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Duromedics Mitral Valve Leaflet Escape

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-Abstract-

We report a case of leaflet embolization of central leaflet fracture a 31mm mitral Edwards-Duromedics prosthesis.

A leaflet was fractured to two segments, a larger one embolized to right common iliac artery and a smaller one to left femoral artery, respectively. Patient was reoperated with 29mm mitral Carbomedics prosthesis and incidentally found of smaller segment in left femoral artery at cannulation site. The embolectomy was done 15 days after cardiac operation through midline abdominal incision.

Leaflet escape of a mitral Edward-Duromedics prosthesis is a rare, potentially curable mode of valve failure. After mechanical valve replacement, unexplained heart failure and acute pulmonary edema, mechanical valve failure should be suspected. Correct interpretation of clinical signs, symptoms and fluroscopy should allow early diagnosis of leaflet escape and prompt surgical therapy.

Duromedics 승모판 판막의 판엽파손

나찬영 · 소동문 · 한재진 · 이영탁 · 박표원
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-국문초록-

1960년 9월 Starr에 의해 최초로 승모판막 환자에 인공판치환술을 시행후 인공판막의 계속되는 발전을 거듭하여 최근에는 유효판구 면적이 커지고 중심혈류가 방해받지 않고 판의 높이가 낮은 쌍엽판막을 기계판막으로 많이 치환하는 추세이다.

저자들은 38세된 남자 환자에서 Duromedics 판막으로 이중판막 치환(승모판 31mm, 대동맥판 25mm)후 5년뒤 승모판 판엽의 파손에 의한 급성 심부전으로 승모판 인공판막 재치환 하였으며 파손된 판엽의 일부는 인공심폐기 설치를 위해 박리한 좌측 고동맥에서 우연히 수술중 발견되어 제거하였으며 다른 일부분은 수술후 복부초음파 및 computed tomogram 상으로 복부 대동맥이 분지후 우측장골동맥 기시부에 전색되어 심장수술후 2주째 개복하여 제거하였다.

심장판막치환후 설명안되는 심한 호흡곤란과 흉부 X-선 소견상 급성 폐부종을 보이는 경우는 인공판막의 부전으로 보고 조기진단 및 조기 수술이 바람직하며 조기진단을 위해서는 cineradiogram 이 신속하며 비관혈적인 방법이라 사료된다.

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Introduction

The Duromedics valve prosthesis was introduced in clinical use in 1982 and May 1988, marketing and distribution of the valve was suspended as leaflet escapes had been observed in 12 patients after about 20,000 implants[1~2].

The Duromedics valve prosthesis is designed as a bileaflet valve with central flow characteristics and a self irrigating hinge mechanism to avoid stasis and thrombosis in the critical articulation area[3].

Investigations are attempting to identify the failure mode of the vlave and to find out whether the fractures are due to manufacturing or design problems. Structural failure remains a rare but serious complication of prosthetic valves and carries a high motality[4~5].

We report a case of leaflet escape of a mitral Duromedics prosthesis following leaflet fracture, and embolization at the right common iliac artery and left femoral artery.

Case report

A 38-year-old male presented in 1986 with about a 10 year history of increasing exertional dyspnea, easy fatigue, and orthopnea as a sequel to attacks of childhood rheumatic carditis. On admission in 1986, the clinical features of gross mitral steno-insufficiency and moderate aortic insufficiency were substaintiated by echocardiography and cardiac catheterization.

The cardiac catheterigation revealed a mean pulmonary arterial pressure of 22mmHg, a mean diastolic mitral valvular gradient of 8mmHg, left ventriculography revealed a grade II regurgitation of the contrast media into slightly enlarged left atrium, stiffness of mitral valve motion and rather preserved left ventricular contractility.

Root aortography revealed a grade II aortic regurgitation and normal coronary artery. Ejection fraction of left ventricle was estimated 65.4% by preoperative echocardiography.

The mitral and aortic valve were replaced in september, 1986 with 31 and 25mm Duromedics valve respectively. Mitral and aortic valve replacement was achieved without difficulty with 14, 16 respective mattress sutures of 2-0 Ethibond sutures with pledget.

The valves bedded well in their definitive positions with both leaflets moving freely. Postoperative course remained totally uneventeful and he was discharged three weeks postoperatively. After discharge, he had been well being state and regular followed up for anticoagulation(Fig. 1).

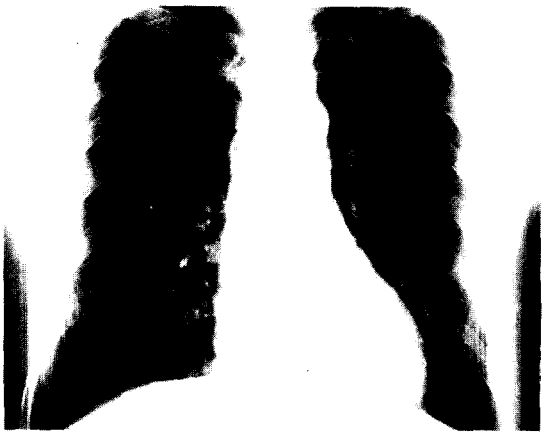

Fig. 1. OPD follow up chest X-ray after DVR state

However, one day before admission, five years and 2 months following valve replacement, he suddenly experienced severe retrosternal tightness accompanied by extreme dyspnea and visited the nearest local clinic.

On admission at local clinic he was aggravated dyspnea and expectorating blood tinged sputum. So, next day he was transfered to our hospital, at emergency room arrival, he was tachypneic(46 per minute), restless, expectorating frothy sputum, and systolic diastolic blood pressure of 100/70mmHg, tachyarrhythmia at 130 beats per minute and raised jugular venous pressure were noted.

Fig. 2. Preoperative chest X-ray
: reveal pulmonary edema.

Diffuse bilateral coarse rales indicative of pulmonary edema was subsequently confirmed by chest X-ray(Fig. 2).

Prosthetic mitral and aortic valve clicks were audible but distinctive murmurs could not be audible due to tachycardia and pulmonary rales. ECG demonstrated sinus tachycardia at a rate of 130 per minute.

Clinical diagnosis of acute left ventricular failure consequent upon mechanical valve dysfunction was made and therapy instituted. Transesophageal echocardiography demonstrated only one mobile leaflet and non-visualization of another leaflet(Fig. 3). Cineradiography was not performed due to patient condition. He was immediately transferred to the operating room, and cardiopulmonary bypass was instituted via left femoral artery and vein.

The mechanical mitral valve was well healed with good endothelialization of the sewing ring, no thrombi or paravalvular leakage. The anterior leaflet moved normally, but the posterior leaflet was not visualization. Through search of the left atrium, appendage, pulmonary veins and left ventricle failed to find the missing part. The mechanical aortic valve function was good.

The Duromedics mitral valve was replaced by a 29mm Carbomedics mitral valve. After discontinuation of cardiopulmonary bypass, during left femoral artery repair, we found incidentally one fractured leaflet segment at the just distal part of arterial cannulation site and removed. But we could not foun another fractured leaflet segment at operating room.

A patient was weaned ventilator at one day postoperatively. For search missing leaflet segment, checked as simple abdomen X-ray.

We could not find leaflet segment on simple abdominal X-ray(Fig. 4). On lumbar spine lateral view revealed a suspected leaflet segment at front of the $L_{4\text{-}5}$(Fig. 5). Abdominal sonography(Fig. 6) and computed tomography(Fig. 7) confirmed a embolized fractured segment at the origin of the right common iliac artery. At postoperative 2 weeks, missing fractured leaflet segment was removed by laparotomy(Fig. 8).

He was discharged 10 days after laparatomic embolectomy and returned to full emplyment, and active life(Fig. 9).

Discussion

Mechanical prosthesis have been shown to pro-

Fig. 3. Preoperative transesophageal echocardiogram
: no visible one leaflet in bileaflet prosthesis.

Fig. 4. Simple abdomen X-ray
no visible leaflet segment

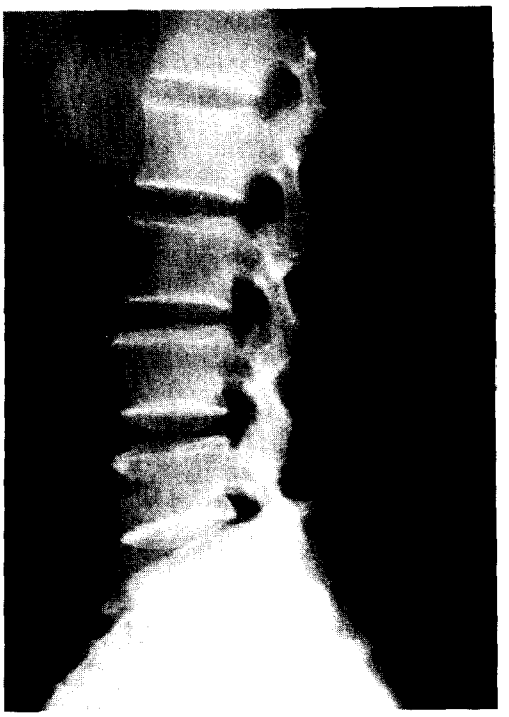

Fig. 5. Lumbar spine lateral view
suspicious embolized leaflet segment at front of L_{3-4} area.

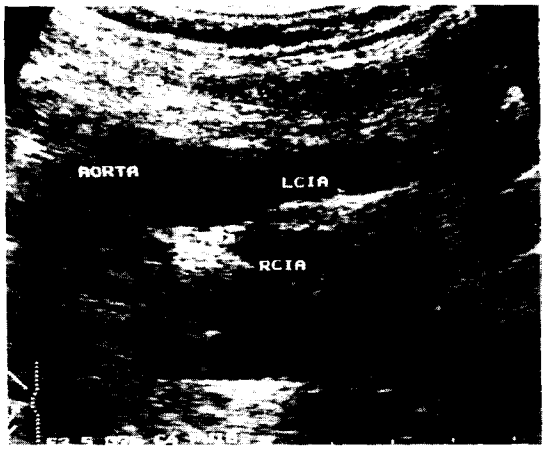

Fig. 6. Abdomen sonogram
: embolized segment on right common iliac artery

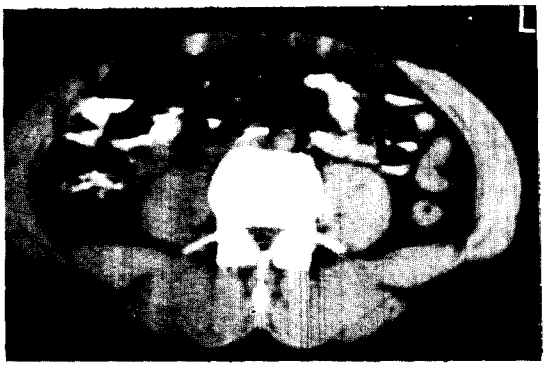

Fig. 7. Abdomen CT
: embolized sement on right common iliac artey

cess superior hemodynamic characteristics and an excellent record of durability[6~7].

Duromedics bileaflet valve prosthesis was withdrawn in May 1988 from the market 12 leaflet escape had been reported in 20000 implant[3]. Mechanical disruption in other bileaflet valves has been discribed by others[8~9].

As compared to single disc valve[10], or ball valve[11], bileaflet valve escape offers a better chance for adequate treatment and patient survival because the escape of only one leaflet still leaves some residual valve function.

Disc escape in single disc valves has reported to result in sudden death[10], but single leaflet escape

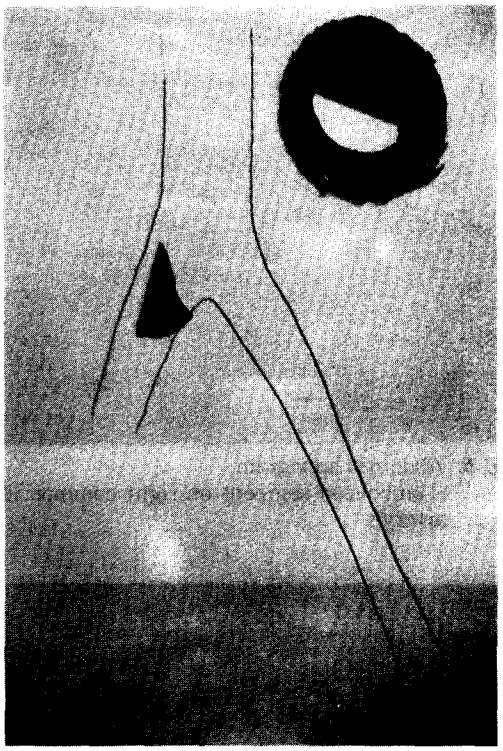

Fig. 8. Schematic view of the embolized segment site.

Fig. 9. Chest X-ray after discharge.

in a bileaflet valve has not caused sudden death [12-14]. The acute onset of unexplained heart failure and pulmonary edema in a patient with mechanical valve is highly suggestive mechanical valve dysfunction as opposed to a more gradual onset, which might result from valve thrombosis[13].

In leaflet escape from a Duromedics valve, 90% of cases the mitral valve involved, half of them being the 31mm vlave. Site of fracture is variable[14]. Our case is double valve replacement patient with 31mm mitral, 25mm aortic. The onset variable from 19 days to 41 months, with mean interval of 21.6 months[14], but our case in 62 months interval. It is the longest time interval in reported cases.

Though differential diagnosis between valve escape and valve thrombosis can be suspected on clinical, phonocardiography and echocardiographic basis, Deuvaert FE et al proposed that fluroscopy is the rapid, noninvasive test to distinguish between both conditions[15].

At operation, missing leaflets unlikely will be found in heart, because they usually embolize. In double valve replacement, 31mm leaflet passed through a 23mm aortic valve without disrupture its function[12]

Embolized leaflets usually have not been to create urgent problem. Usual location of the embolized leaflet is aortoiliac bifurcation, common iliac artery[12]. Our case is embolized at the right common iliac artery in larger segment and left femoral artery in smaller segment.

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