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Original Article

Can we start to think about consensus-oriented clinical practices?

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Pulmonary vascular disease is a major complicating factor in patients with congenital cardiac defects and left-to-right shunts. Unoperated patients have a prevalence of severe pulmonary vasculopathy ranging from 3% to nearly 100% depending on the defect. Even successful correction of the anomalies may be followed by residual pulmonary arterial hypertension depending on the magnitude of preoperative hemodynamic abnormalities and the severity of vascular lesions. This is usual in patients operated after nine months of age, and inevitable above the age of two years.[1]

Improvement of surgical techniques and postoperative care has dramatically influenced outcomes, since patients can now be assigned to operation early in life. There is general agreement that early assignment to operation is crucial for immediate postoperative recovery and prevention of residual pulmonary hypertension in infants with certain anomalies. This is the case for truncus arteriosus, large non-restrictive ventricular septal defects, transposition of the great arteries with a ventricular septal defect and complete atrioventricular septal defects, especially when associated with Down's syndrome. Despite this tendency to correct the anomalies in the first months of life (which is not the scenario in many underserved areas of developing countries), it is known that some infants present with clinical features suggestive of early onset pulmonary hypertension not associated with clear left-to-right shunting. This constitutes a real challenge for pediatric cardiologists, and points towards the need for in depth preoperative evaluation of the pulmonary circulation (noninvasive and invasive).

Despite the lack of large controlled studies, much has been learned about the potential for reversibility of pulmonary vasculopathy following adequate treatment of congenital cardiac anomalies. For many years, direct assessment of pulmonary vascular lesions by examining lung biopsy specimens allowed pediatric cardiologists and pathologists to understand the ongoing process of pulmonary vascular remodeling in congenital cardiac disease, and propose criteria of reversibility.[2,3] Nevertheless, criteria for operability and reversibility of pulmonary vascular disease in these patients (which include a series of data obtained from clinical, noninvasive and sometimes invasive evaluation) need to be revised in view of the development of the so called "new drugs" for treatment of pulmonary arterial hypertension,[4] and the emerging possibilities of combining medical and surgical therapies.

Besides neonates (who require special attention) and infants and young children with left-to-right shunts, there are subsets of patients with congenital cardiac disease that deserve particular consideration. Adolescents and adults with the Eisenmenger

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syndrome constitute a very special group.[5] In terms of medical therapy, there is much to be learned about the long-term benefits of the "new drugs", since the natural history in this group is completely different from idiopathic pulmonary arterial hypertension, with considerably better survival curves. Also, assignment of patients with elevated and fixed pulmonary vascular resistance to correction of their defects may be disastrous. To the other side of the scenario are patients without a subpulmonary ventricle, for whom cavopulmonary anastomoses are considered as a possibility for definitive palliation. A careful evaluation of the pulmonary vasculature is needed in theses instances, since even mild elevation of pulmonary vascular resistance postoperatively may result in failure of the cavopulmonary circuit.

In the last decades, considerable expertise has been accumulated in terms of diagnostic evaluation and management of patients with pulmonary arterial hypertension associated with congenital cardiac disease. Yet, there has been a relatively restricted number of publications based on large multicenter controlled studies. This makes it difficult to construct guidelines and develop recommendations. Another problem is that the scenario is quite complex. What is defined for infants and young children who are potential candidates for repair of simple defects is not applicable to older patients with advanced pulmonary vasculopathy or those with complex anomalies requiring anastomoses between the systemic veins and pulmonary arteries. Despite these difficulties, it is probably possible to use current knowledge to start a discussion and address specific issues. With this in mind, a group of physicians and scientists decided to review the currently available literature and add experience that has been accumulated in good reference centers in order to generate statements on the subject. The authors prepared the chapters not only with the objective of providing some guidelines, but also attempting to identify issues that are not sufficiently clarified, and could be a matter of future investigation. Also, the authors were oriented to be as flexible as possible while preparing the chapters and the statements, since the demands in underserved regions are different from those in developed countries where the latest diagnostic and therapeutic developments are available. Unfortunately, there is restricted space for flexibility in specific issues as is the case of the management of neonates, or severely ill patients who need a lung transplant. On the other hand, it is almost impossible to find out substitutes for the drugs that have been developed for treatment of pulmonary arterial hypertension, even considering the difficulties to make such drugs available in certain areas. In this way, may we suggest that the readers try to adapt the current statements to the local conditions and availabilities as far as possible. It is one of the objectives of the Pulmonary Vascular Research Institute to increase the partnerships with doctors and institutions in underserved areas as an attempt to help them improve the local capabilities.

Intended users

The issues addressed in the consensus are of potential interest for all professionals involved in the management of patients with congenital cardiac disease associated with pulmonary hypertension, including:

- pediatric cardiologists involved in invasive and noninvasive diagnostic procedures
- Cardiologists who assist adults with congenital cardiac disease
- Cardiac and cardiothoracic surgeons
- Pathologists who are interested in congenital cardiac disease in general, and pulmonary hypertension in particular
- Preoperative and postoperative intensive care specialists involved in the management of patients with congenital cardiac disease
- Anesthesiologists involved in diagnostic and therapeutic procedures
- Nurses, physiotherapists and other professionals involved in the management of patients with congenital cardiac disease, particularly neonates, infants and children.

Methodological issues

Contents and authors

Ten chapters were prepared, focusing on different aspects of pulmonary arterial hypertension associated with congenital cardiac disease including management of neonates, definition of operability in infants and children, current diagnostic role of imaging, immediate postoperative care, medical treatment, decision about lung or heart-lung transplantation, and special conditions such as absence of a subpulmonary ventricle and the Eisenmenger syndrome. A discussion on congenital diaphragmatic hernia was included, in view of the potential association with congenital cardiac defects. No other etiologies of pulmonary arterial hypertension and pulmonary hypertension in general were addressed.

For preparation of each chapter, two authors from different geographic regions were invited. Institutions from developing countries with high standards in terms of medical care were included. All of the invited authors were considered experts in their specific fields, and have been involved in the management of congenital cardiac disease for many years.

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Literature searching

The literature searching was planned to cover the years of 1990 to 2007 necessarily. However, inclusion of essential publications outside this period was strongly encouraged. Priority was given to meta-analyses and randomized controlled studies and review articles whenever possible, followed by other publications of high scientific standards. All of the consulted articles were in the English language. MEDLINE/PUBMED searching was defined as essential, but additional sources were encouraged.

Level of evidence

Statements were developed for some but not all of the issues addressed, and were given a classification and a level of evidence according to the instructions for guideline preparation of the American College of Cardiology and American Heart Association.[6]

Consensus preparation, discussion and approval

The consensus was proposed in January 28–30, 2007, in Valetta, Malta, during the 1st Annual Meeting of the Pulmonary Vascular Research Institute (www.pvri.info). During the first semester of 2007, the board of authors was established, with inclusion of additional physicians and scientists according to the mentioned criteria. The literature searching was started in July. On the 11th of October, 2007, the taskforce had a videoconference for discussion of the ongoing process of consensus preparation. The second discussion was in Marbella, Spain, January 20–22, 2008, during the 2nd Annual Meeting of the Institute. At that time, all of the chapter drafts were available for discussion.

Each of the chapters was prepared by two authors. As a general rule, the first author prepared the text, which was reviewed by the second one. Subsequently, the text was analyzed by at least two other members of the taskforce, for critical comments and suggestions. Finally, the original authors expressed their opinion about the points and suggestions that were raised. Whenever necessary, quick within-taskforce surveys were implemented in order to solve problems that depended on expert opinion.

Initiative and support

The present work was an initiative of the Pulmonary Vascular Research Institute, as an educational activity of the Pulmonary Hypertension Associated With Congenital Heart Disease Taskforce. The project was entirely supported by the Institute, with no direct involvement of any other institutions. Thus, there are no conflicts of interest involved.

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