

Single Chamber Ppm vs Dual Chamber Ppm in Children

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Selecting a pacing system

The positive hemodynamic effects of AV synchronous pacing have been well described in adults. With AV asynchronous pacing, the atria may contract against closed AV valves, causing atrial distension with subsequent increases in pulmonary wedge pressure and jugular venous pressure. This might provoke signs and symptoms of fullness, dyspnea, headache, fatigue, syncope and exercise intolerance, the so-called pacemaker syndrome. Clearly, they feel better when programmed to atrial-based pacing compared with ventricular-based pacing, and subjectively report being more able to perform the usual activities of daily living. Furthermore, higher incidences of death, strokes, atrial fibrillation, pacemaker syndromes, and congestive heart failure during VVI pacing have been reported compared with DDD pacing modalities.

While evidence exists that DDD pacing might be superior to VVI pacing in adults, no similar data are available in children, in whom a single chamber device offers the advantage of lower cost, ease of implantation and extended battery longevity. Pacemaker syndrome is exceedingly uncommon in young children; those children who became symptomatic had been paced for a median of 11 years. Rate-responsive ventricular pacing has been frequently utilized in children with complete AV block, and has been well demonstrated in studies to adequately respond to the physiological demands of healthy, active children. So, single chamber pacing device is preferably implanted as the initial pacing mode in young children, particularly in those with a structurally normal heart, isolated complete AV block and normal ventricular function.

Specific considerations in selecting single or dual chamber device

Although early establishment of AV synchrony offers no added benefit in children with a structurally normal heart, isolated complete AV block and normal ventricular function, many of the pediatric pacemaker patients have underlying structural heart disease, tachyarrhythmias, and hemodynamic derangements, compromising ventricular performance. Therefore, there are some special situations where dual chamber device should be considered.

Ventricular dysfunction: An important consideration in selecting a pacing system is the presence of ventricular dysfunction. The ventricular dysfunction may worsen when a child receives a single chamber device. Therefore, a dual chamber system should be selected in patients with ventricular dysfunction with or without congenital heart disease.

Single ventricle morphology and Fontan palliation: Sinus node dysfunction and complete AV block are common indications for permanent pacing in patients after Fontan palliation. Studies have estimated that approximately 10% of these patients need pacemaker insertion during follow-up. Furthermore, AV synchrony is vital in patients with Fontan physiology. The inability to maintain AV synchrony after the Fontan operation has been correlated with an adverse late outcome.