RESULTS

RESULTS

Chart (1)

Represents sex distribution in patients with PDA.

Total number of the patients with PDA in our study was 150 patients.

There were 69 males (46%) and 81 females (54%).

Chart (2)

Represents prenatal factors in the patients with PDA.

It was shown from chart (2) that there was bleeding in first trimester in 11 patients (7.3%) , an influenza in 10 patients (6.6%), pre-eclampsia in 5 patients (3.3.%) , Diabetes in 4 patients (2.6%), hypertension in 3 patients (2%), hyperemesis in 2 patients (1.3%), urinary tract infection in 2 patients (1.3%), and exposure to X-ray in 2 patients (1.3%). One of each of circulage operation (0.6%), maternal rubella (0.6%) deep venous thrombosis (0.6%) and thyrotoxicosis (0.6%).

Table (1)

Represents obstetric history in the patients with PDA.

It was shown fromt he table that there was normal delivery in 133 patients, Caesarean section in 17 patients, full term in 14.1 patients, and preterm and low birth weight in 9 patients.

Chart (3)

Represents neonatal period.

It was shown from the chart that there was normal neonatal period in 121 patients, delayed onset of breathing in 22 patients, cyanosed at birth in 24 patients, jaundice at birth in one patient and shortness of breath at birth in 4 patients.

Chart (4)

Represents age at first symptoms in the patients with PDA.

It was shown from chart that first symptoms in the patients appeared in the patients between age one day to 6 months in 101 patients, between 6 months to 12 months in 16 patients, between 1 year to 2 years in 8 patients, betwen 3-5 years in 21 patients, between 6-10 years in 3 patients and between 11-15 years in one patients.

Table (2)

Represents family history in patients with PDA

It was shown that there was positive history of consanguinity in 88 patients (58.6% of total) and negative history of consanguinity in

62 patients (41.4% of total). 4 patients had PDA in siblings in two families (2.6%), 6 patients had PDA in the family about (4%), 10 patients (6.6%) had a history of C.H.D. in the family and 14 patients (9.3%) had a history of R.H.D. in the family.

Chart (6A and B)

Represents the symptoms in the patients with PDA.

In cases of PDA in our study, there were various presenting symptoms, upper respiratory tract infections in 104 patients, palpitation in 92 patients, delayed milestones in 80 patients, feeding difficulties in 60 patients, dyspnea on exertion in 58 patients, fatigue in 58 patients, history of CHF in 55 patients, dyspnea at rest in 52 patients, poor weight gain in 52 patients and sweating in 39 patients.

Pneumonia in 27 patients, syncope in 22 patients, cyanosis on exertion in 20 patients, cyanosis at rest in 17 patients, angina in 12 patients, history of left ventricular failure in 10 patients, paroxysmal nocturnal dyspnea in 5 patients, haemoptysis in 3 patients, subnormal mentality in 3 patients.

Table (3)

Represents general examination in patients with PDA.

It was shown that JVP was normal in 85 patients and abnromal

in 65 patients, 52 of them was about 3 cm and 13 of them was about 4 cm in our patients.

Pulse was within normal volume in 13 patients and bounding in 137 patients. Delay of femoral pulses with coarctation of aorta in 5 patients , high pressure gradient between upper limbs and lower limbs was found in 5 patients , hypertension was recognized in 5 patients, cyanosis was present in 17 patients and clubbing was found in 9 patients.

125 patients had high arched palate, and 3 patients had saddle nose.

Deformity of helix of ears was found in 3 patients and low set ears was found in 2 cases.

Hyperteleorism was found in 15 patients and deafness in one pateint .

Precordial bulge in 60 patients, marked parasternal deformity in 2 patients, Harrisons sulcus in 11 patients, pectus excavatum "funnel chest" in 4 patients, large square topped skull in 3 patients, bilateral cataract in 2 patients, bilateral congenital macrocorneae in one patient, prominent epicanthic folds in 5 patients, Mongoloid slant in 3 patients.

Table (4)

Represents the precordial examination in the patients with PDA.

Cardiac impulse was palpated during cardiac examination at the left sternal edge and apex : 80 had LV impulse, 23 had RV impulse, 43 were biventricular and 4 were quiet.

P_2 was palpated in 27 cases..

Systolic thrill was palpated in 61 patients, at pulmonary area in 24 patients, at the left sternal edge in 33 patients and at the apex in 4 patients.

Corrigan's sign was seen in 6 patients.

Diastolic thrill was palpated in 12 patients, at left sternal edge in 7 patients and at pulmonary area in 5 patients.

Table (5)

Represents Auscultation in patients with PDA.

The first heart sound was normal in 149 patients and S_1 was faint in one case.

The second heart sound was normal in 8 patients , was split in 135 patients and single in 7 patients.

P_2 was loud in 140 patients and soft in 10 patients.

Third heart sound was audible in 62 patients.

Ejection click was audible in 12 patients.

The most striking finding from physical examination in patent ductus arteriosus is ductus murmur (continuous or machinary murmur) at pulmonic area. Ductus murmur was present in 144 patients and absent in 6 patients.

Site of maximal intensity of the continuous murmur of PDA in our patients at pulmonary area in 125 patients, at left sternal edge in 9 patients, at left infraclavicular in 6 patients, at aortic area in 3 patients, and at right sternal edge in one patient.

Radiation of ductus murmur in our patients, to LSE in 23 patients, to left infraclavicular area in 11 patients, to apex in 4 patients, to back in 4 patients, to left shoulder in 4 patients, to axilla in 2 patients, and to infrascapular area in one patient.

There were 146 patients having ductus murmur, 23 patients had murmurs grade 4,73 patients had murmurs grade 3,42 patients had murmurs grade 2 and 6 patients had murmurs grade 1.

A diastolic mitral flow murmur (MDM) secondary to the increased flow across the mitral valve due to left to right shunt was heard at the apex in 82 patients, MDM was grade I in 9 patients, grade 2 in 72 patients and grade 3 in one patient.

An ejection systolic murmur on aortic area was heard in 3 patients, this murmur may be due to aortic stenosis in these patients, they were graded 2 in these patients.

Early diastolic murmur on the aortic area was heard in 5 patients, 4 had murmurs grade 2 and one had murmur grade 3.

The possible causes of these murmur (EDM) may be due to aortic incompetence, associated with PDA in these pateints.

Pansystolic murmur on tricuspid area was heard in one patient and had grade 2. The cause of this murmur may be related to tricuspid incompetence associated with PDA.

Pansystolic murmurs on left sternal edge were heard in 53 patients, one murmur of them had grade 1, 31 had grade 2, 17 had grade 3 and 4 had grade 4.

These murmurs may be due to presence of VSD associated with PDA or fallot's tetralogy with PDA or A-V canal with PDA.

Pansystolic murmur on mitral area was heard in 5 patients, 3 had grade 2 and 2 had grade 3. Mitral incompetence may be a possible cause for these murmurs as in cases of endocardial fibroelastosis.

Late systolic murmur was heard on the apex in one patient and had grade 3. The possible cause of this murmur may be due to mitral

Carey Coomb murmur on the apex was heard in one case, due to rheumatic carditis in this case.

An ejection systolic murmur on pulmonary area was heard in 32 patients, maybe due to presence of pulmonary hypertension among these patients.

Table (6)

Represents chest X-ray findings in patients with PDA.

Cardiothoracic ratio (CTR) in plain chest - X rays in our patients, was below 55% in 15 cases , from 55% - 60% in 42 cases, from 60% - 70% in 73 cases and above 70% in 20 cases.

Enlargement of LV was recorded in 124 cases, LA in 84 cases, RV in 58 cases and RA in 12 cases.

Aorta was small in 9 cases and large in 36 cases.

Lung was plethoric in 105 cases, central plethora with peripheral cut-off was seen in 36 cases, lung oligaemia was noticed in 7 cases.

Venous haze (oedema) was seen in 2 cases (indicative of pulmonary venous hypertension).

Dilated pulmonary artery was seen in 106 cases.

Calcium deposits on pulmonary artery was seen in the 5 cases.

Signs of core - pulmonale (PHT) was noticed in 36 cases. SVC is obvious in 3 cases. Enlargement of thymus gland was seen in 9 cases.

Ductus sign was seen in chest X-ray in 33 cases as a separate convexity between the aortic knuckle and the pulmonary artery segment with obliteration of the angle between the aorta and pulmonary artery.

Two patients had dextroposition, one of whom was situs inversus (visceral situs).

Scapular deformity was seen in two patients indicative of Sprengel shoulder.

Ground glass appearance of lungs was seen in one case (indication of hyaline membrane disease).

Bronchiectasis was seen in bronchogram in one case.

Chest - X-ray show right ventricle enlarged and uplifted apex (Coeur en sabot) in 4 cases (indicative of Fallot's tetralogy).

Loss of volume of left lung causes heart to be shifted more to left due to post-operative lobectomy due to congenital lobar emphysema was seen in one case.

Right bronchogram of right lower lobe show segmental consolidation from residual aspiration pneumonia since birth was seen in one case.

Chest X-ray showing egg shaped heart was seen in 3 cases (indicative of TGA).

Table (7)

Represents electrocardiographic findings in patients with PDA.

ECG study revealed normal ECG in 12 patients (8%) in our study.

ECG study revealed regular sinus rhythm in 147 cases (98%) and an irregular rhythm in 3 cases (2%). Bradycardia was found in one case (0.6%) , multiple supraventricular ectopics in one case (0.6%) and sinus tachycardia in 62 cases (41.3%).

The QRS axis was normal in 121 cases (80.7%) , right axis deviation in 20 cases (13.3%) and left axis deviation in 9 cases (6%).

We found right axis deviation in ECG in our study in such cases of PDA with Eisenmenger's syndrome, cases of PDA associated with ASD, VSD, TgA, Fallot's tetralogy, pulmonary atresia, pulmonary stenosis, and hypoplastic left ventricle.

We found left axis deviation in ECG in our study in cases with large PDA, coarctation of aorta, complete A-V canal, aorto pulmonary window and right coronary artery fistula communicating with right ventricle outflow.

Partial right bundle branch block (PRBBB) was seen in 16 cases (10.6%).

Left ventricular hypertorphy in 136 cases (90.6%) , left atrial hypertrophy in 66 cases (44%) , right ventricular hypertrophy in 60

cases (40%), right atrial hypertrophy in 27 cases (18%) and between cases of LV hypertophy and RV hypertrophy, there was biventricular hypertrophy in 40 cases (26.6%).

P-pulmonale (P wave was tall and peaked) was seen in 36 cases (24%) (indicative of PHT).

Tall R waves in V_{5-7} were found in 130 cases (86.6%) and tall T waves in V_{5-7} in 120 cases (80%) (indicative of left ventricular hypertrophy).

Prominent S waves in V_5 was seen in 55 cases (36.6%) (indicative of right venrtricular hypertrophy).

Prolonged P-R interval was seen in 30 cases (20%).

Ductus septal Q waves were seen in 105 cases (70%) in our study (indicative of PDA in ECG).

Congenital complete atrioventricular heart block was seen in one case (0.5%).

Mirror image of dextrocardia in ECG was noticed in 2 cases, inverted P wave in L_I in 2 cases, inverted QRS in L_I in 2 cases and inverted T wave in L_I in 2 cases (1.3%).

Chart (7)

The QRS axis in frontal plane was betwen 0° and - 60° in 8 patients. The axis lay between - 61° and - 90° in one patient. The axis lay 0° and + 60° in 54 patients. The axis lay + 61° and + 90° in

67 pateints. The axis lay + 91° and + 120° in 14 patients. The axis lay + 121° and 150° in 4 patients. The axis lay + 151° and + 180° in 2 patients as in chart (7).

Chart (8)

Represents correlation between depth of Qs wave and septal thickness on the echo in the patients with PDA.

From this graph, comparing the depth of the Q waves in ECG to septal thickness on the echo has shown a positive correlation between both parameters, thus indicating the septal hypertrophy and thickness on echo, can be predicted by the depth of Q waves on the ECG.

Table (8)

Represents echocardiographic findings in patients with PDA.

Echocardiography was done to 150 patients by M-Mode with Doppler, two-dimensional and Doppler echo.

The echocardiographic studies revealed the following :

By two-dimensional echo, suprasternal approach revealed patent ductus arteriosus between left pulmonary artery and arch of aorta and between left pulmonary artery and ascending aorta in 126 patients (84%). By Doppler Echo, selective volume sampling at site of communication between pulmonary artery and aorta revealed a

continuous flow (systolic and diastolic flow) and confirmed patent ductus arteriosus in 126 patients (84%).

By Doppler Echo, ductus viewed and confirmed in lateral sitting position in 126 patients (84%).

The echo studies in our patients with PDA revealed a silent PDA was found in 3 patients (2%).

Echo studies in our patients revealed 4 patients (2.6%) were living only on patent ductus arteriosus in cases of pulmonary atresia with PDA.

Echo findings are consistent with PDA in 126 patients (84%) in our study.

By echo study, we found pulmonary hypertension in 43 patients (28.6%) in our study.

In our study , echo studies revealed dilated left ventricle in 138 patients (92%) , dilated left atrium in 105 patients (70%) , dilated rigth ventricle in 52 patients (34.6%), dilated right atrium in 15 patients (10%), dilated aortic root in 61 patients (40.6%), dilated pulmonary artery in 82 patients (54.6%) and an interventricular septal hypertrophy in 80 patients (53%).

Table (9)

Represents associated cardiac anomalies as depicted by echocardiography.

Echo studies in our patients with PDA revealed other associated cardiac anomalies with PDA as the following :

VSD was found in 37 patients , Fallot's tetralogy in 5 patients, AI in 5 patients, coarctation of aorta in 4 patients., MI in 4 patients, pulmonary atresia in 4 patients, ASD (secundum type) in 4 patients. Mitral valve prolapse in 3 patients and TGA in 3 patients.

One of each, bicuspid aortic valve, rupture sinus of valsalva of aorta, tricuspid atresia, complete A-V canal, atretic mitral valve, valvular pulmonary stenosis , hypoplastic left ventricle, hypoplastic right ventricle, dextrocardia with situs inversus, aortopulmonary window, ASD (ostium primum) , patent foramen ovale and aneurysm of interatrial septum.

Chart (9 A and B)

Represents incidence of associated cardiac anomalies as depicted by echo in patients with PDA.

Incidence of associated cardiac anomalies with PDA as the following :

VSD (24.6%), Fallot's tetralogy (3.3%),AI, (3.3%), coarctation of aorta (2.6%), MI (2.6%) pulmonary atresia (2.6%), ASD (secundum type) (26%), Mitral valve prolapse (2%) , TGA (2%).

One (0.6%) of each,bicuspid aortic valve, rupture sinus of valsalva of aorta, tricuspid atresia, complete A-V canal, atretic mitral valve, valvular pulmonary stenosis, hypoplastic left ventricle, hypoplastic right ventricle, dextrocardia with situs inversus, aortopulmonary window, ASD (ostium primum), patent foramen ovale and aneurysm of interatrial septum.

Echo studies in our study revealed these echo findings in our patients with PDA as the following:

By selective Doppler volume sampling at the bifurcation of pulmonary artery, there is a continuous both systolic and diastolic flow in one patient (indicative of aorto-pulmoanry window).

Regurgitation jet across aortic valve was detected in 5 patients (indicative of aortic incompetence).

Remarkable diastolic eccentricity of the anterior aortic leaflet was apparent in one patient due to congenital bicuspid aortic valve.

Aorta arising from right ventricle in 3 patients (indicative of TgA).

Aortic root overriding the ventricular septum, VSD , dilated right ventricle and valvular and infundibular pulmonary stenosis in 5 patients (indicative of Fallot's tetralgy).

There is pulmonary defect opposite the aortic cusps in one patient (indicative of rupture sinus of valsalva of aorta).

Atretic tricuspid valve and big excursion of tricuspid valve in one patient (indicative of tricuspid atresia).

Atretic mitral valve and big excursion of mitral valve in one patient (indicative of mitral atresia).

Regurgitation jet across mitral valve was detected in 4 patients (indicative of mitral incompetence).

Pan systolic prolapse of mitral valve was detected in 3 patients.

Echo showed a characteristic floating of the anterior mitral leaflet through the echo of the ventricular septum from left ventricle to right ventricle (indicative of complete A-V canal).

Thickened and stenotic pulmonary valve was detected in one patient.

Stenotic segment of aorta was found in 4 patients (indicative of coarctation of arota).

Atretic pulmonary valve was found in 4 patients (indicative of pulmonary atresia).

Pulmonary artery arise from left ventricle and aorta anterior to pulmonary artery in 3 patients (indicative of TGA) . But pulmonary valve is placed anterior to aortic valve but no evidence of signs of TGA in one patient.

Hypoplastic left venticle was detected in one patient and hypoplastic right ventricle in one patient.

An interventricular septal defect was detected in 37 patients and increased paradoxical motion of septal ventricular wall in 34 patiens (indicative of VSD).

Dextrocardia with situs inversus was found in one patient.

An interatrial septal defect was detected in 6 patients, ASD secundum type in 4 patients, ASD ostium primum in one patient and patent foramen ovale in one patient.

Aneurysm of interatrial septum was detected by echo in one patient.

Measurements of chambers and vessel size

The normal values for chamber size and vessel dimensions in patent ductus arteriosus are shown in Table (10).

Echo dimensions in patients with patent ductus arteriosus are shown in Table (11).

It was shown that dilated left atrium in 105 patients, dilated right ventricle in 52 patient, dilated left ventricle in 138 pateints and dilated aortic root in 61 patients.

Increasing the left atrial diameter to aortic diameter ratio. Large LA : Ao ratio (> 1.3) or a serial increase overtime is useful confirmatory evidence of a hemodynamically significant ductus arteriosus .

In our study, we found LA : Ao ratio (>1.3) in 69 patients (46%).

Table (12)

Represents catheterization in the patients with PDA.

150 patients with PDA were established in their diagnosis at cardiac catheterization and angiocardiography.

Right cardiac catheter was done in 136 patients and left cardiac catheter was done in 49 patients.

Cardiac catheter technique was percutaneous in 83 patients and open technique in 67 patients.

Cardiac catheter pass through patent ductus arteriosus among our patients in 136 patients.

Systemic arterial oxygen saturation measured in room air were available in all patients with patent ductus arteriosus.

Oxygen saturation difference between right ventricle and pulmonary artery especially with patent ductus arteriosus ranged between 5% to 10% in 15 patients between 10% to 20% in 60 Patients and between 20% to 30% in 75 patients.

Pulmonary hypertension was found in 43 patients (ranged between 45/20 to 120/80 mmHg with a mean of 40 mmHg).

Left to right shunt varying from 2 : 1 to 3:1 was found in 142 patients, bidirectional shunt was found in 6 patients and right to left shunt in 2 patients.

Table (13)

Represents angiocardiographic findings in patients with PDA.

Angiocardiographic studies in our patients with PDA revealed, a negative jet in the pulmonary artery via PDA during systole in 110 patients and a negative contrast shadow in the pulmonary artery during diastole (wash out phenomenon) in 110 patients.

Pulmonary artery opacification in left ventricular angiocardiography was detected in 49 patients.

Pure PDA, not associated with cardiac anomalies was found in 91 patients and PDA with associated cardiac anomlies occurred in 59 patients.

Table (14)

Major points to identify PDA in cardiac catheter and angiocardiography:

* passage of catheter through PDA.

* Negative contrast shadow in pulmonary artery from non opacified aortic blood during diastole.

* Negative jet in the pulmonary artery due to shunt via PDA during systole.

* Aortic injection proximal to PDA in left anterior oblique projection.

* Pulmonary artery injection in hypertensive ductus.

* Step up in oxygen saturation at pulmonary artery level.

In our study, the selective pulmonary artery angiography was done in 2 patients and the dye in the pulmonary artery immediately filled the descending aorta via PDA. Cardiac catheter revealed a very high pulmonary pressure (120/80 mmHg) in the two patients. These two cases of Eisenmenger's reaction with reverasal of shunt from the pulmonary artery to the aorta.

In our study, three children with triad of endocardial fibroelastosis, mitral incompetence and patent ductus arteriosus are reported.

At cardiac catheterization the catheter passed from the pulmonary artery to the descending aorta in all our 3 cases and both samples and pressures were recorded on withdrawal proving the presence of a patent ductus arteriosus. All our 3 cases showed pulmonary hypertension which was severe in 2 cases (70/40 and 80/30 respectively) and only moderate in case 3. (45/20).

Selective right ventricular angiocardiography revealed a negative contrast filling defect in pulmonary artery during diastole in our 3 cases, due to non opacified blood coming from aorta via PDA. They also showed mitral incompetence as denoted by delayed

emptying time of an enlarged left atrium in our 3 cases. The pulmonary vasculature was engorged with peripheral tapering of the vessels. The size of their left ventricles did not appreciably change from systolic to diastolic films indicating a non compliant or tethered left ventricular myocardium in our 3 cases (indicative of endocardial fibroelastosis).

In our 3 cases, a biopsy from the left atrial appendage was taken for histologic examination and reported as suggestive of endocardial fibroelastosis. The sections examined showed moderate thickening of the endocardium formed of fibrous tissue strands and elastic fibres. The myocardium itself showed no significant pathological changes.

Table (15)

Represents associated cardiac anomalies as depicted by cardiac angiography.

Angiocardiographic studies for our patients with PDA revealed many associated cardiac anomalies among our partients as the following :

VSD was detected in 34 patients, aortic incompetence in 3 patients, aortic coarctation in 5 patients, pulmonary atresia in 6

patients, Mitral incompetence in 5 patients. Mitral atresia in one patient, ASD (secundum type) in 4 patients, ASD (ostium primum) in one patient, patent foramen ovale in 3 patients, dextrocardia with situs inversus in one patient, dextrocardia only in one patient and hypoplastic left ventricle in 2 patients.

Transposition of great arteries in 5 patients, pulmonary arteriovenous fistula in one patient, endocardial fibroelastosis in 3 patients, inferior vena cava to the left atrium in one patient, Fallot's tetralogy in 4 patients and aortopulmonary window in 2 patients.

One of each, single coronary artery, juxtaposition of the atrial appendages, mitral valve prolapse complete A-V canal congenital bicuspid aortic valve, valvular pulmonary stenosis and right coronary fistula communicating with right ventricle outflow tract.

In angiocardiographic studies in our study, overriding of aorta on interventricular septum was detected in 4 patients (indicative of Fallott's tetralogy).

Complete A-V canal showing the typical goose - neck appearance due to cleft anterior leaflet of the mitral valve floating to the outflow of the left ventricle in diastole.

In pulmonary valvular stenosis, pulmonary valve is thickened, stenotic and doming.

In case of right coronary fistula communicating with the right ventricle outflow tract, the proximal segment of the right coronary artery is grossly enlarged and tortuous and communicating with the right ventricle outflow tract as evident by re-opacification of the outflow tract and the pulmonary artery.

In cases of VSD, an injection of dye in left ventricle pass to right ventricle through VSD due to left to right shunt.

In cases of coarctation of aorta , a stenotic segment of aorta was detected in the left ventricular angiography

In cases of Fallot's tetralogy in angiocardiography, we detected overriding of aorta on interventricular septum, dilated right ventricle, VSD and pulmonary stenosis.

In cases of TGA in angio, we detected aorta arising from right ventricle and pulmonary artery arising from left ventricle.

Atretic pulmonary valve in angio (indicative of pulmonary atresia).

Atretic mitral valve in angio (indicative of mitral atresia).

Mortality before surgery :

In our study, there were three cases of death before the operation, two of whom were due to severe congestive heart failure and the third case due to subacute bacterial endocarditis with severe congestive heart failure.

OPERATION FOR PATENT

DUCTUS ARTERIOSUS

Between June 1978 and June 1993, 126 patients underwent cardiac operations in Maadi Armed Forces Hosptial except 6 which were abroad, 2 in U.S.A. and 4 in the U.K. 120 of them underwent surgical closure of patent ductus arteriosus. Their ages ranged from 10 months to 15 years.

Associated cardiovascular anomalies were present in 59 patients, some patients had more than one anomaly.

All patients survived operation except in one patient who died after the operation from blood transfusion incompatibility and late follow up data were available for 120 patients.

One of PDA with VSD developed complete heart block during operation and required implantation of internal pace maker.

Table (16)

Represents operative findings in the patients with PDA.

The surgical incision in the thorax was left posterolateral thoracotomy at 4 th intercostal space (closed heart operation) in 103 patients, right lateral thoracotomy at 4th intercostal space (closed heart operation) in one patient and median sternotomy (open heart opration) in 22 patients.

The ductus size varied from 3 mm to 1 cm in diameter at surgical closure of PDA in 120 patients.

Calcified PDA was present in 6 patients during surgical ligation of PDA.

PDA was at the classic site opposite the isthmus in most of our patients.

Banding of pulmonary artery due to severe pulmonary hypertension was done in 9 patients.

Repair of ADS was done in 3 patients and ligated PDA in these cases.

Closure of aortopulmonary window was done in 2 patients by division of window and repair of aorta and pulmonary artery by suture.

Right subclavian pulmonary anastomosis was done in one patient. In this case, it was diagnosed as case of PDA with complex congenital heart disease as mitral atresia with hypoplastic left ventricle, VSD , TGA, pulmonary atresia, ASD and single coronary artery. In this case, PDA remained opened not closed beside right subclavian pulmonary anastomosis was done. An anastomosis was done using interrupted 7-0. Prolene sutures, joining the end of the right subclavian artery to the side of the right pulmonary artery.

Repair of VSD was done in 20 patients. In all 20 cases , repair and closure of the ventricular septal defect, surgically and ligated PDA. Closure of VSD was by dacron patch with interrupted sutures, but one case developed complete heart block and required implantation of internal pace maker.

Complete surgical repair of coarctation of aorta was done in 3 patients, resection of the coarctation of aorta and anastomosis end

to end of aorta after resection of the coarctated segment of aorta and ligated PDA in these cases.

Surgical repair of TGA and pulmonary atresia and ligated PDA in one case. In this case, right atrium to pulmonary artery valved conduit and insertion of homograft in the IVC, the tricuspid area closed using a pericardial patch and ligated PDA.

Finger exploration of the left atrium and left atrial biopsy was done in the 3 patients with associated endocardial firboelastosis in our study. Digital exploration of the mitral valve revealed mitral incompetence of moderate degree coming mainly from the anterior commissure due to thickening and plastering down of the chordae tendinae . Biopsy specimen taken from left atrial appendage in our 3 patients showed typical histologic changes of endocardial firbroelastosis . The sections examined showed marked thickening of the endocardium, formed mainly of interlacing strands of fibrous tissue and many parallel elastic fibres. The fibrous tissue strands were found to penetrate and surround the adjacent muscle fibres of myocardium. Few and slightly thick . Walled blood vessels were present with mild subpericardial fibrosis in our 3 cases. PDA ligated in these cases.

Total correction of Fallot's tetralogy was done in 2 patients. In first case, complete repair of Fallot's tetralogy by closure of large infundibular VSD with dacron patch, correction of pulmonary stenosis by valvotomy and outflow patch and ligated PDA.

In second case, total repair of Fallot's tetralogy by using a dacron patch for closure of VSD and pulmonary valvotomy and resection of the pulmonary infundibulum, a patch was placed over the right ventricular out flow and ligated PDA.

ASSOCIATED CONGENITAL CARDIAC ANOMALIES WITH PATENT DUCTUS ARTERIOSUS

Table (17)

Represents associated congenital cardiac anomalies in the patients with PDA.

VSD was found in 34 patients, pulmonary atresia in 6 patients, MI in 5 patients ,TGA in 5 patients, coarctation of aorta in 5 patients, Fallot's tetralogy in 4 patients, ASD (secundum type) in 4 patents, patnet foramen ovale in 3 patients, AI in 3 patients, endocardial firboelastois in 3 patients, hypoplastic left ventricle in 2 patients and aortopulmonary window in 2 patients.

One of each, complete A-V canal, compelete congenital artrioventricular heart block, single coronary artery, inferior vena cava to left atrium, juxtaposition of the atrial appendages,mitral valve prolapse, ASD (Ostium primum), mitral atesia, Pulmonary valvular stenosis, congenital bicuspid aortic valve, dextrocardia with situs inversus, dextrocardia only, dextroversion, right coronary artery fistula communicating with the right ventricle outflow tract and pulmonary arteriovenous fistula.

Chart (10 A and B)

Represents incidence of associated congenital cardiac anomalies with PDA.

VSD was about (22.6%) , pulmonary atresia (4%), MI (3.3),TGA (3.3%), coarctation of aorta (3.3%), Fallot's tetralogy (2.6%), ASD (secundum type) (2.6), endocardial fibroelastosis (2%), patent foramen ovale (2%), AI (2%), hypoplastic left ventricle (1.3%) and aortopulmonary window (1.3%)..

(0.6%) of each, complete A-V canal, complete congenital atrioventricular heart block, single coronary artery, Inferior vena cava to left atrium, juxtaposition of atrial appendages, mitral valve prolapse, ASD (ostium primum), mitral atresia , pulmonary valvular stenosis, congenital bicuspid aortic valve, dextrocardia only, dextrocardia with situs inversus, dextroversion, right coronary artery fistula communicating with the right ventricle outflow tract and pulmonary arteriovenous fistula

Table (18)

Represents associated cardiac lesions with PDA

Congestive heart failure in 55 patients, pulmonary hyeprtension in 43 patiente, left venrtricular failure in 10 patients, subacute bacterial endocarditis in 5 patietns systemic hypertension in 5 patients.

Eisenmenger's syndrome in 2 patients, complete heart block in one patient and rheumatic fever in one patient.

Chart (11)

Incidence of associated cardiac lesions with PDA.

CHF (36.6%), PHT (28.6%), LVF (6.6%), SBE (3.3%), systemic hypertension (3.3%), Eisenmenger's syndrome (1.3%) Complete heart block (0.6%), rheumatic fever (0.6%).