large amounts of aluminum-containing particles are introduced into the respiratory tract.\textsuperscript{15,16} While metallic aluminum and Al\textsubscript{2}O\textsubscript{3} dusts seem to have a fibrogenic potential in the lungs, the risk in most occupational settings is believed to be small.

The patient described in this report worked in confined quarters aboard ship, where he was exposed exclusively to aerosols of oxidized aluminum. Concentrations of welding fumes under these conditions are increased approximately tenfold over the amounts detectable in the air around welders working in open spaces.\textsuperscript{19}

The patient also was a heavy smoker. In this regard, experimental studies have demonstrated the retention of inhaled particulates and strikingly reduced lung clearance in smokers.\textsuperscript{20} One might conclude that this set of circumstances predisposed to aluminum particle accumulation in the lungs and the development of pulmonary lesions.

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Left Atrial Pacing Following Mustard’s Correction of Transposition of the Great Vessels*

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We report the transvenous placement of a left atrial endocardial lead for permanent pacing therapy seven years after correction of transposition of the great vessels by the Mustard intra-atrial baffle technique.

Correction of transposition of the great vessels by the Mustard intra-atrial baffle procedure has been widely employed since the mid 1960s. Unfortunately,

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the immediate and long-term complications of this operation have included supraventricular brady- and tachyarrhythmias, junctional arrhythmias, and even complete heart block. This has been attributed to surgical trauma, atrial distention, baffle contracture with resultant venous obstruction, and also tricuspid valve dysfunction with insufficiency. This report concerns the use of atrial pacing as a therapeutic modality in handling one of these problems.

**CASE REPORT**

A cyanotic infant with simple D-transposition of the great vessels underwent a Blalock-Hanlon atrial septectomy at the age of six days. Because of continuing severe cyanosis, a second atrial septectomy was performed two months later. At age three years the child underwent an intra-atrial baffle procedure of the Mustard type. Despite the absence of sinus rhythm, the child did well postoperatively, and cardiac catheterization confirmed normal hemodynamics. Two years later, aged five years, he remained asymptomatic, with ECG evidence of a rapid nodal rhythm and no evidence of atrial electric activity. In March 1977 (4.5 years postoperatively) the child exhibited a sinoatrial mechanism with exercise treadmill testing. Atrial electric activity at a rate of 130 during exercise was conducted normally into the ventricles, but the child remained in nodal rhythm at a rate of 80 when at rest. In June 1979 at age ten (seven years postoperatively) the child had several episodes of nodal bradycardia with heart rates of 40 to 50 noted by Holter monitoring, but the patient remained asymptomatic. The occurrence of premature ventricular contractions during periods of nodal arrest caused some concern. Pacemaker therapy was recommended.

Catheterization for hemodynamic and electrophysiologic assessment documented effective pacing and normal atrioventricular conduction from the left atrial appendage. Junctional recovery time was 1.1 sec during the study up to rates of 180 beats/min. Again, no hemodynamic abnormalities were noted during this study. In June, 1979 a tined bipolar pacing lead (Medtronic 6962-65) was inserted through the left cephalic vein into the left atrial appendage (by virtue of redirected venous flow). Pacing thresholds of 2 mamp at .8 V and sensing at 6 mV were obtained. A demand atrial pulse generator (Medtronic 5995) programmed to a rate of 80 was attached. A bipolar lead was utilized because of enhanced maneuverability during insertion, and the unipolar generator was selected for improved sensing capability.

Current follow-up has demonstrated that the child remains asymptomatic with excellent pacemaker function. Waveform analysis and ECG and radiographic analysis of the pacemaker system reveal no abnormality of function or change in position (Fig 1).

**DISCUSSION**

The successful application of cardiac pacing to the treatment of iatrogenic dysrhythmias has resulted in marked improvement of survival following repair of congenital heart disease. Whereas the previous application of ventricular pacing for patients with atrioventricular dissociation or symptomatic bradycardias of sinus or junctional origin resulted in maintenance of cardiac rate, maintenance of atrial-ventricular synchrony may be more beneficial in selected patients. The maintenance of atrial and ventricular contraction in a child with transposition of the great vessels following successful intra-atrial baffle repair is particularly pleasing. In this situation, the increased ventricular volume at end-diastole as well as promotion of proper atrioventricular valve closure are theoretical benefits to the questioned endurance and long-term sufficiency of the right ventricle and tricuspid valve.

Transvenous pacing has not been commonly employed in children because of problems of growth, size

![Figure 1. Postoperative PA and lateral chest x-ray film demonstrates proper position of left atrial pacing catheter. One of the bipolar leads is capped, since a unipolar generator was used.](image-url)
consideration, and likelihood of lead displacement. We believe that the benefits of atrioventricular coordination outweigh these theoretical disadvantages in a patient after treatment of transposition by Mustard's technique. The problem of a relatively smooth-walled left atrium was solved with a tined lead that wedged tightly into the elongated left atrial appendage. Ventricular pacing in patients with intra-atrial appendage has often required the placement of epicardial electrodes because of the difficulty in securing catheter position in the smooth left ventricle.

The feasibility and advantage of atrial pacing must be thoroughly investigated in each patient by preoperative electrophysiologic catheterization studies. It is mandatory to demonstrate normal conduction through the atrioventricular node from impulses generated within the left atrial appendage. It is also important to confirm that conduction through the atrioventricular node will be successful at varying heart rates, including sinus tachycardia. In this particular patient with an intra-atrial baffle, it was most important to demonstrate adequate patency of the superior vena cava-baffle suture line to permit transvenous placement of the lead. Because this is a common site of significant obstruction with this operation, angiographic analysis of this area is important.

Although this patient was asymptomatic prior to pacemaker implant, there has been a subjective increase in activity and improvement in attitude noted by the family since the institution of atrial pacing. Twenty months of follow-up have demonstrated no change in lead position or loss of pacemaker function.

We submit this report to suggest the feasibility of transvenous left atrial pacing in children after the intra-atrial baffle operation. It should be emphasized that careful patient selection through electrophysiologic studies, selection of proper lead and pacemaker, and thorough follow-up all contribute to successful patient therapy.

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D-Penicillamine-induced Severe Pneumonitis

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We report the first histologically described case of severe D-penicillamine-induced pneumonitis. It occurred in a 73-year-old woman who suffered from rheumatoid arthritis and had previously demonstrated gold intolerance. Pathologic study disclosed marked interstitial and alveolar damage resembling that described with certain chemotherapeutic agents. We assess the drug's responsibility, discuss possible pathogenetic pathways, and provide suggestions regarding the patient on a D-penicillamine schedule.

The use of D-penicillamine for the treatment of rheumatoid arthritis has been markedly restrained because of the frequent occurrence of various adverse reactions. Among these are pulmonary complications, including bronchiolitis obliterans and diffuse miliary lung opacities. The latter have never been described histologically. We report a case of D-penicillamine induced pneumonitis with a histopathologic study.

CASE REPORT

A 73-year-old woman was admitted on August 23, 1980 because of fever and dyspnea. She gave a history of rheumatoid arthritis since 1978 for which she received (in 1979) several courses of gold salts, which were discontinued because of skin rash. D-penicillamine, 300 mg daily orally, was started on July 11, 1980 for treatment of recurring joint symptoms. On August 15, after a total D-penicillamine dosage of 10.5 g, she noted she was dyspneic and febrile. She was given ampicillin by her physician and D-penicillamine was withheld, but her respiratory condition worsened and required her admission. Physical examination disclosed a tachypneic patient; temperature was 37.7°C and numerous fine inspiratory rales were heard over both lung fields. Cyanosis was present at rest, and arterial blood gases while the patient received 4 L/min oxygen via a nasal cannula were: PaO₂, 43 mm Hg, and PaCO₂, 35 mm Hg. Laboratory data showed normal red blood cell count, 20,000 leukocytes with normal differential count and no eosinophils; there was no proteinuria. A test for rheumatoid factor was negative and antinuclear antibodies titer was 1/1,024, but there were no antiDNA antibodies. Complement fractions were within normal limits and no circulating immune complexes could be detected. Anteriorposterior chest x-ray film (Fig 1) showed decreased lung volume, small bilateral pleural effusions, and diffuse opacities with a predominant interstitial pattern, although alveolar shadows could be observed in both lung bases.

Mycoplasma pneumonia and D-penicillamine reaction were considered and erythromycin, 2 g per day, was given. The respiratory condition remained stable, but the patient

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