Abstracts from the U.S.S.R.

Introduction

THE CARDIOVASCULAR AREA is one of several fields of the US-USSR Exchange in the Field of Medical Science and Public Health in which cooperative research programs are being developed, in accordance with the Agreement Between the Government of the United States of America and the Government of the Union of Soviet Socialist Republics. This agreement was signed in Moscow on May 23, 1972. The National Heart, Lung, and Blood Institute, the US coordinating institution for the cardiovascular portion of the agreement, is developing collaborative efforts between American and Soviet scientists in the following areas: Pathogenesis of Arteriosclerosis, Management of Ischemic Heart Disease, Myocardial Metabolism, Congenital Heart Disease, Sudden Death, and Blood Transfusion, Blood Components and Prevention of Hepatitis with Particular Reference to Cardiovascular Surgery. In addition, an artificial heart research and development program is being developed under a separate agreement which was signed June 28, 1974, in Moscow.

So far, there has been a substantial exchange of scientists, delegations, techniques, publications and information. One of the objectives of the exchange program is to explore ways to increase the use of Soviet medical literature by American clinicians and scientists, and vice versa. It was decided that one way to accomplish this exchange of information would be for Soviet scientists to furnish the US with abstracts of recent and important papers in cardiology. These would then be edited by the National Heart, Lung, and Blood Institute and published as an annual feature in Circulation. The abstracts would thus reach virtually all of the cardiovascular investigators in the US. The choice of articles, and the content of the abstracts, is the prerogative of the Soviet investigators. The following abstracts are the sixth set submitted to the National Heart, Lung, and Blood Institute.

Experimental Study of Biosoluble Preparations of Immobilized Fibrinolysin

E. I. Chazov, A. V. Mazaev, V. P. Torchilin, B. S. Lebedev, E. V. Ilyina, E. M. Ginzburg, and V. N. Smirnov, All-Union Research Center of Cardiology, Academy of Medical Sciences of the USSR, Moscow, USSR. Kardiologiia 17(11): 139-142, 1977

Presently used methods of systemic and local injection of soluble fibrinolytic agents have many disadvantages. Their main drawback is an inability to obtain selectively high enzyme concentrations in the specific substrate (thrombus) if equally high enzyme concentrations are not present in the general circulation. The authors created microsphere preparations of fibrinolysin immobilized on modified Sephadex. A single injection of these microspheres was made directly into the affected vascular bed. Once lodged there, the microspheres slowly dissolved, and simultaneously released their active component.

In experimental artificial thromboembolism of the canine femoral artery, modified Sephadex microspheres containing fibrinolysin showed a marked thrombolytic effect. Lysis of the thrombus was confirmed by the complete restoration of blood flow and normalization of the angiogram. In the doses used, the damaging effect of native microspheres on the distal circulatory network was evaluated using blood flow and perfusion pressure data. The authors found that the number of embolized arterioles or capillaries was easily compensated for. This improved approach to depositing drugs in the body could also be used to treat a number of other diseases (for example, oncological or endocrine diseases).

The advantages of the method include the possibility of depositing a drug at a predetermined site and regulating the rate of release of the active ingredient (since the "life" of the microspheres can be changed by modifying the carrier). The therapeutic dose is also decreased, with a corresponding decrease in the immune reaction of the organism.

Detection of Reserpine-like Substances in Heart, Brain, Liver, and Kidney Tissues from Animals and Humans

P. P. Garyaev and A. M. Vikhert, All-Union Research Center of Cardiology, Academy of Medical Sciences of the USSR, Moscow, USSR. In Proceedings "Modern Problems of Cardiology" 1: 133-141, 1977

A method was developed to extract and purify a number of basic compounds from animal tissues. The physical-chemical investigation of these substances, called RS-fractions, showed that they resembled reserpine in several ways. Mass spectra of the RS frac-
tions and reserpine have common principal ions and a similar relationship with respect to intensity. Absorp-
tion spectra for the compounds and reserpine in the ultraviolet region, and the nature of the changes produced in these spectra by using solvents with different polarity, are similar. However, the fluorescence spectra and chromatographic behavior of the RS fractions and reserpine differ. C\(^{14}\)-sodium formate administered intraperitoneally to rats or added to tissue homogenates was incorporated into the RS fractions isolated from their heart, kidneys, liver, and brain. H\(^{3}\)-tryptophan introduced into homogenates of the same organs was also incorporated into the RS fractions.

The authors hypothesized that the compounds are complexes of reserpine or similar substances with some unidentified components, and that RS-fractions can be considered an endogenous autoregulatory system for metabolism of catecholamines and indolamines. The complete structure of these compounds must be determined before their role in animal cells can be understood.

The Relationship Between Plasma HDL-Cholesterol and Plasma Steroid Hormone Levels

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Plasma lipid and plasma steroid hormone studies were carried out in 165 male volunteers aged 40–59 years (average 49 years) free of any signs of ischemic (coronary) heart disease (IHD). Cholesterol (C), triglycerides (TG) and HDL-cholesterol (HDL-C) were determined in an AA-11 Technicon autoanalyzer after precipitation of the LDL- and VLDL-lipoproteins (LP) with heparin in the presence of magnesium ions. The LP fractions were separated by electrophoretic densitometry on polyacrylamide gel using an "Intergraph" densitometer, and their percentage concentration was calculated. The concentrations of LDL- and VLDL-cholesterol were calculated by formula. The plasma concentrations of estradiol, estriol, and testosterone were determined by radioimmunoassay using kits manufactured by Sorin. The subjects were divided into three groups based on the amount of HDL-C. The average value of HDL-C in group 1 was 33.6 ± 0.9 mg%, in group 2, 50.6 ± 0.8 mg%, and in group 3, 82 ± 3.0 mg%. Total plasma C, the percentage of C in each LP fraction, LDL-LP and LDL-LP-Cholesterol (LDL-LP-C) were within normal limits in each group. Average lipid values in group 1 were: HDL-C 33.6 ± 0.9 mg%; TG 189 ± 11.4 mg%; VLDL-LP-C 37.7 ± 2.3 mg%; and VLDL-LP was 34% of the total plasma LP. Average values for group 3 were: HDL-C 82 ± 3.0 mg%; TG 93.5 ± 7.8 mg%; VLDL-LP-C 19.7 ± 2.5 mg%; and VLDL-LP was 13% of the total plasma LP. Thus TG, VLDL-LP, and VLDL-C were twice as high in group 1 (HDL-C 33.6 ± 0.9 mg%) as in group 3 (HDL-C 82 ± 3.0 mg%).

The plasma concentrations of steroid hormones of subjects in all three groups were also within physiological limits. However, their average values differed in groups 1 and 3. As the HDL-C increased from 33.6 ± 0.9 mg% (group 1) to 82.0 ± 3.0 mg% (group 3) estradiol, and the estradiol/estriol ratio doubled and the testosterone concentration rose from 541 ± 63 ng% to 884 ± 49 ng%.

Evaluation of Blood Coagulation and Prethrombotic State in Patients with Coronary Atherosclerosis by Application of Controlled Local Venous Blockade


Thromboelastograms, coagulograms, studies on the fibrinolytic system of the blood, and the index of thrombophilia were carried out on 111 patients with coronary atherosclerosis and 40 healthy control subjects before and after application of a blood pressure cuff inflated to the subject's diastolic pressure. In the controls, the thromboelastogram and the coagulogram did not change significantly after the functional test of local venous congestion. However, there was a significant increase in fibrinolysis due to the release of plasminogen activators into the blood. In patients with marked coronary atherosclerosis, the activation of fibrinolytic enzymes by local venous constriction was significantly less. This decrease was probably due to the suppression of the system's compensatory-adaptive reactions, as well as the frequently observed suppression of fibrinolysis induced by increases in the concentrations of antiplasmin and inhibitors of plasminogen in the blood. The blood of these patients also had a stable hypercoagulation potential which resulted in a high degree of thrombophilia.

The complex drug therapy generally used in patients with coronary atherosclerosis, consisting of vasodilators, hypotensive agents, and antiatherosclerotic agents, did not significantly improve the hypercoagulability of the blood; nor did it counteract the suppression of the normal fibrinolytic activation or decrease the prethrombotic state. The hypercoagulability, suppression of activation of additional fibrinolase, and marked prethrombotic state seen in patients with coronary atherosclerosis could contribute to the formation of intravascular thrombi. The authors question whether the treatment of these patients should also include agents which decrease the hypercoagulative state of the blood and increase its fibrinolytic activity.

Adaptation to High-Altitude Hypoxia and Its Effect on the Resistance of Vessels

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In earlier investigations the authors found that in animals, adaptation to hypoxia significantly inhibits the development of experimental DOC-salt hypertension. To clarify the mechanism of this prophylactic effect, the authors investigated the effect of adaptation to high-altitude hypoxia on the resistance of resistant vessels. Regulated perfusion of the hind limb vessels was performed on male Wistar rats, and their resistance was measured. Control animals kept on a plane at 200 meters above sea level and adapted animals kept in the mountains at an altitude of 2100 meters above sea level were compared.

A tendency toward decreased resistance of the resistant vessels appeared after 15 days of exposure to high altitude. Thirty days after the onset of adaptation to high altitude the decrease in resistance became significant. The decrease in the resistance of the resistant vessels in the animals which had adapted to high-altitude hypoxia persisted after denervation of the extremity, and is thus the result of a reduction in the myogenic component of the vascular tone. This reduction of the myogenic component is accompanied by a decrease in the pressor reaction to asphyxia and to administration of norepinephrine. These data indicate that high-altitude adaptation inhibits the development of experimental hypertension by means of a decrease in the myogenic component of the vascular tone.

**Humoral Pressor and Depressor Systems in Hypertension**

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Humoral pressor and depressor systems were investigated in 15 healthy and 55 hypertensive males 20–55 years old. The experiments were carried out at rest and after walking for 1 hour, before and after taking 120 mg furosemide (120 mg daily dose). The following changes were typical of patients with an unstable increase in blood pressure: 1) An increase in the basal level of renin activity, and an aldosterone content higher than the average normal level (in 50–60% of the cases) or above the upper level (in 20–30% of the cases). The prostaglandin-F (PGF) content was elevated in 70% of patients compared with healthy controls. Other humoral pressor substances were not significantly different from normal. 2) The response of the renin-angiotensin-aldosterone system to walking was twice as pronounced as in the control group. After taking furosemide, the reaction became less pronounced. 3) An increase in the basal level of depressor hormones and enzymatic activity (prostaglandins A, E, progesterone and urinary kallikrein) appeared more frequently than in the control group. The activity of these depressor humoral systems was not changed by walking.

Typical results in patients with a stable elevation of blood pressure were as follows: 1) The basal level of the pressor humoral system was average or below average as compared to control subjects, while the levels of the components of the depressor systems were mostly at the lower normal limit. 2) The reaction of the renin-angiotensin system in response to the stimulation of walking was similar to that of control subjects. After treatment with furosemide this pressor response decreased by 50–75% of the pretreatment level. 3) The response of the depressor humoral systems to any type of stimulation was sharply decreased. Under the experimental conditions tested, the pressor humoral systems in hypertensive patients predominated over the depressor systems. The authors hypothesize that exhaustion of the humoral depressor systems may be one of the factors in converting labile hypertension into stable hypertension.

**Evaluation of Functional and Morphologic Changes in the Lungs During the Development of a “Second Barrier” in Patients with Mitral Valve Disease**


Two methods of evaluation of the “second barrier” state are presented. Seventy-four patients with various stages of mitral stenosis according to the classification of Bakulev-Damir were studied.

The first is a direct method which is based on the analysis of intracardiac hemodynamic indices and the contractile function of the right ventricle before and during physical load. In cases of predominance of the functional component of the “second barrier,” pulmonary resistance decreases, stroke and minute volume increase, the work of the right ventricle increases, the intraventricular pressure rises more rapidly, the duration of isometric tension and the ejection period are reduced, and the average volumetric velocity of ejection increases.

The second is an indirect method which is based on the determination of pulmonary function tests. Vital capacity, tidal volume, and total lung capacity are measured immediately after the use of diuretics and after prolonged cardiotonic therapy. An increase in the tidal volume without substantial change in the vital capacity is considered indicative of the presence, morphologically, of the “second barrier.”

The authors found a close interdependence (r = 0.97, p > 0.01) between the increase in the tidal volume and the increase in pulmonary-alveolar resistance during graded physical stress.

**The Interaction of Myocardial Hypertrophy and Myocardial Contractile Capacity Measured by Echocardiography**

Yu. S. Sobol, All-Union Research Center of Cardiology, Academy of Medical Sciences of the USSR, Moscow, USSR. Ter Arkh 48 (4): 60–76, 1976

An echocardiographic examination of 117 males with hypertension and 20 healthy males was conducted to investigate the myocardial contractile
capacity of the left ventricle in various degrees of hypertrophy. None of the patients had clinical evidence of congestive heart failure. All patients with clinical or ECG signs of ischemic (coronary) heart disease were excluded from the study. Investigation of myocardial inotropism and central hemodynamics indicated that despite the prevalence of the isometric type of myocardial hyperfunction in hypertensive patients, mobilization of the inotropic compensatory mechanism was not observed in all patients. A decrease in myocardial contractility, more marked with pronounced hypertrophy, was observed in some patients in the initial stages of left ventricular myocardial hypertrophy. Even at early stages of myocardial hypertrophy the compensatory Frank-Starling mechanism was evoked. This compensation was particularly significant when marked hypertrophy of the left ventricle was present. An increase in myocardial mass was accompanied by a proportional rise in the end-diastolic volume and stroke index. Mobilization of the inotropic compensatory mechanism in some hypertensive patients with cardiac hypertrophy resulted in a marked increase in stroke volume and in the development of a hyperkinetic type of circulation in both the early and late stages.

Differential Diagnosis of Essential Hypertension and Some Forms of Symptomatic Hypertension With a Latent Course

A. M. Vikhert and O. A. Kozdoba, All-Union Research Center of Cardiology, Academy of Medical Sciences of the USSR, Moscow, USSR. Ter Arkh 48 (7): 53-70, 1976

The authors studied 150 patients aged 19-48 years suffering from varying degrees of arterial hypertension. Small changes were observed in the urine of all patients and the results of selective renal function tests were inconclusive. Renal x-rays did not reveal any gross kidney pathology. Needle biopsy of the kidneys was performed on all patients and the specimens were examined by light and electron microscopy. Eighty-four patients had chronic diffuse glomerulonephritis accompanied by membranous, membranous-proliferative, proliferative and sclerotic alterations of the glomeruli. Twenty-five patients had chronic pyelonephritis with focal interstitial sclerosis with infiltrates, tubular atrophy in the necrotic zone, renal cells similar in appearance to thyroid cells, glomerular edema, productive endarteritis and perivascular sclerosis. Both types of pathology were present in three patients, i.e., a combination of chronic pyelonephritis and chronic glomerulonephritis. In 48 patients (25.3% of the total number studied) the histology of the biopsies was that typically found in cases of essential hypertension. That is, there were no inflammatory or inflammatory-fibroplastic changes in the glomeruli, tubules and interstitial tissues of the biopsy specimens.

Use of Tranquilizers in Patients with Myocardial Infarction

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In this paper the use of tranquilizers in treating 91 male myocardial infarction patients suffering from concomitant mental disorders is reported. The efficacy of the treatment varied widely with various types of psychoses, depending on the degree and type of the mental disorder. Tranquilizers were more effective in patients with acutely developing emotional disorders with a predominance of anxiety and moderate neurosis, particularly for the nonspecific anxiety that occurs in the first months after myocardial infarction. In patients with marked hypochondriac and cardiophbic syndromes, treatment with tranquilizers alone had little effect, especially in the postinfarction period. A combination therapy consisting of tranquilizers, neuroleptics and/or antidepressants produced good and lasting results in myocardial infarction patients. Such treatment was more effective than treatment with tranquilizers alone, particularly when the latter were not very effective. On the basis of these results, the author discusses indications for and the method of tranquilizer therapy, including optimal drug dosages and the duration of treatment for patients in all stages of the disease.

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