

ommended due to the frequent need for redilatation. If balloons are risky, stents are not recommended and surgery has a re-intervention rate of 0, why do patients in Group B have catheter intervention at all?

From Table 2, it is obvious that this study has one of the shortest follow-ups, especially in Group C, where most of the patients had stent implantations. The incidence of recoarctation and re-intervention could be significantly under-reported.

The conclusions of the study have no direct correlation with the data presented.

This is essentially an audit of one centre's practice and throws no new light on the management of coarctation.

## REFERENCE

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## LETTER TO THE EDITOR RESPONSE

# Reply to Shanmugam and Maharajh

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**Keywords:** Aortic coarctation in children • Age-related therapy

We thank Dr Shanmugam and Dr Maharajh for their paper entitled 'Management strategies in aortic coarctation' [1] and would like to answer to their remarks regarding our paper recently published in this journal [2].

Due to the single-centre retrospective clinical follow-up case series nature, the number of patients in the paediatric population is often limited (in our series,  $n = 91$  consecutive patients). Statistical analysis, therefore, was restricted to evaluate (i) efficacy of treatment defined as a decrease in Doppler gradient (%) for each age group, (ii) comparison between the types of procedures (surgery vs. balloon dilatation vs. stent implantation) for each age group and (iii) comparison of the type of pathology of coarctation of the aortic arch (native vs. recurrent). Further statistical analysis was excluded due to appropriateness regarding statistical power.

Regarding Table 2 including reviews of current paediatric literature, the number of included patients in our study is not underpowered [2].

The authors of the letter are completely correct that our primary focus was the analysis of age-dependent differences in the treatment of aortic coarctation, which has not been published before under this specific purpose to our knowledge. Therefore, we did not focus on data regarding the resolution of arterial hypertension in each age group, because it was not intended as primary focus of the paper, but may be a further topic of research in the future.

Nevertheless, the number of 24 recurrent coarctations included 16 patients following surgery, 5 patients following

catheter interventions and 3 patients following both procedures (surgery and catheter interventions).

We thank the authors for their critical remarks regarding the interpretation of the results of group B, including patients at an age between 6 months and 6 years. Indeed, as the authors correctly comment, statistical comparison remains difficult and further subanalysis comparing subgroups within patients of group B is limited and therefore was omitted.

Nevertheless, optimal treatment of this age group remains open and is still a matter of ongoing debate between surgeons and interventionists: cardiac surgery seems to be suitable, but further studies are required in the future, including multicentre prospective clinical trials, to answer which management strategies in aortic coarctation are optimal in each age group.

In conclusion, the publication was not intended to serve as a state-of-the-art paper such as recommend stent implantation as a primary modality, but as an excellent alternative to surgery in patients older than 6 years of age (group C). Nevertheless, in our institution, optimal treatment is discussed and planned for each patient by an individual approach involving all members of our interdisciplinary team of cardiac surgery, paediatric cardiology, anaesthesia and intensive care medicine.

Again, the authors would like to thank Dr Shanmugam and Dr Maharajh for their important comments, which underline that our data give new insights into an age-dependent approach in the management of aortic coarctation.

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## LETTER TO THE EDITOR

## Nuss procedure for all? But all are not equal!

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**Keywords:** Pectus excavatum • Nuss procedure • Chest wall deformity

We read with great interest the very well-written review of Kresopoulos and Goldstraw [1] and the interesting editorial comment of Robicsek [2] regarding the Nuss procedure.

Our experience in this field began in 1956 with the classical Ravich procedure modified over the years by using a steel strut bar seagull wings-like shaped [3]. In the last 5 years, we appreciated the thoroscopic approach of a steel strut bar insertion in selected cases of young patients (from 15 to 21 years-old) with pectus excavatum.

We believe that some aspect of the choice between a so-called 'minimally invasive' and an 'open' procedure must be pointed out:

- (i) The Nuss procedure is not 'minimally invasive' because both pleural spaces have to be opened to insert the bar as commented by Robicsek. When compared with the Ravich procedure, the Nuss is of course less invasive in terms of osteotomy, blood requirement and maybe scar, but the patient must be informed that surgical risk differs from 0% and some complications may occur.
- (ii) Age at operation is a crucial point in the indication for a Nuss procedure. Donald Nuss presented his series with 10 years of FU in 1998 [4] with a very young patient population (1.5-15 years). The skeletal age of a patient can make the difference in terms of immediate, mid-term and long-term results.
- (iii) The costs of the steel bars are acceptable when compared with those for longer in-hospital stay and blood transfusions, as required for other procedures.

Our flow chart for pectus excavatum repair is:

- the use of Nuss technique for patients among 14 and 22 years old;
- the use of modified Ravich procedure by using our steel strut bar for patients older than 22 years old.

In the borderline for skeleton-age patient population, a CT scan with 3D reconstruction must be performed in order to evaluate the calcium apposition in the ribs. This can play a significant role in the compliance of the complex sternum-ribs when a metal bar without osteotomies is introduced, in order to avoid dislocation or excessive chest pain.

In conclusion, we think that careful patients' selection is mandatory for satisfactory chest wall's repair and the ideal surgical approach should be tailored on patient's characteristics, keeping in mind that the Nuss procedure cannot be always used because patients are not all equal!

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