Superior Vena Caval Anomaly Preventing Pervenous Pacemaker Implantation

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Endocardial stimulation of the heart, using a pervenous electrode and subcutaneously implanted pulse generator, is now commonly employed in the management of complete heart block refractory to medical therapy. Relative contraindications to the use of this technique are few and include only organic tricuspid valve disease because of the potential risk of endocarditis and symptomatic heart block in infants who may outgrow the electrode (Chardack *et al.*, 1966). Though passage of the electrode into the heart is generally uncomplicated, an unusual thoracic venous anomaly encountered in the case presented below prevented utilization of this technique. Among 150 permanent pervenous pacemaker implantations performed in this laboratory, this represents the only instance in which thoracotomy and epicardial electrode insertion were necessitated because of inability to guide a pervenous electrode into the right ventricle.

Case Report

This 76-year-old man was admitted to the Massachusetts General Hospital in 1967, for management of complete heart block. He had suffered angina pectoris for 10 years, with increasing and incapacitating congestive heart failure of one year's duration. Though heart block had been present for one year, he had never experienced syncope or dizziness. Examination of the heart revealed a grade 3/6 ejection systolic murmur of aortic stenosis. The heart rate was 44/min., and dissociated atrial sounds were audible together with cannon waves in the jugular venous pulse. The electrocardiogram confirmed complete heart block with an idioventricular rhythm at a rate of 42/min. Because of refractory congestive heart failure, implantation of a permanent pervenous pacemaker system was undertaken 4 days later. Attempted insertion of a temporary electrode from each arm resulted in passage through a persistent left superior vena cava which communicated with the right atrium

via the coronary sinus (Fig.). Further advance into the right ventricle could not be accomplished. Opacification of each innominate vein with contrast material confirmed the complete absence of a right superior vena cava, with the entire venous drainage of the upper body entering the right atrium by way of the left superior vena cava. Temporary pacing was then accomplished by guiding an electrode into the right ventricle from the right saphenous vein and inferior vena cava which drained normally. Two days later, thoracotomy and implantation of an epicardial pacemaker system were performed without incident.

Discussion

Complete inversion of the superior vena caval system with absence of the right superior vena cava was first reported by Greenfield in 1876. Though a left superior vena cava is often seen in association with congenital heart disease with a "double" superior caval system, its presence as an isolated anomaly is rare and generally of no haemodynamic consequence. In patients undergoing permanent pervenous pacemaker implantation, the electrode is inserted via a tributary of the superior vena cava (usually the cephalic or external jugular vein) and passed into the trabecular system of the right ventricle (Harthorne *et al.*, 1967). Because a left superior vena cava almost invariably enters the right atrium through the coronary sinus at the base of the atrium, passage of a catheter into the ventricle is difficult if it can be accomplished at all. In this case, the entire venous drainage of the upper body through the anomalous left superior vena cava made it impossible to pass a pacemaker electrode into the right ventricle from anywhere in the superior vena caval system.

Though a temporary electrode could be placed in the right ventricle through the femoral vein and

FIG.—Catheters passed from right and left arms are seen to pass through the left superior vena cava and coronary sinus. The pacemaker electrode tip lies in the apex of the right ventricle (photo retouched).

inferior vena cava, this approach is not suitable for permanent pacing.

Summary

Persistence of the left superior vena cava with absence of a right superior vena cava is a rare anomaly. A case is reported in which its presence prevented permanent pervenous electrical stimulation of the heart.

References

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