of localized deformity of the pulmonary artery, we take the measurement just proximal to the first branch.

Retrospective analysis of the preoperative PA-indexes and surgical results in three groups disclosed different lower limits of the PA-index for the safe conduct of various procedures in each entity. In the Fontan group, the PA-indexes were distributed at higher levels than those in the other two entities and were almost in the normal range. Pulmonary circulation in this group is sustained without effective right ventricular contraction but rather by right atrial contraction or by venous pressure. This peculiar anatomic and physiological situation naturally requires an almost normal pulmonary arterial size, as suggested by Fontan and associates.[13] The retrospective analysis of our patients who had a successful Fontan-type operation revealed that our empirical estimation of development of the pulmonary artery tree was almost appropriate.

The incidence of severe heart failure in the postoperative period was found to be higher in patients with a smaller PA-index in each group after total correction. Although no postoperative deaths occurred in tetralogy, frequently patients with a PA-index between 100 and 150 mm^2/BSA had severe heart failure following total repair, and the mean cardiac index was 2.5 even with the aid of catecholamine for this particular subset of patients. Therefore, for the sake of safety, patients with a PA-index of more than 100 mm^2/BSA currently can be regarded as candidates for total correction at our hospital.

In the Rastelli group, total correction has to be performed in those with a PA-index of larger than 200 mm^2/BSA (Fig. 11). The mortality rate in patients with a PA-index of less than 200 was 100%, whereas the rate in patients with an index of more than 200 was significantly lower, at 6% ($p < 0.01$).

Retrospective analysis of the Fontan procedure showed that a PA-index of more than 250 mm^2/BSA would be necessary to obtain acceptable results. The mortality rate in this subset was 8%, whereas there were no survivors among those with a PA-index below 250. For the latter group, palliation might be the procedure of choice, since 75% of our patients with a Fontan procedure had undergone previous palliation, which helped the pulmonary artery to grow adequately for functional correction.[4, 14, 15]

Choussat and associates[16] suggested that the preoperative measurement of pulmonary resistance is of importance. However, in the majority of our patients with tricuspid atresia, preoperative catheterization failed to measure the pulmonary arterial pressure, and intraoperative evaluation of the resistance would be unreliable because of anesthesia and deep sedation. Instead, the PA-index could represent to some degree availability of the pulmonary vascular beds even if the pulmonary resistance were unknown. The PA-index can be inversely affected in the presence of peripherally situated anomalies, such as peripheral stenosis. However, in case of cyanotic heart disease with decreased pulmonary blood flow, development of peripheral stenosis is extremely rare owing to low intraluminal pressure. The only exception is found in major bronchopulmonary collateral arteries, whose embryogenesis is considered to be different; furthermore, intraluminal pressure proximal to the stenotic lesion generally is at systemic level. Our results indicated the validity of the PA-index in predicting the postoperative prognosis of the Fontan procedure. The PA-index also may serve as a useful guide in comparing surgical results from different institutions having patients with anomalies of varying severity. The lower limit of the PA-index should vary from one institution to another, but would help to improve the salvage rate of the patients undergoing various procedures.

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