Indications and Limitations of the Wolff-Parkinson-White Syndrome

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PERMANENT cure of arrhythmia by division of the abnormal pathway causing arrhythmia and making it persistent is now being attempted and a new field of cardiovascular surgery has opened up¹. Although surgical treatment has also been undertaken for ventricular tachycardia with good results², this procedure is considered to be indicated chiefly in the Wolff-Parkinson-White syndrome due to the presence of an accessory pathway.

In many countries numerous achievements have already been attained, but in Japan the number of operation and successful cases are still small at present.

With the progress of the electrophysiological examination in recent years, it has become possible to diagnose preoperatively not only the function of the bypass, but also its number and location as well. As a result, the operation proved to be safe, depending on the area of the accessory pathway and the establishment of good procedure.

SUBJECTS

Case 1: An 11-month-old girl weighing 8.8 kg had a bypass located along a lateral free wall of the right ventricle. First onset of paroxysmal supraventricular tachycardia was at 3 months and lasted 2–3 hours. The ventricular rate was approximately 250 beats/min. Physiological examination was within normal limits and had com-

bined no cardiac anomalies. Intracardiac recordings showed an AH interval of 115 msec and a HV interval of 40 msec during paroxysmal supraventricular tachycardia. During sinus rhythm, the H potential fell in the V waves. It was typical Type B WPW syndrome showing frequent heart failure and cyanosis³ (Fig. 1).

Case 2: A 41-year-old female had a bypass located at the anterior half of the atrial septum, complicated by mitral stenosis. There were no episodes of tachycardia or arrhythmia, but there was a marked limitation of movement (NYHA III). His bundle electrocardiography revealed that the AH interval was 100 msec and the HV interval was 24 msec (73 beats/min). During His bundle pacing, pre-excitation was not observed. The ECG pattern was unstable, however, almost always revealing a qrS pattern in the V₁ lead. The initial forces of the vectrocardiogram were directed to the left, posteriorly and superiorly⁴ (Fig. 2).

METHOD

For preoperative studies, electrocardiograms were taken during sinus rhythm, attacks of tachycardia, atrial pacing, right ventricular pacing and induced arrhythmia for functional studies such as refractory periods of the accessory pathway and A–V node His system. Intracardiac recordings such as His bundle electrocardiograms were studied and differentiated from James fibers and Mahaim fibers^{5,6}.

In order to determine the site of the bypass, endocardial mapping of the right ventricular endocardium was compared with the antegrade conduction time of the left ventricle obtained through the coronary sinus. Retrograde conduction time measured during right ventricular pacing

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Fig.1. Electrocardiogram from Case 1.

Fig.2. The electrocardiogram from Case 2 was very unstable and almost always showed a qrS patterns in V₁ lead. In the third strip, the delta wave could not be observed.

Fig. 3. Atrioventricular conduction time was measured from the augmented P wave to the beginning of the epicardial R wave.

in each part of the atrioventricular annulus were comparatively studied.^{7,8} Initial forces of the vectorcardiogram were also studied.^{9,10}

In order to understand the unstable function of the bypass, repeated catheterization were required. These data were recorded simultaneously on tape and reproduced as the occasion demanded.

From these findings, both cases were diagnosed as Type B WPW syndrome with a bypass located at the right ventricle and a median sternotomy incision was used as the approach. The operation was performed under general neuroleptanesthesia on the 1st case in October, 1974 and in the 2nd case in June, 1975.

An epicardial map was made during sinus rhythm (Fig. 3). The earliest excitable area located at the atrioventricular groove at the lateral edge of the right ventricle in both cases.

It was found that tachycardia was initiated and stopped by pressing this site and normal electrocardiographic patterns were recovered in Case 1, but there were no changes in Case 2. Then QRS morphology during right and left atrial pacing were compared in Case 2, but no difference in the QRS duration and spike-delta interval was found.¹¹

After confirmation of location of the accessory pathway, the right atrium was incised under extracorporeal circulation at normal temperature. In Case 1, electrocardiogram was immediately and permanently normalized by an incision of about 30 mm in length reaching the right ventricular myocardium at the tricuspid annulus corresponding to the earliest excitable area.¹² (Fig. 4). In Case 2, no changes were produced with the same procedure. After mitral valve commissurotomy, the entire circumference was pressed, then normalization of electrocardiographic patterns were observed at the anterior half of the atrial septum near the His bundle. Division was given up because of the hazard of surgical block (Fig. 5).

RESULTS

In Case 1, there were no attacks of tachycardia, nor abnormalities in the electrocardiogram for 29 months immediately following surgical treatment. In Case 2, there were no changes in condition, because division of the bypass was impossible. The procedure was effective, inasmuch as the hemodynamics were improved and the incidence of hazardous atrial fibrillation was reduced by the correction of mitral stenosis.

DISCUSSION

Many successful cases of A type and septal type as well as B type have been reported in the surgical treatment of Wolff-Parkinson-White syndrome.^{13,14} It is, however, often difficult to evaluate the location of the bypass preoperatively which is necessary for the division and the determination the possibility of the permanent cure, although the electrophysiological studies are commonly done.¹⁵ Intraoperative epicardial mapping for diagnosis of the site is fairly effective in some cases. Precise mapping is necessary for the improvement of operative results. In cases with a bypass in the septum and those with a great deal of fat in the atrioventricular groove, adequate data necessary for the division are not available and this limits the epicardial mapping itself.

Fig.4. Preoperatively, the earliest exciting area was located at the free wall of the right ventricle along the coronary sulcus (left). After division the accessory pathway, epicardial mapping showed a normal pattern (right).

Fig.5. In Case 2, the earliest excitable area was at the lateral edge of the right ventricle as in Case 1. However, it was confirmed by operation that there was an accessory pathway located at the anterior half of the septum.

Fig.6. With stimulation of the right ventricle 468ms after the R wave, V-A conduction time showed earliest excitability in the antero-septal region (arrow).

In such cases, comparison of the retrograde conduction time at many sites of the annulus obtained during ventricular pacing after atriotomy is effective (Fig. 6)^{16,17} Although mapping was subject to a time limit under non-physiological conditions such as extracorporeal circulation, it was very effective for diagnosis of the location of any concealed bypasses and residual pathways which was somewhat different from the epicardial map and which showed the shortest time in the anterior half of the septum corresponded well to intraoperative findings.

With the improvement of examination methods, division of the accessory pathway located at the ventricular free wall, regardless of whether it is Type A or Type B, is not complicated. On the other hand, in cases with a bypass located near the His bundle, division is extremely hazardous since exact identification of the accessory pathway is difficult, some successful cases have however been reported.²¹

When indication for the operation is considered, it should be kept in mind that the results of the operation are very poor in this area and that there is always the possibility of multiple pathways. It is necessary that the bypass is electrically active for electrophysiological examination. In cases in which the function of the bypass is variable, the operative procedure is apt to obscure the accessory pathways, which may become apparent later due to factors such as myocarditis and cardiac hypertrophy.

CONCLUSION

Two cases of Type B Wolff-Parkinson-White syndrome were treated. In one case, radical operation was successfully performed, but in the other case, division of the accessory pathway was abandoned, because it was too close to the His bundle.

It is clear that if radical operation is to be successful, study of the anatomical area to locate the accessory pathway and a search for possible multiple bypasses are important before and during operation.

In the case in which the accessory pathway located in the septum, the epicardial map was virtually useless and the use of retrograde conduction time after atriotomy was effective. However, indication for this operation should be decided carefully because of the risk of surgical block and low rate of successful cases.

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