary artery index post-operatively does not restrict functional efficacy of the Fontan circulation.

From our point of view the predictive value Nakata index is less informative than the lower lobe index (LLI) which was introduced to optimize preoperative selection of Fontan candidates [2–4]. We use LLI as being more predictive to evaluate adequacy of the pulmonary vascular tree, given that central pulmonary arteries used for calculation of Nakata index can be enlarged before or during a Fontan operation [4].

The lowest Nakata index that precludes a successful Fontan operation is not known [5].

The authors have suggested that PA size at the hilum could be a good representative of the whole PA vascular bed. In the presence of low Nakata index, the normal LLI would automatically classify all these patients to be no longer in a risk category [4]. We observed in our series that the total lower lobe index is more informative than the Nakata index for the selection of candidates for a Fontan operation. In 13 patients (22%) with a low Nakata index (under 200 mm²/m², lowest 125 mm²/m²), the presence of a normal total lower lobe index (>90 mm²/m²) enabled us to successfully perform ECFO combined with enlargement of the main pulmonary arteries in six of them [2].

Based on our experience, we believe that measurement of the lower lobe index is an important adjunct for the evaluation of candidates for Fontan operation.

References


Reply to Ovroutski and Alexi-Meskishvili

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Keywords: Fontan operation; Pulmonary arterial size; Nakata index; Lower lobe index

We greatly appreciate the comments by Ovroutski and Alexi-Meskishvili [1] concerning our article [2]. It should be worth noting that the lower lobe index (LLI) of the pulmonary artery (PA), first introduced by Dr Reddy et al. [3], would be more informative than the PA index in the context of a staged Fontan completion because the lower lobe is beyond the surgeon’s reach and hence has fewer confounding factors. This was particularly true in the days before advances in catheter intervention that nowadays allow deployment even beyond that level. Anyway, our article is not about which index is more superior to another. Regardless of the type of evaluation methods, the vital issue is how reasonably any given method represents functional efficacy of the whole PA vasculature and how pertinently it predicts the Fontan circulation. Any single morphologic index for PA arborization would not be perfectly representative. That is why clinicians need to consider not only PA size but also other parameters such as PA pressure and pulmonary resistance. In addition, the conventional indices namely the PA index (Nakata index) or the McGoon ratio still seem to remain widely accepted in view of their clinical relevance, utility, and accumulated knowledge in the literature. No alternative indicators for pulmonary vasculature including LLI or pulmonary vein index [4] have replaced the conventional ones. Data values obtained by the conventional methods cannot be translated into the newer formats and, strictly, cannot be compared.

Apart from differences in methodology, the main message in our article [2] is that the small size at a given portion of PA tree itself should not be an absolute contraindication of the
Fontan procedure. When a patient possesses favorable conditions for achieving the Fontan circulation (apart from a small PA index), we would not preclude the patient from completion of the Fontan procedure. Furthermore, we have observed a tendency towards a decrease in PA size after the establishment of the Fontan circulation expressed in the format of PA index. We are interested in this tendency as it contrasts with the natural increase in the anticipated normal PA index according to body surface area. We predict that a similar tendency would be the case if alternative indices are applied, as they would reflect the decreased amount of passing blood flow (low cardiac output) and/or non-pulsatile (pumping-chamber-less) PA stream following the Fontan procedure.

References


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doi:10.1016/j.ejcts.2008.01.032