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Surgery for Discrete Subaortic Stenosis#

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-Abstract-

Concerning the operative technique for the relief of discrete subvalvular aortic stenosis, emphasis by some authors has been placed on the superiority of blunt dissection in the enucleation of the entire, obstructing structure such as membranous or fibrous ring stenosis compared with the conventional resection by sharp dissection technique. Here report a case operated applying the technique of blunt dissection, analogous to endarterectomy, which resulted in good clinical improvement. The technique is such that the tissue causing obstruction is peeled off the ventricular septum along the plane of cleavage using a dissector, starting under the commissure between right and left coronary cusps.

As for the origin of stenosis this case imply a possibility of different mechanism of etiology evidenced by that the tissue removed consisted of elastic fibers only.

〈국문초록〉

분리성 대동맥판막하 협착의 수술

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분리성 대동맥 판막하 협착의 수술방법에 관하여 막성이나 융기된 모양의 섬유성 협착의 조직을 고식적인 절제 방법보다는 전 조직을 적출해내는 박리적 술식이 우수하다고 보고되고 있다. 혈관의 내막박리술에 비길 수 있는 이 박리적 술식을 이용하여 좋은 임상적 치험을 얻은 증례를 보고한다.

이 술식은 대동맥판막의 좌·우 관상편의 중간교련 밑에서 시작하여 심실중격과의 박리면을 따

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라 박리기(dissector)를 이용하여 협착을 일으킨 이상조직을 박피해 내는 방법이다. 그리고 이 환자에서 제거한 조직이 탄력섬유(elastic fiber)로만 구성되어 있었는데, 이것은 병인론의 어떠한 다른 기전의 가능성을 시사해 주는것이 아닌가 한다.

Introduction

The area of the stenosis took one of the forms of a localized circumferential membranous collar, ridge, or diffuse tunnel-like obstruction in the outflow tract of the left ventricle. Deutsch and his co-workers classify the anomaly into four angiographic types, that is, membranous diaphragm, thick annular fibrous ring, fibromuscular nonannular, and tunnel-like stenosis[3,8,9,13,16].

For the membranous and the ridge type lesion, the conventional resection surgery by sharp dissection has been done in many cardiac centers[1-9,12,14,15], which were reported with some complications and the large residual pressure gradient or persisting(or recurrent) obstruction[1-9,12].

But in 1981 some authors suggested the new technique of enucleation by reporting their experience emphasizing the superiority when contrasted with the conventional sharp dissection[10,11].

Here report a case operated by adopting the new technique in which the lesion were membrano-ridge type of discrete subaortic stenosis with congenital bicuspid aortic valve.

Case

A fifteen-year old male patient was seen first in the OPD of Cardiology of the Eul Ji General Hospital on April 19, 1985, when he was diagnosed as congenital aortic stenosis. The patient had been complaining exertional dyspnea and palpitation since his childhood. On admission to the Dept. of Cardiovascular surgery on August 6, 1985, physical examination showed blood pressure of 110/70 mmHg, 80 beats per minute and audible systolic ejection murmur graded IV/VI at aortic area with palpable thrill. It seemed that the second heart sound decreased a little. The patient was in New York Heart Association Functional Class III, but he was receiving no midication. The liver was not congested. His height was only 141cm and weighed 31kg, which was comparable to the averages of eleven or twelve year-old Korean boys.

An electrocardiogram(Fig. 1) demonstrated axis deviation to the left and severe left ventricular hypertrophy with strain. A chest roentgenogram(Fig. 2) showed left ventricular enlargement and C-T ratio about 52.5%.

The M-mode echocardiogram showed SAM(Systolic Anterior Motion of the Anterior leaflet of Mitral Valve) like echogenic density and narrowed LVOFT at the subvalvular region, measured only 0.8cm in diameter by secta scan(Fig. 3).

Aortic valve was opening centrally without eccentricity(Fig. 4). Left ventricular wall and septum hypertrophy implicated the possibility of IHSS(Fig. 5).

Right cardiac catheterization gave no specific informations. On retrograde left side catheterization, the catheter failed to pass across the aortic valve into L.V. cavity, so it was unble to obtain left ventriculography and pressure gradient. But the aortogram and levophase left ventriculography gave some informations suggesting a valvular abnormality with deformed figure and LVOFT narrowing. And also the left ventricular cavity showed marked contracted volume and severe ventricular wall thickness(Fig. 6).

Operative Findings

The left and right coronary cusps were fused together forming a raphe. The non-coronary cusp was so redundant that the two cusps sized same, and the aortic opening was located centrally and

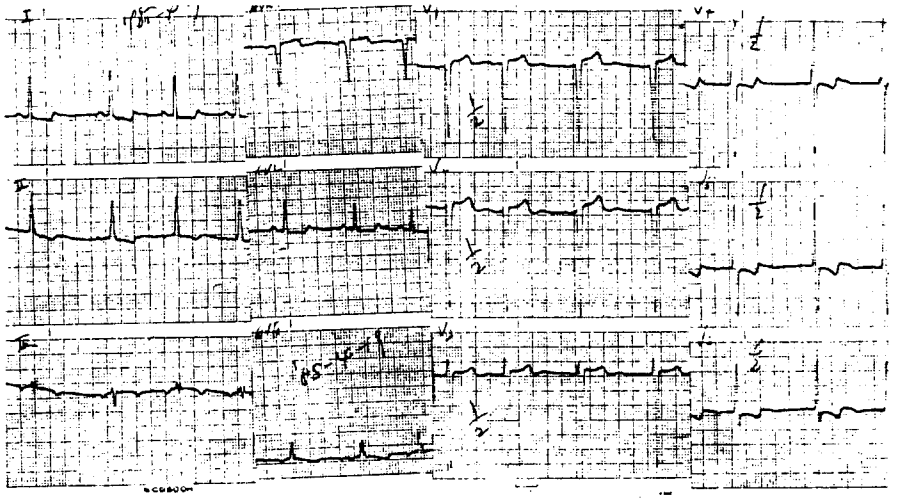

Fig. 1. Pre-operative EKG showed severe left ventricular hypertrophy.

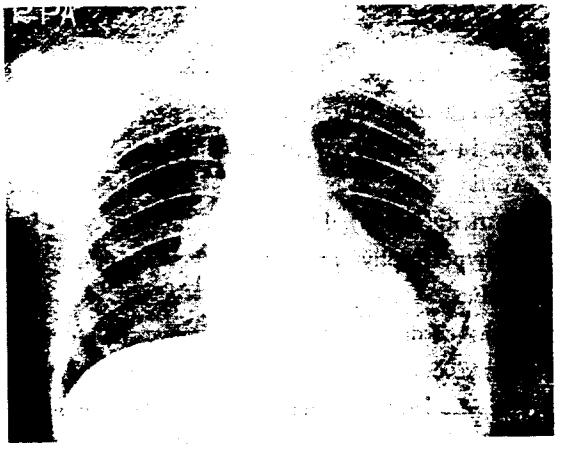

Fig. 2. Pre-operative chest P-A showed marked left ventricular enlargement.

not causing stenosis or eccentricity(Fig. 7).

By retracting the cusps' a circular discrete subaortic narrowing resulted from thick circular membrano-ridge was found just below the aortic cusps of which opening sized not more than 8mm that even the operator's little finger tip couldn't pass it. The tissue appeared somewhat glistening milky white and covered onto the septum(Fig. 8).

Operation

The circular membrano-ridge was removed by the technique of endarterectomy using an intima dissector. The procedure started from the mid point between right and left coronary cusp(fused as one cusp) advancing to the area above the mitral valve and to the area of conducting system below non-coronary cusp. At first it was important to find out the cleavage plane between the abnormal obstructig tissue and the septal muscular wall. Complete removal was not obtained over the area of mitral valve and conduction for fear of causing valvular and conduction damages. But the obstructive tissue was dissected completely over the septal wall. After the circular removal of that structure as much as possible the size of the annulus opening was ealarged as No. 20. Hegar dilator could be passing across it. No other procedures were done on the valve itself in consideration of the aortic opening was enough in size.

Post-operative Course

Post-operative course was uneventful and respiratory care was done for 3 days. Owing to the marked LV wall thickness, some cardiac enzymes were checked serially to exculde the myocardial damage during operation, which were normalized one week later.

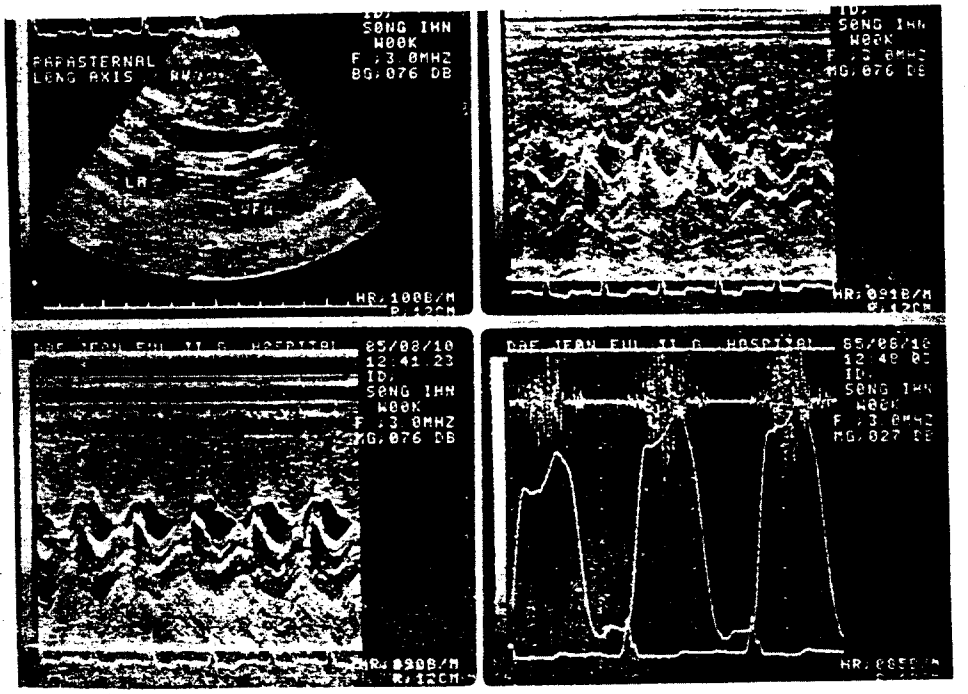

Fig. 3. Pre-operative echocardiography. LVOFT narrowing was seen and measured only 0.8cm in diameter. M-mode showed SAM-like echogenic density.

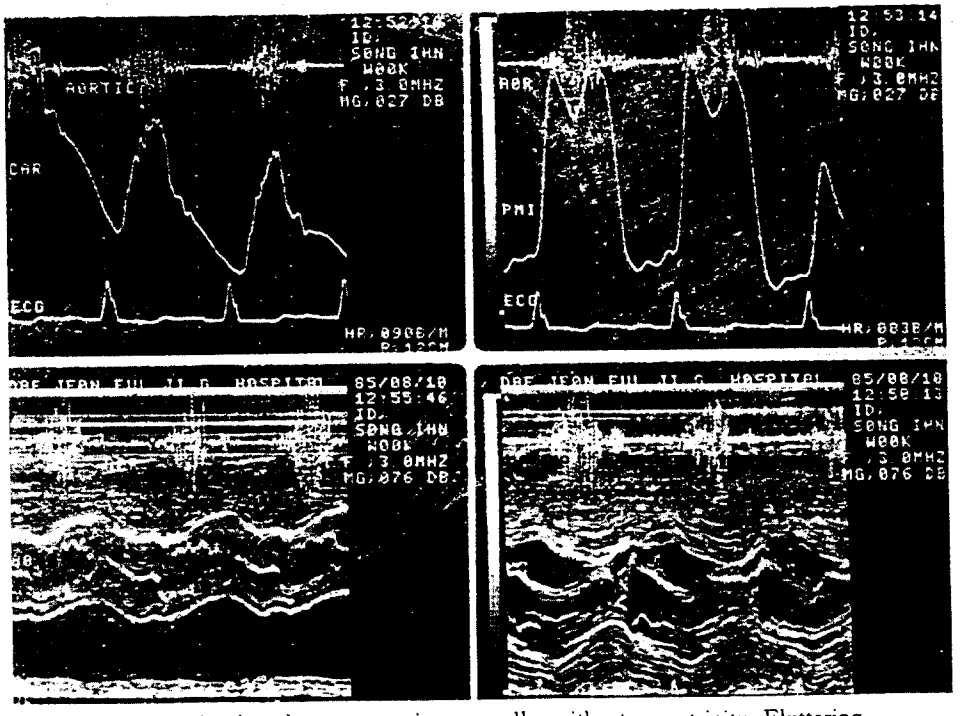

Fig. 4. Aortic valve was opening centrally, without eccentricity. Fluttering of the valve cusp was seen, which might be caused by jet flow from subaortic stenosis.

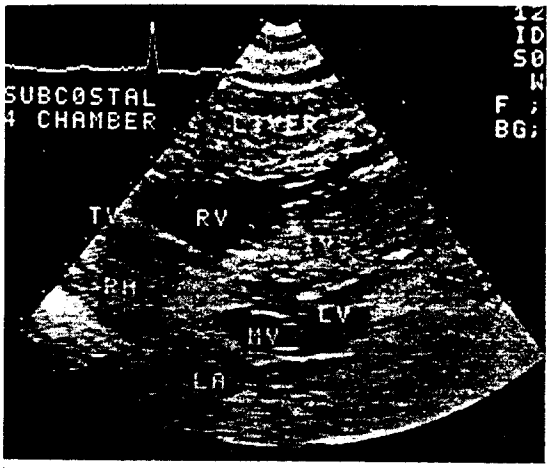

Fig. 5. Marked septum and left ventricular wall hypertrophy were seen on subcostal 4-chamber view.

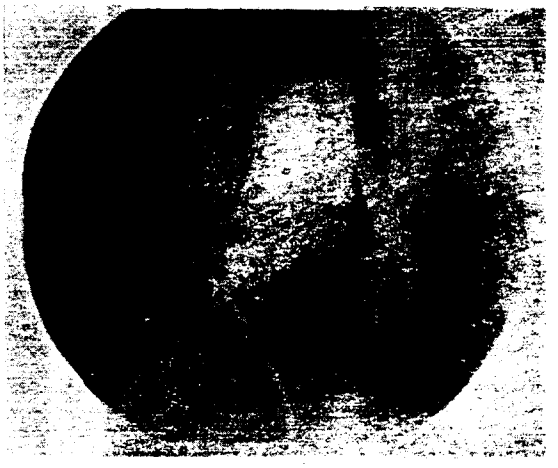

Fig. 6. Levophase left ventriculography. The findings of marked LV wall thickening, small volume of LV cavity, protruding of the septum into the LVOFT, and deformed aortic valvular cusps(S-shaped radiolucency) were noticed. Even though the definite subvalvular stenotic structure was not seen a distinct difference of contrast was present between aorta and LV or LA.

EKG showed no pathologic changes.

Late result

The physical capacity of the patient increased

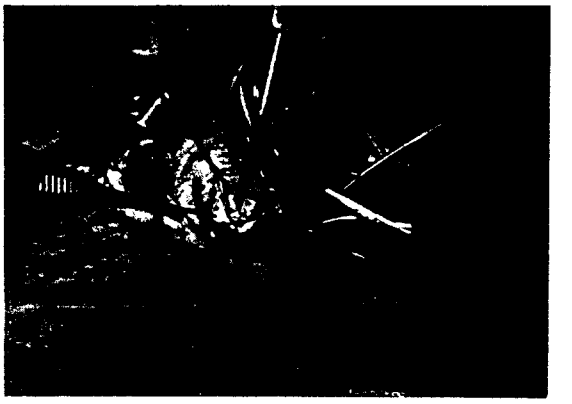

Fig. 7. The congenital bicuspid aortic valve was shown, which was thought not to cause obstruction by enough size of opening.

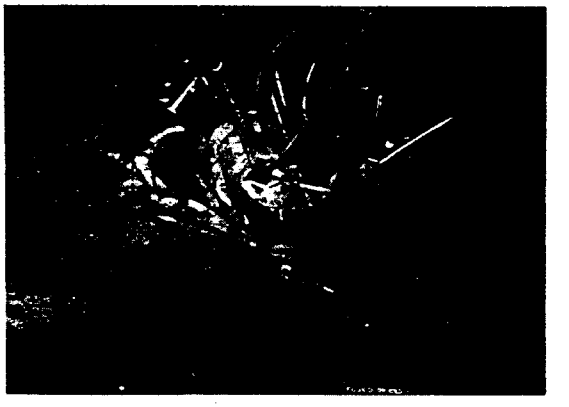

Fig. 8. a discrete membrano-ridge type stenosis was found just below the valves on retracting the aortic valves, pointed with forcep.

remarkably as to enjoy playing even a football.

Cardiac systolic murmur graded II/VI along LLSB(the PMI changd from base to this ara) and the chest X-ray showed much reduction of heart size(C-T ratio 46.9%) at the OPD follow-up of 3 months later(Fig. 9).

The postoperative echocardiogram showed persisting SAM like echogenic density, but subaortic annular diameter increased to 13mm from pre-operative 8mm(Fig. 10). The EKG revealed much reduction in voltages comparing with pre-operative one(Fig. 11). But post-operative cardiac catheterization was not carried out, and the patient was

Fig. 9. Post-operative chest P-A showed much reduction of heart size: C-T ratio measured by 46.9%.

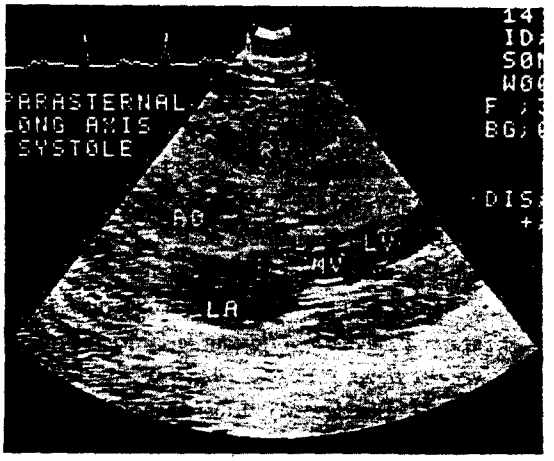

Fig. 10. Parasternal long axis veiw of secta-scan revealed distinct increase of size of subaortic valvular region in LVOFT more than 1.3cm.

lost to follow-up in 13th month.

Discussion

Dr. Gallotti and Dr. Ross suggested the superiority of the new technique for the surgery of discrete subaortic stenosis in 1981. They advocated the technique of enucleation of the obstructing structure by blunt dissection(Fig. 12), which might be expected to peel away from the heart, analogous to endarterectomy in the peripheral vascular system.

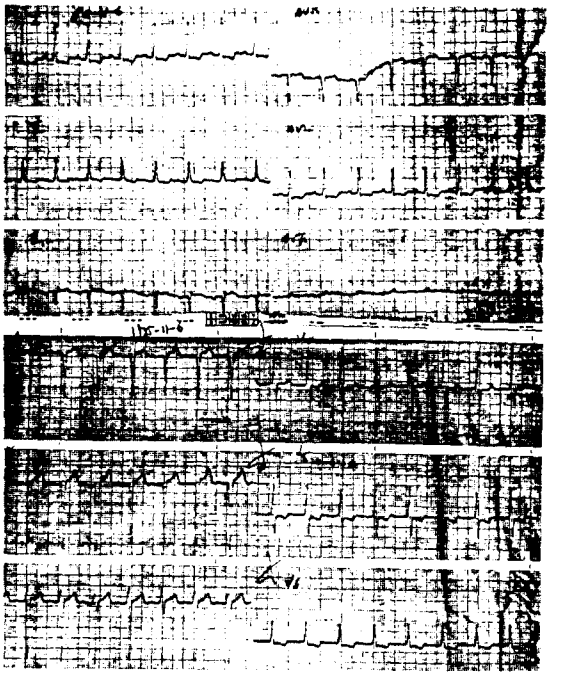

Fig. 11. The post-operative EKG showed much reduction of voltages.

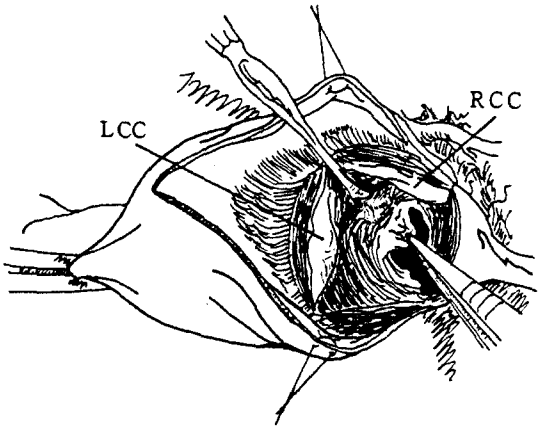

Fig. 12. Exposure and dissection of the subaortic obstructing structure with a dissector or freer: Dissection should be started under the commissure between the right and left cusp or over the septal region. The procedure is analogous to endarterectomy.

They suggested that the technique of blunt dissection consistently develops a subendocardial plane that completely removes the structure with-

out causing damage to the conduction or valve tissue. And the other rationale was that sharp dissecion could not obtain complete removal of the structure and such residual islands of the tissue may contribute recurrence of subaortic obstruction by causing areas of turbulence of flow[10,11].

Concerning the method, the subaortic area is exposed by retraction of the aortic cusp under aortotomy. Under visualization of the junction of the structure with the ventricular septum, using a retractor, with the subaortic shelf placed under tension by traction downward and away from the muscular interventricular septum, a freer or dissector is used to find a plane of cleavage, starting under the commissure between right and left coronary cusps. The tissue is then peeled off the ventricular septum by blunt dissection, which is done clockwise and counterclockwise and also onto the septum.

Secondary muscular hypertrophy was severe in this patient which was almost misdiagnosed as IHSS. In addition to the ventriculographic findings which were similar to IHSS, the echocardiography showed the eche of "SAM" but the ratio of the thickness IVS/PW was lower than 1.3. This case implied that much caution must be paid for the diagnosis of IHSS.

Another point to be stressed are the associated anomalies. There were many reportings of the associated malformations. The congenital bicuspid aortic valve causing stenosis were seen in many literatures[1,8-10,12,14-16]. On the contrary the bicuspid in this patient was thought not to contribute to the obstruction.

The most serious complications with the conventional technique were aortic and mitral regurgitation or valvular cusp and conduction damage[4,6-8,12,15]. But it might be reduced the incidence of the complications by utilizing new technique[10,11] In This patient there was a suspicion of mitral regurgitation by physical and echo findings but not definitive.

As for the origin of the obstructing tissue congenital and acquired lesion were indicated by some authors[10,11]

The histology of the tissue obtained from this patient revealed that it consisted of elastic fibers only, which implicate possibility of a different mechanism of etiology.

This case showed good clinical result for 13 months of follow-up. The surgical technique of blunt enucleation of the obstructing structure may be entirely satisfactory from a hemodynamic point of view and carries a low surgical risk.

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