Proceedings of the British Cardiac Society

The 57th Annual General Meeting of the British Cardiac Society was held at the Welsh National School of Medicine, Heath Park, Cardiff, on Wednesday and Thursday, 12 and 13 April 1978. The President, W. Somerville, took the Chair during private business. At the scientific sessions the Chair was taken by J. P. D. Mounsey.

Abstracts of Papers

Ultrasound diagnosis of superior vena caval pathway obstruction after Mustard's operation

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Superior vena caval pathway obstruction is an important cause of late morbidity and mortality after Mustard's operation. Clinical detection of such obstruction is frequently difficult because of the development of extensive collateral venous circulation, which decompresses the superior vena cava.

As flow is less likely to be normal than pressure, we recorded jugular venous flow profiles transcutaneously in 28 patients after Mustard's operation for simple transposition using a bidirectional Doppler blood velocimeter.

Twenty-four patients (86%) showed a dominant forward flow peak during ventricular diastole. Most had a normal exercise capacity and none showed any other evidence of superior vena caval pathway obstruction. This pattern was considered normal, particularly as it was also seen in 2 patients immediately after surgical relief of the anomaly. Of these 2 patients, before reoperation 1 showed an absence of pulsatile flow and the other had a forward peak during ventricular systole but reversed flow throughout diastole.

A similar forward peak during ventricular systole with, during diastole, forward flow but no peak, was seen in 2 other patients; since flow should peak when the mitral valve is open this pattern probably signifies early superior vena caval pathway obstruction.

Thus transcutaneous velocimetry is a promising technique for early detection of superior vena caval pathway obstruction, and might render further invasive investigation unnecessary.

Two-dimensional echocardiography in atrioventricular canal malformations

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Two-dimensional echocardiography (mechanical 60° sector scanner) has been applied to 9 infants and children with the angiocardilographic diagnosis of atrioventricular canal malformations. An oblique view of the normal heart can show simultaneously all 4 chambers, the junction between atrial and ventricular septa, and the anterior atrioventricular valve leaflets. In 7 patients the confluent atrioventricular septal defect was shown as discontinuity and asynchronous movement between the contiguous parts of the atrial and ventricular septa; in 2 patients the atrial septum was not seen (single atrium at surgery and large ostium primum defect at necropsy). A single wide echo represented a common anterior atrioventricular valve leaflet (CL), apparently attached to the ventricular septum in 7. Left ventricular injection of 'ultrasonic contrast' in 3 patients suggested shunting directly to the right ventricle in 1 (CL not attached to ventricular septum on echocardiography) and to the atria in 2 (CL attached to ventricular septum). These preliminary studies suggest that the 4-chamber view combined with contrast echocardiography should make possible the differentiation of partial atrioventricular canal and type A complete atrioventricular canal from complete atrioventricular canal types B and C.

Papillary muscle echoes in hypertrophic obstructive cardiomyopathy

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From a previous echocardiographic study (Rodger, 1976) of hypertrophic obstructive cardiomyopathy (HOCM), we concluded that the echoes intervening in systole between the interventricular septum and the mitral anterior leaflet originate from the posterior papillary muscle and its chordae tendineae.

The hypothesis has been re-examined: 7 patients with HOCM have been investigated by single and multiple beam echocardiography. On the single beam scans, systolic anterior motion of the mitral apparatus preceded anterior motion of the left ventricular posterior wall and the apparent continuity between posterior wall echoes and the muscular component of the mitral echo complex was found to be spurious. Multiple beam scanning in the transverse and oblique axes of the left ventricle showed that the structure intervening between the septum and the mitral anterior leaflet in systole was in continuity with the anterolateral wall of the left ventricle and moved anteromedially during systole. This structure was not recorded on longitudinal scans during diastole.

It is concluded that in HOCM the echoes recorded in systole between the septum and the mitral anterior leaflet originate from the anterior papillary muscle and its chordae, and that displacement of these structures is responsible for systolic anterior motion of the mitral leaflets.

Reference

Major arrhythmias in aortic stenosis detected by 24-hour ambulatory monitoring

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The true incidence of serious cardiac arrhythmias in patients with haemodynamically significant aortic stenosis has not been previously defined. In the present study 24-hour ambulatory electrocardiographic tape recordings were made in 40 patients requiring aortic valve replacement. At least two recordings were made before operation and repeated in the early (1 to 7 days) and late (2 to 3 months) postoperative periods. Episodes of advanced atrioventricular block or asystole were detected in 6 of 40 patients (15%) and managed routinely by pacemaker implantation.

Ventricular arrhythmias were detected in 87.5% per cent of patients before operation. Importantly, 7 of 40 patients (17.5%) developed malignant ventricular arrhythmias, for example ventricular tachycardia and ventricular fibrillation. Prodromal ventricular arrhythmias, including premature beats > 60 per hour, and those occurring from multiple foci, in couplets or of R-on-T type, occurred in 85 per cent of patients before operation. Angiographically shown obstructive coronary artery disease or impaired left ventricular function predisposed to malignant ventricular arrhythmias before operation, but there was no clear correlation with aortic valve gradient. The high incidence of malignant ventricular arrhythmias in the preoperative and late postoperative periods suggests that antiarrhythmic therapy should be evaluated in all patients with severe aortic stenosis on diagnosis, during and after recovery from aortic valve surgery.

Spontaneous termination of paroxysmal re-entrant supraventricular tachycardia; mechanisms and implications for rational prophylactic or emergency therapy

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By continuously recording the blood pressure and performing tilt tests during intracardiac electrophysiological studies in 16 patients with paroxysmal re-entry atrioventricular tachycardia we have shown a relation between the 4 phases of reflex autonomic activity restoring the blood pressure and the mechanisms of termination of paroxysmal re-entry atrioventricular tachycardia. These phases are: (1) profound hypotension with normal autonomic tone; (2) blood pressure rise because of increased sympathetic and decreased vagal activity; (3) blood pressure ‘overshoot’ response; and (4) established tachycardia with new stable blood pressure and autonomic reflex activity.

Paroxysmal re-entry atrioventricular tachycardia often terminates spontaneously by a mechanism of self-induced second degree block in one of the two atrioventricular pathways when the frequency of reciprocation exceeds the Wenckebach rate for this component of the circuit; the less the discrepancy between these two rates, the likelier it is that spontaneous termination will occur by this mechanism. When the site of spontaneous termination is the atrioventricular node, the attack may stop in either phase 1 or phase 3 when vagal tone is normal. Head-down tilt or atrioventricular nodal depressant
drugs favour this mechanism and allow those in phase 4 to regain the more favourable phase 3 situation and thereby an enhanced likelihood of termination. Quinidine-like drugs may be either ineffective or indeed detrimental.

Conversely, spontaneous termination occurs most readily in the extra-atrioventricular nodal pathway in phases 2 and 4 with head-up tilt. Quinidine-like drugs favour this mechanism while atrioventricular nodal drugs may be more detrimental. When prophylaxis against re-entry fails, an alternative approach is to encourage early spontaneous termination of paroxysmal re-entrant atrioventricular tachycardia in either the atroventricular node or extra atrioventricular nodal pathway, with appropriate antiarrhythmic drugs and postural change.

After propranolol (0.2 mg/kg body weight) all the variables returned to control values and were unchanged by subsequent reinfusion of isoprenaline at a rate of 2.0 μg/min.

Our results show nuclear angiography to be valuable in assessing changes in ventricular function. Of particular interest is the divergent effect of isoprenaline and exercise on ejection fraction in patients with angina; this warrants further investigation.

References


Effect of exercise, isoprenaline, and propranolol on left ventricular function in normal subjects and patients with angina as assessed by nuclear angiography

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To make a detailed assessment of the value of nuclear angiography in measuring changes in ventricular function, we studied the effects of exercise followed by beta-stimulation and beta-blockade in 8 normal subjects and 4 patients with angina pectoris. We measured ejection fraction by the bolus technique (Hannan et al., 1977) and generated ventricular volume curves by the retriggered method (Muir et al., 1977).

During dynamic supine leg exercise normal subjects increased their ejection fraction from 0.58 to 0.71, but patients with angina showed no change or even a decrease in ejection fraction.

After infusions of isoprenaline at 0.75, 1.0, and 2.0 μg/min the ejection fraction increased in all subjects from a resting value of 0.58 to 0.72, 0.74, and 0.76, respectively. Both the mean ejection rate and the peak rate of change of volume during systole (dVs/dt) increased while the mean ejection time decreased progressively with increasing doses of isoprenaline. The changes in peak rate of change of volume in diastole (dVd/dt) and the mean diastolic filling time (td) were variable and probably of little significance.

Localisation of coronary artery disease by thallium-201 stress myocardial scintigraphy

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Myocardial imaging using thallium-201 (201TI) administered during maximal exercise has been performed in 4 projections in over 100 patients with ischaemic heart disease to determine the pattern of scintigraphic uptake defects associated with specific coronary lesions seen on angiography.

A triad of defects was found in left anterior descending disease, viz. an apical wedge defect in 70 per cent of lesions, a septal uptake defect in 85 per cent of lesions, and a defect seen only in the left lateral projection in 72 per cent of lesions.

We have called this last defect a diagonal window because it was found with independent disease of the diagonal branch of the left anterior descending or with main trunk left anterior descending disease occurring before this branch. It was the most useful scintigraphic sign for differentiating proximal from distal disease in the left anterior descending and had a specificity of 90 per cent.

False negative scintigraphic defects occurred more frequently in triple vessel disease and in association with well-developed coronary collaterals.

Severe left anterior descending disease occurring without an apical wedge defect was associated with an excellent calibre of the distal left anterior descending lumen in 25 out of 28 patients (89%).

Specific scintigraphic patterns of 201TI myocardial uptake appear valuable in the non-invasive
localisation of left anterior descending disease and in the planning of aortocoronary bypass graft operations.

Exercise radionuclide ventriculography: assessment of changes in global left ventricular function, and in function of contractile segments in patients with left ventricular aneurysms

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Thirteen patients with left ventricular aneurysms had first pass radionuclide ventriculograms performed at rest, and at submaximal supine exercise before and after afterload reduction with 5 mg sublingual isosorbide dinitrate. Ejection fraction of the left ventricular contractile segment was calculated from the resting isotope study and the contrast cineangiogram, using the double hemisphere model, and a modified area-length method. From the 2 techniques, it correlated closely ($r = 0.86$).

At exercise total left ventricular ejection fraction, measured from the high frequency fluctuation in radioactive counts over the left ventricle, increased in 6 patients, decreased in 5, and was unchanged in 2. Ejection fraction of left ventricular contractile segment increased in 7, including 5 in whom left ventricular ejection fraction increased, and ejection fraction of left ventricular contractile segment fell in 5, of whom 4 had decreased left ventricular ejection fraction.

After afterload reduction, at the same level of exercise, left ventricular ejection fraction increased for the whole group ($P < 0.01$) and mean pulmonary transit times fell significantly ($P < 0.01$).

Of 7 with increased ejection fraction of contractile segment, 5 improved further after isosorbide dinitrate ($P < 0.05$), and 2 with initially decreased ejection fraction of contractile segment improved exercise levels conspicuously after isosorbide dinitrate.

Exercise first pass radionuclide ventriculography can accurately estimate the ejection fraction of the contractile segment, an important factor in predicting the prognosis of aneurysmectomy. Changes in the contractile segment on exercise and with afterload reduction may be a further guide in the selection of patients for aneurysmectomy.

Relation between coronary anatomy, myocardial perfusion, and praecordial electrocardiographic signs in coronary artery disease

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Exercise electrocardiography is used to identify myocardial ischaemia in patients with anginal chest pain. However, it is necessary to investigate the relation between disturbances of regional perfusion and electrocardiographic signs of myocardial ischaemia.

Twenty-eight patients with anginal pain underwent 16 point praecordial electrocardiographic mapping before and after exercise. The area, severity, and time course of ST segment depression and Q waves were measured in serial praecordial maps. These patients underwent coronary and left ventricular angiography. A catheter was positioned in the aortic sinuses and $^{81}$Kr was continuously infused at rest and during pacing. Regional myocardial activity was recorded to examine moment to moment changes in regional myocardial perfusion.

The results fell into four groups. The first group with normal coronary arteries had uniform ventricular perfusion and normal praecordial electrocardiographic maps during stress. A second group with coronary artery disease (lesions > 70%) showed fixed defects of perfusion and corresponding praecordial areas of Q waves. A third group with coronary artery disease (lesions > 70%) had reversible disturbances of regional perfusion associated with praecordial areas of ST segment depression during stress. The last group with coronary artery disease (lesions > 70%) had uniform ventricular perfusion and normal praecordial electrocardiogram during stress.

This study suggests that there is a relation between disturbances of regional myocardial perfusion and the praecordial electrocardiographic signs of myocardial ischaemia in these patients.

What does not cause ischaemic heart disease?

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High mortality from ischaemic heart disease in England and Wales is associated with (1) low temperature, (2) high rainfall, (3) low drinking water calcium, and (4) low socioeconomic class. Epidemiological studies relating water calcium, socioenvironmental to our example, First, the relation must be shown to be causal. For example, our analyses of 1969 to 1971 mortality data in England and Wales indicate that water hardness is a confounding and not a causal variable: pairs of communities using hard and soft water but similar in other respects show similar mortality from ischaemic heart disease. Second, the relation must be shown to be disease specific and not the result of non-specific association with earlier death from all causes. We have shown that the four socioenvironmental variables listed above are associated with general mortality and not specifically with mortality from ischaemic heart disease; it appears therefore that they act through influencing the age of death irrespective of its cause. Geographical variations in mortality from ischaemic heart disease are not associated with similar variations in age-standardised proportional mortality from ischaemic heart disease.

Exercise testing and thallium-201 myocardial perfusion imaging in evaluation of aorto-coronary bypass surgery

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Fifteen patients presenting with angina pectoris underwent exercise evaluation using a bicycle ergometer, and myocardial perfusion imaging using thallium-201 (201Tl) before and after aorto-coronary bypass surgery.

After operation 12 patients were symptom free, 2 had moderate exercise limitation by breathlessness without angina, and 1 was symptomatically unaltered with continuing angina. Using a standardised exercise procedure exercise duration averaged 8:45 (±3:23) minutes before operation and 10:32 (±2:31) minutes after operation (P < 0:1). Maximal heart rate achieved during exercise rose from 134 (±24)/minute before operation to 157 (±17)/minute after operation (P < 0:01).

The exercise electrocardiogram showed evidence of ischaemia in 12 patients before operation. After operation one patient had new Q waves suggesting perioperative myocardial infarction. In 8 patients the exercise electrocardiogram showed no evidence of ischaemia, while in 3 patients, though less pronounced, electrocardiographic evidence of ischaemia persisted.

Before operation 14 patients had defects on exercise 201Tl images consistent with ischaemia. After operation 201Tl imaging suggested complete revascularisation in 10 patients with partial revascularisation in 2 patients (one with continuing angina). Perioperative myocardial infarction was seen in 2 patients. In addition there were small areas of apparent myocardial necrosis in 3 patients.

201Tl myocardial imaging is a useful technique to assess aorto-coronary bypass surgery, both to provide evidence of relief of myocardial ischaemia and to show myocardial damage occurring in the perioperative period.

Cranio-caudal tilt in angiocardio-graphic visualisation of congenital heart defects

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The interventricular septum normally spirals in a clockwise fashion as it courses posteriorly and superiorly from the apex of the heart to its base.

In order to visualise its maximum length with a fixed posteroanterior x-ray beam, head-up tilt of the patient is required. Different degrees of rotation about the patient’s longitudinal axis will bring the atrial, and inflow, trabecular, perimembranous, and infundibular components of the ventricular septum in line with this beam. Injections of contrast medium on the appropriate side of the septum to be investigated will profile and display defects in it.

Atrioventricular canal defects are characterised by a constantly abnormal relation of the mitral component to the interventricular septum. Interatrial and interventricular components of the defect can be distinguished easily, because the right atrium and right ventricle do not overlap

As this view also displays the left ventricular outflow tract throughout its length, obstructions there are better defined than in conventional projections which cause foreshortening. The anatomy of the aortic arch and pulmonary artery bifurcation (given appropriate obliquity) is also well shown.

Having performed over 200 such angiograms, we are persuaded that oblique projections with craniocaudal tilt are the best method, particularly for left ventricular angiography.
Demonstration of aortopulmonary communications using a balloon angio-catheter

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Major aortopulmonary communications are often present in cyanotic congenital heart disease. Demonstration of the size and distribution of these vessels is of importance before operation. This is commonly done by retrograde aortic catheterisation and selective arteriography of individual collateral vessels. However, this method is tedious, requires multiple injections, and may not show all major communications. A technique is described which provides good definition of major collateral vessels using only one injection of contrast.

A balloon angio-catheter is floated anterogradely along the aorta until the tip is distal to the area of interest. Immediately before contrast is injected the balloon is fully inflated, producing near total obstruction to forward flow in the descending aorta. Contrast is then injected into the aorta just proximal to the balloon. Obligatory flow occurs through vessels arising from that portion of the aorta and anastomoses are clearly defined. The technique has been used in 12 children aged 2 days to 7 years (weight 2.5 to 20 kg). After obstruction to forward flow the systolic blood pressure increased by a mean of 20 mmHg. Injection of contrast caused a further small transient rise. No adverse effect occurred in any patient after balloon inflation or contrast injection. The technique has wide application in cyanotic congenital heart disease.

Working capacity of children with transposition of the great arteries after Mustard repair

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A Mustard repair provides physiological correction. Of the late survivors, 75 per cent are leading normal lives with little or no exercise intolerance. The working capacity of 22 patients with transposition of the great arteries was studied 5 to 10 years after operation.

Ten patients were corrected in infancy (mean age 9 months), and in this group the mean age at time of study was 7.3 years (6.75 to 9.3 years). A further 12 patients were corrected later (mean age 3.3 years) and studied at a mean age of 11.7 years (9 to 18 years). A progressive exercise test was performed, recording heart rate and ventilation, and measuring gas exchange.

Of the patients corrected in infancy, 9/10 achieved a normal maximum work load, as did 4/12 of the older group, the remainder being just below normal (P < 0.025). The maximum oxygen consumption measured showed the same trend. The ventilation was abnormally high in relation to carbon dioxide production in the infant operated group, but also tended to be high in the older group. Of all patients, 59 per cent were in sinus rhythm at time of study, but neither maximum work load nor maximum oxygen consumption was influenced by the type of rhythm present.

Thus, the working capacity of children undergoing Mustard repair in infancy is within normal limits, but is just below the normal range in those corrected later. A longitudinal study will show whether the infants maintain a normal capacity with growth.

Primary total correction of tetralogy of Fallot under age of 2 years: results of 50 consecutive unselected cases

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Between 1972 and 1977, 50 consecutive patients under the age of 2 years with tetralogy of Fallot requiring operation underwent primary total correction irrespective of their age or the anatomy of the lesion. The ages of the patients were between 2 and 24 months. Twenty (40%) were operated upon as emergencies, because of cyanotic attacks. Four patients had hypoplastic pulmonary arteries. Twenty-one (42%) required reconstruction of the right ventricular outflow tract with homografts. There were 9 early deaths: 5 of these patients were receiving propranolol before the operation. There have been no late deaths. The 41 survivors have been followed up for between 12 and 72 months. One patient has required reoperation for an aneurysm of the right ventricular outflow tract and is now well. The remaining patients are asymptomatic and developing normally. Thirty-one have been re-investigated routinely 1 to 60 months after operation. Twenty-nine patients had a RV/LV ratio of below 0.35. There was no evidence of residual ventricular septal defect in any patient.
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It is concluded that primary total correction of tetralogy of Fallot can give satisfactory results even if there is unfavourable anatomy provided that the patients have not received propranolol; and that adequate relief of the outflow tract obstruction, with or without homograft reconstruction, gives maintained good results.

Applied anatomy of coronary arteries in univentricular hearts

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The diagnosis and surgical correction of univentricular hearts remains a challenge. The coronary artery anatomy, its relation to morphological characteristics, and its surgical implications have been analysed in 26 necropsied specimens of univentricular heart, all but 2 having undergone operation (18 septation, 6 palliation).

Twenty-one had a morphologically left ventricular main chamber with an anterior outlet chamber, 17 left-sided subaortic, 3 right-sided subaortic, and 1 right-sided subpulmonary. Delimiting arteries outlined the outlet chamber in 16 of these hearts. Major anterior delimiting parallel branches of the right coronary coursed over the front of the heart in all but 1, and 13 had been interrupted with resultant ischaemic myocardial injury.

Five hearts were without outlet chamber, 2 with morphologically left ventricular and 3 with morphologically right ventricular main chamber. Rudimentary pouches were present in 3, in 1 anteriorly and in 2 posteriorly. The 2 lying posteriorly were not outlined by delimiting arteries. Two of this group had coronary artery injury.

Identification of outlet chambers and rudimentary pouches is facilitated by knowledge of coronary anatomy. The presence of major right anterior delimiting parallel arteries over the usually favoured ventriculotomy site renders them vulnerable to surgical injury, exemplified by such mishap occurring in 15 of 18 septated hearts.

Preservation of renal tubular function during cardiopulmonary bypass using pulsatile flow

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Pulsatile blood flow has many physiological advantages over non-pulsatile flow. It is now possible to deliver pulsatile flow with standard cardiac bypass using a pulsatile device and balloon pump module.

We looked at the effect of pulsatile flow on renal function in 20 patients undergoing elective coronary artery surgery, half receiving pulsatile flow on a random basis. The free water clearance, a sensitive indicator of renal tubular function, was measured before, during, and after bypass. Urine flows and diuretic usage were noted.

A previous study showed that free water clearance (normal range −25 to +100 ml/hr) deteriorates during bypass, reverting to normal 24 hours after operation. We confirmed these findings, but in patients receiving pulsatile flow free water clearance remained within the normal range. Urine flow during bypass in the non-pulsatile group was a mean of 87 ± 60 ml/kg per hr compared with 165 ± 120 ml/kg per hr in the pulsatile group (P = 0.05). Furthermore, half the patients in the non-pulsatile group diuretized during and after bypass compared with one patient in the pulsatile group. No patients studied developed renal insufficiency in terms of increased urea or creatinine.

We conclude that pulsatile flow maintains normal renal tubular function during cardiac bypass, and may be useful in patients with preoperative renal insufficiency or those undergoing long bypass procedures.

Bromocriptine in methylidopa treated hypertension: possible role of central dopaminergic activity

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Methylidopa increases serum prolactin, probably by reducing effective central dopaminergic activity. Bromocriptine is a dopaminergic agonist. We have studied the effects of bromocriptine therapy in 10 hypertensive patients already taking only methylidopa (0.5 to 3.0 g/day). After baseline measurements, optimal dosage of bromocriptine was achieved (7.5 to 20 mg/day), and bromocriptine was then replaced by placebo on a double-blind basis. Supine and erect, systolic and diastolic blood pressures were significantly reduced by bromocriptine. Serum prolactin fell significantly. Total exchangeable body sodium, 24-hour urinary sodium and potassium excretion, and serum angiotensin levels
were not significantly altered. Three patients lost pre-existent ankle swelling but there was no mean weight loss. All patients volunteered that they experienced an improvement in well-being, with loss of impotence in one. The antihypertensive effect of bromocriptine may be the result of increased central dopaminergic activity and/or of a reduction in prolactin-mediated central loss of impotence.

**Effects of oxygen administration, bicarbonate infusions, and brief hyperventilation on patients with pulmonary vascular obstructive disease**

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In an attempt to clarify further the mechanisms underlying labile rises in pulmonary vascular resistance, the effects of administering high oxygen concentrations, brief voluntary hyperventilation, and correction of acidosis were studied in 16 patients in whom congenital heart disease was associated with pulmonary vascular disease. On breathing 100 per cent oxygen there was a significant fall in pulmonary vascular resistance from 21.8 ± 4.6 to 12.9 ± 3.6 units m² (P < 0.001), with a rise in pulmonary blood flow from 4.4 ± 0.6 to 8.8 ± 2.0 litres/min per m² (P < 0.025) and a fall in pulmonary artery pressure from 67.8 ± 2.8 to 61.8 ± 4.0 mmHg (P < 0.025). The changes occurring on sodium bicarbonate administration in 6 patients did not reach levels of significance, but the size of each individual response was closely correlated with the response to oxygen administration. No significant changes occurred either on voluntary hyperventilation or in the systemic circulation with any intervention. However, systemic vascular resistance was positively correlated with pulmonary vascular resistance (P < 0.01). As a result of this, though age was correlated positively with both pulmonary artery mean pressure (P < 0.025) and vascular resistance (P < 0.025), it was not correlated with the ratio of pulmonary to systemic resistance. Since pulmonary vascular disease is progressive, these results cast some doubt on the validity of resistance ratio as a measure of its severity.

**Effect of triac and propranolol on developing myocardium in rats**

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In long-standing cases of hyperthyroidism, cardiomyopathy may result and analogues of thyroid hormones, for example triac (triiodothyroacetic acid), could play a part in causing heart muscle disease.

To study experimentally the effect triac may have on the developing myocardium, 60 µg triac per day alone, and in combination with 50 µg propranolol per day, were administered intramuscularly to pregnant rats for 15 days. Another group was given 50 µg propranolol per day only, and a final group, receiving buffer solution alone, served as controls. No further injections were given to the newborn rats, which were killed at intervals varying between 2 and 56 days after birth. Samples of myocardium were examined histologically, histochemically, and ultrastructurally.

In the group of young rats where the parent had received triac alone, severe changes of hypertrophy with extensive disarray of myofibrils were observed ultrastructurally, similar to those of hypertrophic cardiomyopathy in man. Disarray was not observed histologically. At day 56, this irregular arrangement was lost and hypertrophied myocardium was found. In the triac and propranolol group, hypertrophy was consistently observed without significant disarray at any stage during the experiments. Propranolol alone showed no effect on the myocardium.

It is concluded that triac produces profound changes in the myocardium of developing rats, simulating hypertrophic cardiomyopathy, and that propranolol appears to protect the myocardium from this disarray. The implication of these findings to the human situation are discussed.