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大動脈 縮窄症의 臨床的 考察***

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=Abstract=

Coarctation of the Aorta in Adult: Report of three Cases and Review of the Literture

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Coarctation of the aorta is an important congenital cardiovascular defect, which occurs in a significant number of persons.

The basic anatomic defect is a localized deformity of the media, manifested by two types of strictures in the aorta: "true" coarctation and tubular hypoplasia.

The zone of coarctation is characteristically located distal to the origin of left subclavian artery at or just beyond the insertion of the ligamentum arteriosum.

It shortens life if untreated, but it can be corrected to render the patient functionally normal.

Here we have a 2-year operative experiences with 3 Cases of the aortic coarctation, two or hypoplastic type and one of postductal type, at age of 17 to 19 year old Korean, operated in 1965 and 1968 at the National Medical Center. The purpases of this report are to describe the immediate and late effect of surgery, histopathologic bases and the rarity of this lesions in Korea.

緖 論

大動脈縮窄症(Coarctation of aorta)은 胎生學的 缺陷으로 大動脈內腔의 狹窄(Tubular hypoplasia) 또는 縮小(constriction)가 大動脈을 따라서 어느곳에서도 생길 수 있으나, 大部分 動脈靭帶(ligamentum arteriosum)의 附着部 부근에서 左鎖骨下動脈의 起始部 直遠位部에 생기며, 上肢에서 高血壓이 나타나고, 上下肢 사이에 큰 血壓差異를 보이는 것이 特徵으로 1903年 Bonnet[1]가 처음 記述하였으며, 이를 幼兒型(preductal type)과 成人型(post ductal type)으로 區分하기도 하며, 縮小型(true coarctation)과 狹窄型(tubular hypoplasia)으로 區分하기도 한다[2].

이 疾患은 歐美에서는 先天性 心臟病의 4~9%[3]을 차지하나, 韓國에서는 매우 稀少하여 0.4~2%[4,5]로 알려져 있다.

本症患의 血壓上昇機轉, 生後自然經過가 아직 完全히 解決되지 않고 있으며, 東洋에서의 낮은 頻度의 原因에 對해서도 未知數이다. 그러나 1945年 Crefoord[7]와 Nylin, Gross[8]와 Hufnegal이 처음으로 手術에 成功한 以來 많은 手術成功例와 良好한 術後 經過들을 報告하고 있다.

本報告는 1959年以來 現在까지 國立醫療院 胸部外科에서 治驗한 3例의 大動脈縮窄症을 文獻考察과 함께 報告하는 바이다.

症例 Ⅰ.

Ⅱ. CASE REPORTS

case Ⅰ. Im K. Male 6505251

This 19-year-old Korean male was admitted to

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the N. M. C. on May 3, 1965 with an one year history of mild chest discomfort, dyspnea on exertion, progressive visual disturbances and frequent episodes of nasal bleeding. However, 4 years prior to this admission to the N. M. C. he suffered a massive nasal bleeding without any known causes, and was informed that he had a congenital heart disease. Otherwise his past history and the family history were not contrbuted.

Physical examination revealed a normally developed and well nourished patient with a relatively prominent development of the trunk compared to that of the lower extremities (Height 176cm Weight 63.3kg). The blood pressure was significantly higher in the upper (230/120 mmHg) than in the lower (120mmHg systolic by palpation) extremities. The pulse was morepowerful in both upper arms and diminished and delayed in the lower, rate around 72/min. A systolic thrill was noted on palpation along the left sternal border. On percussion, the heart dullness was wider than usual, but no abnormal pulmonary alteration was found. A systolic murmur Gr. Ⅱ/Ⅲ was audible over the entire precordium, with the maximum point at the 3 ICS on LSB.

The pulsation from possible collateral blood vessels was noted on thechest wall, shoulder, neck and in the interscapular region. No hepatosplenomegaly or other abdominal organomegaly was demonstrable but a faint systolic murmur on the paraumbilical region was audible.

The ECG showed left ventricular hypertropqy. (Fig. 1) and episodes of arrhythmia withmia with some nodal escape beats. Serial chest and heart X-ray film showed cardiomegaly especially a left ventricular enlargement, multiple rib notchings in both sides and an indented left upper mediastinal shadow as the "3 sign", 6505251 Im K.

caused by the dilated proximal segments and the left subclavian artery. On aortography, a marked coarction of the aorta was found just distal to the origin of the left subclavian artery and the extensive collateral circulation was observed through the intercostal arteries and especially both

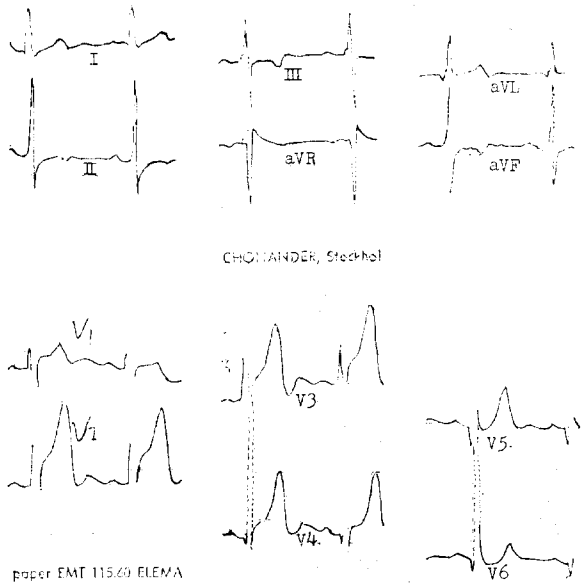


Fig. 1. May 12, 1965 Interpretation: Left Ventricular Hypertrophy Op. diagnosis: Coarctation of Aorta.

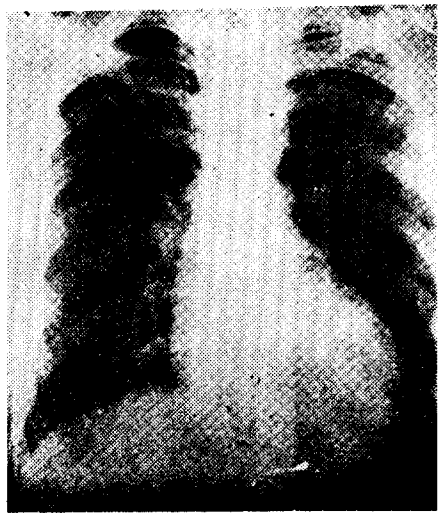


Fig. 2a. Case | Im K. A picture of plain chest X-Ray fim showing left ventricular enlargement and indentation at the begining of the dercending aorta, "3" sign. The arrow point to classical notchesin the ribs.

amarian arteries which were widened and tortuous. The proximal pert of subclavian artery was markedly dilated.

Fig. 2b. Case I Im K. Early stage of aortography reveals abrupt marrowing and omplete stenosis ofaorta at junation of arch and descending aorta. From the aorta above the stonosis a big internal mammary mammary artey is visnalized along the cours of the vertebral column, with non-visualization of dercond!ng aorta below the coarotation.

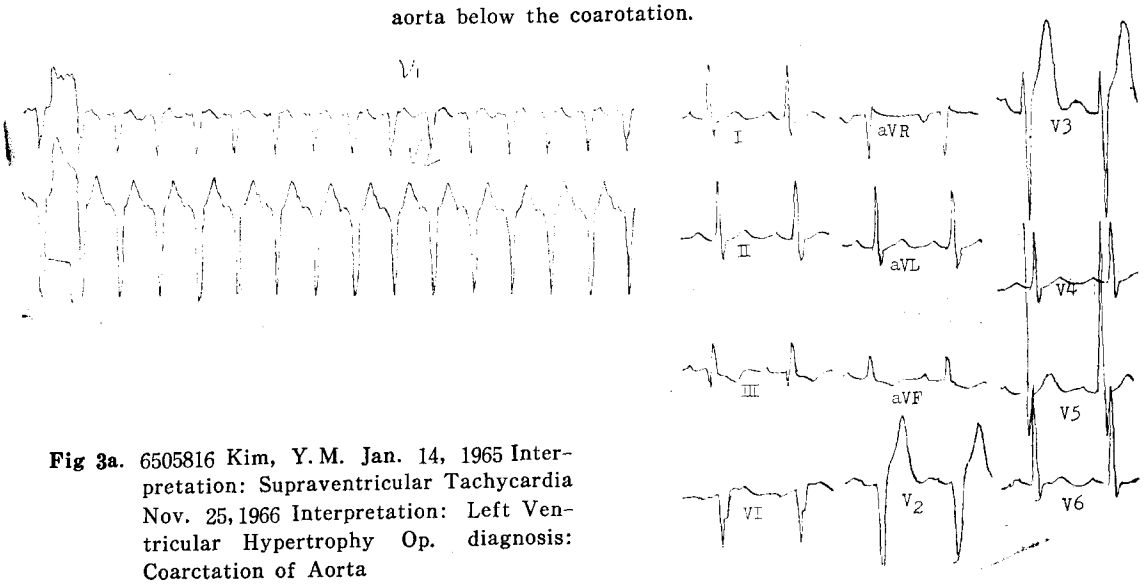


Fig 3a. 6505816 Kim, Y. M. Jan. 14, 1965 Interpretation: Supraventricular Tachycardia Nov. 25, 1966 Interpretation: Left Ventricular Hypertrophy Op. diagnosis: Coarctation of Aorta

On May 19, 1965, the involved part of the aorta was resected through the posterior-lateral thoracotomy. Following the aortic resection, a transplant of a "Teflon graft" 10cm long was made and an appropriate anastomosis performed.(Table 5.)

The histopathology of the resected aorta revealed organized thrombus formation in the arterial wall in which hemorrhage and recanalization was observed. The adventitial tissue showed marked hemorrhage but no signs of inflammatory or

Table I, Pre-and Post-perative Changes in Blood Pressure (mmHg) Above and Below the Coarctation of Aorta

Extremities	Before Operation			After Operation					
				2 months			2 years		
	Syst.	Diast.	Pulse Pressure	Syst.	Diast.	Pulse Pressure	Syst.	Diast.	Pulse Pressure
Rt. Uppe	r230	120	110	150	90	60	180	90	90
Lt. Upper	230	120	110	140	90	50	200	80	120
Rt. Lower	120	—	—	140	—	—	200	100	100
Lt. Lower	120	—	—	150	—	—	230	130	100
Difference	110	—	—	±10	—	—	−20−30	—	—

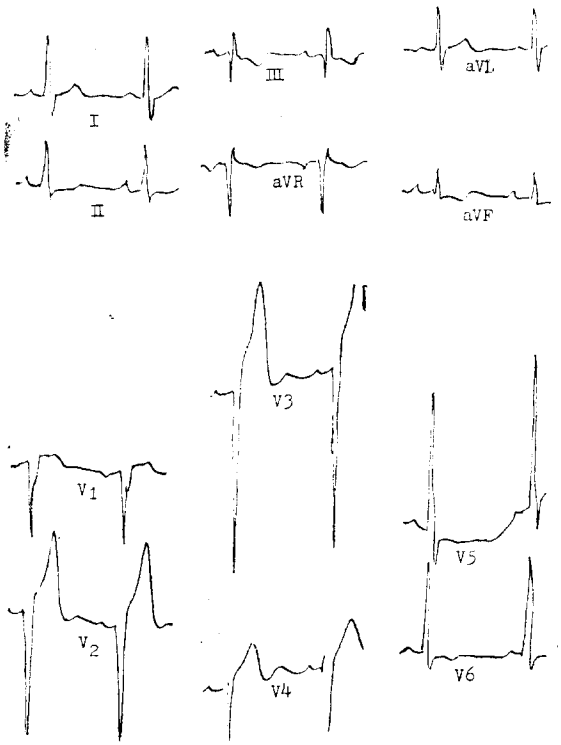


Fig 3b. 6505816 Kim, Y.M. Jan. 12, 1967 Interpretation: LeftVentricular Hypertrophy with strain
Op. diagnosis: Coarctation of Aorta

Fig 4. Case Ⅱ. Kim Y.M. Late phase of aortographyshows vimalization of the descending aorta through collateral arteries. The arrow points to the stenotic part of aorta.

Fig. 5a Im. K. 6505251 I)

sclerotic changes of arterial of arterial wall were noted. The postoperative course involved complications in that evidence of nasal bleeding, pneumothorax and pleural fluid in the left hemithorax remained temporarily. The hypertension noted

Fig. 5a Im. K. 6505251 Ⅱ)

Fig 5b. Kim. M. M. 6505816. Stenotic area:

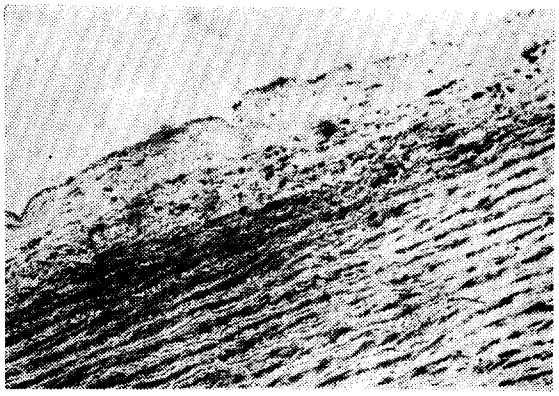


Fig 5b. Kim. Y. H. 6050816. Sudan Stain.

preoperatively in the upper arms declined to normal and the pressure gradient narrowed between upper and lower extremitiespostoperatively.

However, two years later after the operation, hypertension (Arm 190/80mmHg) developed in both upper and lower extremities but the femoral pulses were in good and strong. He has no subjective difficulties in ordinary life except for a slight tingling sensation over both arms.

Case Ⅱ. Kim Y. M. Male 6505816

On March 29, 1965, a 17-year-old Koreanmale was referred to the N. M. C. from the Galvary Clinic for the investigation and elucidation of the cause of his hypertension with the possibility of surgical correction. Actually, he had been suffering from palpitation, severe headache, dizziness and general malaise for the last 4 years, when he was diagnosed for the first time as having a hypertension.

The initial onset of symptoms occured at the age of 10 when he suffered from headache and palpitation after physical exertion. The past and the family histories were non-contributory. Upon admission, May 12, 1965, physical examination revealed the patient to be well nourished and of normal general development (Height 167 cm, Weight 54.5kg).

The blood pressure was remarkably high in both upper extremities (Rt. 190/130 mmHg, Lt. 180/110mmHg) and showed a definits pressure gradient externally compared to the lower extremities (Rt. 150/120mmHg, Lt. 140/120mmHg). The pulse was regular and around 80/min at rest. It was more powerful in both upper extremities, while weak and delayed in the lower extremities. The abnormal pulsation was demonstrable on the anterior chest wall around the sternum, below the clavicular region and on the back. The heart was enlarged with increased cardiac dullness. A grade Ⅱ/Ⅲ systolic murmur was audible on the cardiac apex and 3 ICS on LSB. The ictus was on the 6th intercostal space to the leftmidclavicular line without thrill. Normal findings were obtained upon fundus examination. Abdominal examination showed no demonstrableorganomegaly and neurological findings were within normal limits. ECG showed left ventricular hypertrophy. Serial chest and heart x-ray films disclosed left ventricular enlargement with prominent ascending aorta and multiple rib

Table 2 ***Case Ⅱ, Kim, Y. M.*** Pre-and Post- perative Changes in Blood Pressure(mmHg) Above and Belowthe Coarctation of Aorta

Extremities	Before Operation			After Operation					
				2 months			2 years		
	Syst.	Diast.	Pulse Pressure	Syst.	Diast.	Pulse Pressure	Syst.	Diast.	Pulse Pressure
Rt. Upper	190	130	160	140	110	30	—	—	—
Lt. Upper	180	110	70	140	100	40	140	100	40
Rt. Lower	150	120	30	150	120	30	—	—	—
Lt. Lower	140	120	20	150	110	40	140	100	40
Difference	40			−10			0		

notchings.

The typical indentation of the left upper mediastinal shadow wa spresent. On aortography, the characteristic narrowing of the aorta was found just distal to the origin ofthe left subclavian artery. Enlarged internal mammary arteries, large tortuous intercostal arteries and other collateral circulation were demonstrable. On June 14, 1965 the narrowing of the aorta was resected through a left posterior-lateral thoracotomy andan end-to-and anastomosis was made without graft. (Table5.)

The histopathology of the resected aorta showed severe intimal thickening composed of fibrous tissue with ingrowth of blood vessels in most of the stenotic area. The elastic tissue in this part of the artery was somewhat irregular. (fig 5b)

The postoperative course was quite smooth, without complications and the preoperative high blood pressure in the upper extremities declined to normal; a relatively increased blood pressure in the lower extremities now being present. (Table 2.)

On Jan. 11, 1967 this patient was readmitted because of exertional dyspnea and numbness on both the hands and feet and for aortography. The blood pressure showed no pressure difference between upper and lower extremities (Lt. upper 140/100 mmHg, Lt. lower 140/100 mmHg) and the femoral pulse was good in both. The heart showed an audible systolic murmur Gr. Ⅱ on apex and Lt. sternal border. Compared to the previous ECG trace, the present trace showed no interval changes with left ventricular strain. (fig 3b) On the 2nd aortography, there were some narrowing "wasting" of the aorta but the caliber was still relatively good. But there was some dilation for the distally in the descending aorta.

Case Ⅲ Park Y. H. Female 6804814

This 17-year-old female was admitted to the N. M. C. on March 25, 1968, because of palpitation, exertional dyspnea cough with recurrent U. I. R. and nasal bleeding which had become worsen for 2 years. Cardiomegaly discovered at her age of 3 during an episodes of common cold while at productive cough, nasal bleeding and dyspnea occured.

Physical examination revealed emaciated and retarded physical development with height 158cm and weight 38kg. The blood pressure was high and strong in thearms (220/90mmHg) and faint to absent in the legs (120/80 mmHg). Heart examination disclosed pansystolic murmur Gr. Ⅲ/Ⅳ on the entire precordium and continuous murmur audible at the left 2nd and 3rd intercostal spaces and thrill palpable. Liver was enlarged to 3FB along the right costal margin and spleen tip palpable without ascites.

ECG showed suggestive biventricular hypertrophy with left ventricular preponderance (fig 6). Chest and heart x-ray film (86319) showed pancardiomegaly and increased vascularites of lung suggesting left to right shunt. Aortogram demonstrated patent ductus with possible coarctation of aortaand renal angiogram showed a little smaller left kidney

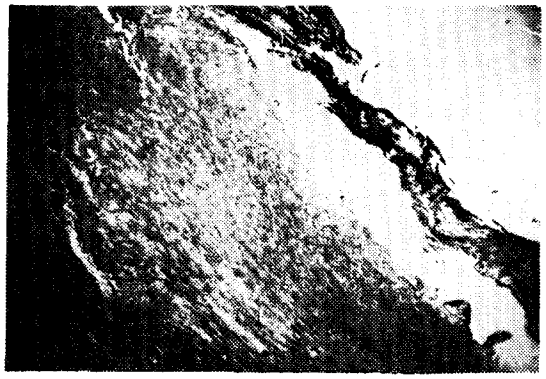


Fig 5c. Park. Y. H. 6804814

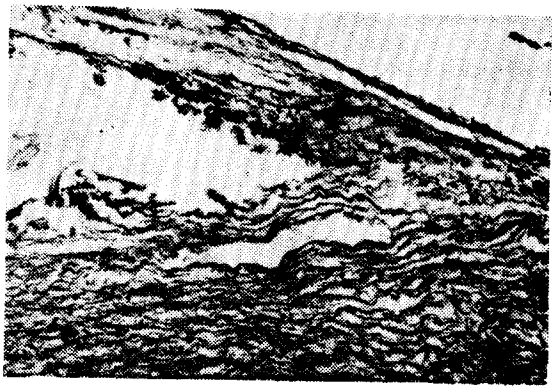


Fig 5c Park. Y. H. 6804814

without vascular abnormalities and splenomegaly also noted. Cardiacc atheterization revealed markedly elevated main pul. artery (109.5/74.5 (Mean 87) mm Hg) and no pressure gradient across the pul. valve. (R. V. 109.5/0/5 mmHg)

There was a marked oxygen step-up in main pul. artery (11.5 Vol%) over the right ventricle (8.4 Vol%). Cardiac output was 5.35 L/min and pul. blood flow 10.4 L/min. Calculated Lt to Rt. shant was 48.6% of total pul. blood flow (table 3.)

Aortogram showed patent ductus arteriosus with possible coarctation of aorta and no distinct collaterals.

Table 3. Cardiac Catheterization Report

6804814 Park, Y. H. F

Cath. Position	O_2 Sat. (vols %)	Pressure mmHg
Main pul. Artery	11.52%	109.5/74.5 (Mean 87.0)
Lt. pul. Artery	11.53%	
Right ventricle, Mid.	8.40	109.5/0/5.33
Right Atrium high Mid.	8.86	23.1/2.67 (M10.66)
Brachial Artery	14.89	240.0/83.5 (M 128.0)
Arterial O_2 Sat.	95. 5%	
Cardiac Output	5.35 L/min	
Pul. Blood Flow	10.40 L/min	
Lt. to Rt. Shunt	48. 6% of total pul. blood flow	

Under the diagnosis of PDA or in combination with coarctation of aorta, on July 19, 1968 left standard thoracotomy was made,

No remarkable collateral vessels noted and just beyond the origin of subclavian artery marked coarctation of aorta was disclosed. Proximal part of aorta measured 2.5cm in diameter and distal part 4.5cm in diameter as poststenotic dilatation. Lt. subclavian artery was also dilated to 1.5cm in diameter. The PDA was measured 1.5cm in length and 1cm in diameter. To rule out other possible cardiac anomalies pericardium was opened and

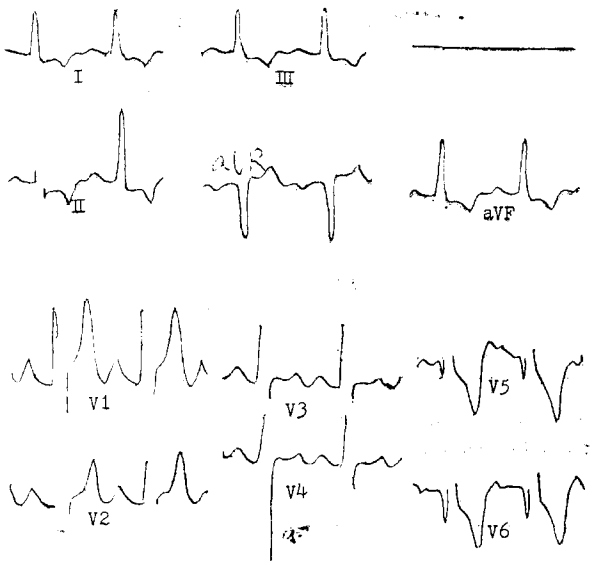
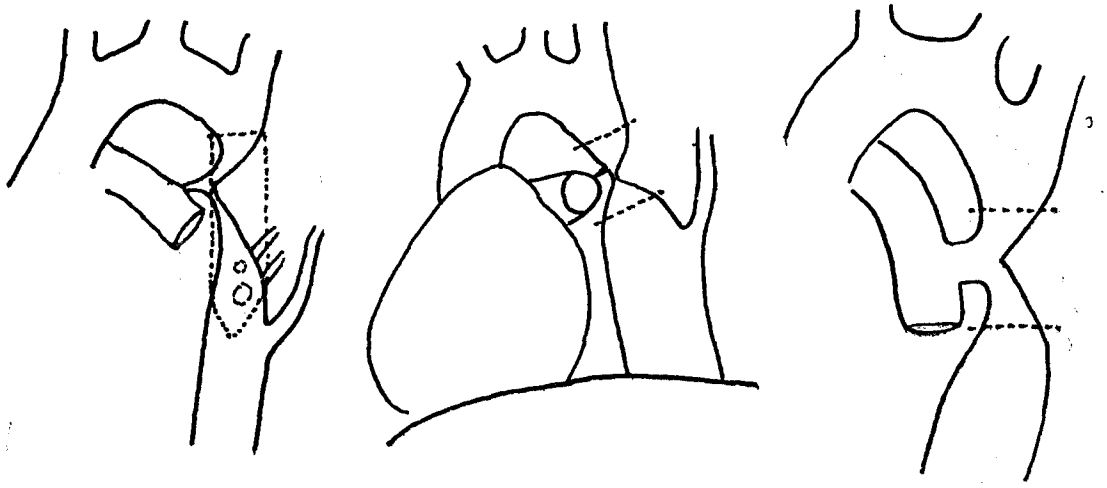


Fig 6. 6804814 Park, Y. H. F Mar. 26, 1968
Intretation: Left Ventricular Hypertrophy with strain
Clinical diagnosis: PDA

Table 4. *** Case Ⅲ, Park, Y. H*** Pre-and Post-operative Changes in Blood Pressure (mmHg) Above and Below the Coarctation of Aorta

Extremities	Before Operation			After Operation					
				2 weeks			2 months		
	Syst.	Diast.	Pulse Pressure	Syst.	Diast.	Pulse Pressure	Syst.	Diast.	Pulse Pressure
Rt. Upper	200	80	120	150	80	70	180	100	80
Lt. Upper	220	90	130	150	100	50	190	110	80
Rt. Lower	1 20	80	40	130	110	20	150	120	30
Lt. Lower	110	—	—	120	90	30	140	110	30
Difference (M)	95			25			40		

Table 5. Sketches of Pathoanatomical Situation in 3 cases of Coarctation of Aorta



Case Ⅰ: "Post-ligamental" The dotted line is shown the Teflon graft applied after resection of involved aorta.

Case Ⅱ: "Post-ligamental" The dotted line is shown a part of resected area of aorta and end to end anostomosis was possible without application of graft.

Case Ⅲ: "Juxta-ductal" type The dotted liine is shown a part of resected area of aorta and end to end anostomosis was possible without application of graft ligation of PDA.

heart was checked to be anatomically normal. The PDA was ligated Pott's vascular clamps were applied proximal and distal parts of coarctation. During this procedure, blood pressure was elevated upto 280mmHg in systole which was controlled with Alfonade infusion down to 220 mmHg.

The coarctation of aorta was resected in 3cm length combined with aortic part of PDA and end-to-end asastomosis of aorta was made (table 5.) Also collaterals to distal part of aorta was not so remarkable. After operation, blood pressure was 180/110 mmHg on the upper extremities and 130/110mmHg on lower extremities. (table 4) Resected aorta for histopathology disclosed a detachment of endothelial lining cells and fragmentation of elastic fibers in association with collagenization of media (fig 5c).

The postoperative course was uneventful with good femoral pulsations but residual pressure gradient between upper and lower eotremities

remained for 2 months hospitalization (table 4.)

考 案

大動脈을 따라서 그 內腔의 狹窄(tubular hypoplasia) 또는 縮小(constrication)가 先天的으로 大動脈의 狹部發育 및 構造의 胎生學的 缺陷으로 생기며, Turner氏 症候群 患者에서 흔히 發生하기는 하나, 一般的으로 女子보다 男子에서 더 많다(M:F=2:1) Abott(1928), Reifenstein, Levine과 Gross(1947)는 大動脈縮窄症 患者의 自然經過에서 60~70%가 40歲 以前에 死亡한다고 하였으며[9] Camphell(1970)[10] 32歲以前에 50%가 死亡하며 平均死亡 연령이 34歲였다고 한다. 臨床徵候는 縮窄의 程度 및 部位 그리고, 患者의 約 1/3에서 볼 수 있는 다른 心畸形의 合併與否에 따라 다르다. 흔히 合併되는 心畸形은 Bicuspid aortic valve PDA, small VSD, Congenital aortic stenosis, Intrcranial A-V malformation 等이다. 縮窄이 動脈管의 近位部에 發生(Infantile Type)하면, 開存하는 動脈管을 通해서 右左短絡으로 말미암아 差異性 淸色症을 나타내며, 動脈管 遠位部에 縮窄을 單獨으로 가지는 小兒와, 若年成人의 大多數에서는 症狀이 없어 一般的 理學的 檢査上에서 心雜音이나 血壓이 높아져 주목되며 때로는 頭痛, 呼吸困難, 심계항진, 鼻出血, 視力障礙, 運動時 跛行(clausication)等이 나타나는 경우가 있다. 高血壓의 發生原因에는 縮窄과 側副血管의 機械的 저항인자와 體液性 特히 腎性 및 Renin-Angiotensin-Aldosteron 機轉이 部分으로 作用하는듯 하다[11,12,13]. 縮窄患者의 主되는 위험은 심한 高血壓으로 초래되며, 腦動脈瘤, 腦出血, 大動破裂, 左心不全 그리고 細菌性心內膜炎等이 포함된다. 大動脈縮窄의 胸部 X-線 및 大動脈造影像은 잘 알려져 있으며(Friedberg 1966), 縱隔洞左界上部에서 확장된 左鎖骨下動脈과 확장된 上行大動脈을 볼 수 있다. 그리고 左側의 縱隔洞周圍陰影(paramediastinal shadow)에 따라 大動脈縮窄部의 陷沒과, 縮窄部前(proxincal aorta or Left SCA)後 (distal aorta)의 확장으로 因한 "3" sign이 診斷의 단서가 되며, 肋骨의 切痕(Dib notching)은 확장된 側副血管의 侵蝕(Erosin)으로서, 년령과 더불어 뚜렷해진다. 心導子法과, 大動脈造影法은 縮窄의 部位와 길이를 알고 다른 畸形의 合併與否를 確認하는데 필요하다. 心電圖所見은 縮窄部近位의 血壓과 患者의 年齡에 따라서 여러 程度의 左心室肥大의 所見을 보인다. Wisheart(1970)[9] 의 報告는 50~75%의 모던 年齡群에서 左心肥大 및 긴장(strain)을 보였으며, 手術後 數年間 觀察結果, 73%에서 手術前 左心肥大가 射轉됨을 볼 수 있었다고 한다. Karnell (1968)[14]은 30歲 以前에 ECG 上 左心室 밝혈(ischemia)이 보이면, 大動脈狹窄症을 의심한다고 하였으며, Tawes(1969)[15]는 左心室 ischemia는 手術後 사망율 증가의 重要한 原因이 된다고 하였다. 1945年 Crafoard와 Nyline 그리고 Gross와 Hufnagel에 依해서 手術이 시도된 以來, 手術經過 및 豫後가 良好하여 外科的 重要한 先天性 心臟疾患으로 되어 있으나, 一年미만의 유아기라, 30歲 以後의 成年期에서는 상당한 死亡율을 보이고 있다. (Gloss et al 1960, Karnell 1968, Shumacker 1968)[16] 手術後 死亡率이 높은 原因으로 大動脈壁의 硬化性 病變과 併存하는 다른 心臟畸形 및 年齡의 限界性, 그리고 手術方法等이 强調되고 있다[17]. (William E ostermiller 1971, Karnell 1968) 手術時期는 小兒期와 若年成人 15歲~15歲)에서 받는 것이 좋다. 手術의 方法은 여러것이 있으나, 大部分 縮窄部의 切除와 端端吻合術로 可能하며 縮窄部位가 긴 例에서는 人工血管 代置術로 矯正을 한다. 小兒期에 手術切除後 Continuous suture를 하는 경우 手術部位의 發育부진으로 再狹窄을 초래하는 경우가 있어 interrupted everting suture를 하는 것이 좋으며 Pelletier et al (1969)[18]은 大動脈 直徑의 55%以上만 유지하면 上下에 血壓差가 없음을 觀察했다는 報告도 있다. 近年에 E. Skagseth (1973)[19]는 手術時 血壓하강을 막아주고, 척추동맥과 腎동맥을 보호하기 위하여 側副行血管, 發達이 나쁘거나, 大動脈에 심한 동맥경화증 병변이 있을 경우, 일과성 이거나, 永久的 By-pass prosthesis를 권하고 있다. 전방척추동맥의 심한 장애로 오는 下半身불수는 大動脈縮窄手術時 흔히 發生하는 것은 아니나, 合併症이 비극적이기 때문에 手術前, 側副血管의 發達程度와 장시간의 大動脈 결찰 및 긴 部位의 대동맥 절단을 조심스럽게 行하여야 한다고 한다. 또한 近位部 동맥차단時 遠位部 동맥압이50mmHg 以下로 떨어지면 위험하다고 한다.

Homograft circumferential replacement를 할 경우 再狹窄 및 확장이나, 退行性變化가 없었다고 한다, (Foster et al 1965), 移植便의 파괴, 石灰化 變性이 생겨 現在는 使用하지 않으며, 人造血管을 더 많이 使用한다. 手術 死亡率은 患者의 年齡과, 合併心臟疾患의 有無에 따라 差異가 크며(Schumacker et al 1968, Tawes et al 1969, Wisheart 1970). 單純한 大動脈縮窄만 있는 경우 5~6%이다. (Braimbridge1965, Karnell 1968)[20] 死亡率이 높은 것은 幼兒期에 側副血管이 發達하기 前과, 血管저항이 늘어난 30歲以後에 많

았다. 幼兒期 사망율은 20%(Brom 1965, Hallman 1967, Schumacke (1968)[16]를 넘었으며, 30歲 以後에는 11.3%(Report of the section on cardiovascular surgery (1957)이었고 Braimbridge and Yen (1965)[20]에 依하면 40歲 以後에서 13%였다. 手術後 死亡의 主原因은 心不全, 肺浮腫, 吻合部의 파열이 제일 많았다. (Rumel et al 1957)

大動脈縮窄의 手術의 目的은 狹窄部 上下의 血壓差를 줄이고, 高血壓을 없애는데 目的이 있으나, 手術後 高血壓이 그대로 남아 있거나, 輕度의 高血壓이 再發하는 경우도 있다. 手術前 高血壓은 25~30 에서 最高値를 보였으며 女子에서 보다 男子에서 더 높은値를 보였다. (Wisheart 1970) 手術直後부터 血壓은 서서히 떨어지기 始作하여(Shumacker et al 1968), 말초 血管저항이 높은 例에서 手術後 혈관저항의 지속으로 요히려 Catecholamine의 배설 增加로 Paradoxical hypertension을 보이는 수도 있다. (Goodal 1969[21] O'Gorman 1969[22]) Karnell(1968)의 報告는 25%例에서만이 血壓의 하강을 보였으며, Rathi and Keich(1964) 報告는 43%에서 手術前보다 血壓이 상승하였다. Wisheart (1970)의 경우 38%에서 수축기 혈압이 150mmHg 以上이었다. Sellors와 Hobsley (1963)[23] 報告는 手術後 5~10年 경과한 患者의 70%에서 혈압의 好轉을 보았고 Wisheart(1970)는 5~17年 手術經過後 65%에서 血壓이 감소하였다. 따라서 血壓 하강은 5~10年에 걸쳐서 好轉된다는 說이다.

結 論

1) 3例의 大動脈 縮窄症 患者中 2例에서 切除 및 端端吻合物을 施行하였으며, 1例에서는, 切除後 人造血管(Teflon graft) 移植을 行하였다. 이들 모두 手術前에 감소 되었던 下肢血壓 및 맥박이 正常으로 회복되었다.

2) Teflon graft를 한 症例에서는 手術後 2年에 上下肢에서 血壓이 상승한 것을 볼 수 있었으나, 正常生活에 별 지장이 없었다.

3) 3例 全部에서 手術後 數個月에 心臟肥大가 감소하는 것을 보았다.

4) 病理組織所見에서 第 1,2例에서는 主로 Intima에 變化를 보였으며, 第3症例에서는 Media에 主病變이 있었으며, 1例는 動脈硬化性 變化를 同伴하였다.

5) 韓國에 發生頻度가 낮은 理由는 自然經過를 알 수 없으나, 胎生學的 缺陷이 적거나, 生後 乳兒時期를 넘지 못한 것으로 추정된다.

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