

Features of Various Somatic Pathologies Including Essential Hypertension and Coronary Heart Disease in Elderly People in Chernobyl Nuclear Power Plant Accident

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Abstract

The article reflects the peculiarities of the course of various somatic pathologies, including essential arterial hypertension and coronary heart disease, as well as the issues of comorbidity in liquidators of consequences of the Chernobyl nuclear power plant (ChNPP) accident in the remote period.

Keywords: Somatic pathology, Essential arterial hypertension, Coronary heart disease, Comorbidity, Liquidators of consequences of the Chernobyl accident, Elder age, Remote period.

Introduction

International statistics shows that in many developed countries the number of elderly people is increasing at an annual rate of 3%. Thus, the proportion of the elderly population is projected to reach 1.4 by 2030, and 2.1 billion by 2050 [1,2]. In the Republic of Kazakhstan (RK), the proportion of people aged 65 and over is 6.8% [3].

The steady aging of the population increases the proportion of cardiovascular diseases, which are the main cause of death of the population. Therefore, according to the statistics agency of the Republic of Kazakhstan, the incidence of cardiovascular diseases increased to 2,463 per 100,000 populations [4].

One of the biggest tragic events of the 20th century was the accident at the Chernobyl nuclear power plant (1986), which caused numerous environmental and human losses. It is known that radiation adversely affects not only the environment, but also affects all human organs and systems. In the aftermath of the Chernobyl accident involved more than 30 thousand Kazakhstans, of which today only 4,500 people survived. The total number of deaths in 1986-87 was about two hundred thousand liquidators, many of whom died not only from acute radiation sickness, but also from cardiovascular disease [5-7]. In addition to cardiovascular diseases, the liquidators have a defeat of the nervous and genitourinary system, endocrine pathologies, gastrointestinal lesions, etc.

It should also be noted that liquidators in almost 90% are diagnosed with more than three diseases of the vascular system. It was noted that patients with vascular comorbidity have a higher mortality rate than the average in the population. This may be due to the negative effect of ionizing radiation on all organs and systems. It was found that the older the patient, the more often the vascular comorbid pathology is recorded. According to the literature, the frequency is 98% - in patients of the older age group (over 65 years).

It should be noted that the data on the risk of CVD occurrence in LCA at the Chernobyl NPP are inconsistent [8,9]. Morbidity and mortality from

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cardiovascular pathology, in the liquidators are significantly higher in comparison with other categories of the population. So, there are publications about a fairly high prevalence of essential hypertension and coronary heart disease in this category of people. However, in the available literature, we have not met publications concerning the study of various somatic diseases in elderly liquidators involved in post-delivery work at the Chernobyl nuclear power plant [8-13].

In this regard, the purpose of this study was to study the comorbidity in elderly people suffering from essential arterial hypertension (EAH) in combination with coronary heart disease (CHD) who participated in the liquidation of the consequences of the Chernobyl accident in a remote period.

Material and Method

A survey of 50 men with EAH in combination with CHD of the elderly took part in the emergency work at the Chernobyl NPP in 1986-91. Since there is no information on the radiation doses received by them, all patients were conditionally divided into 4 groups depending on the period of stay in an ecologically unfavorable zone: group 1 (April-June 1986) - 8 people (16%); 2 (June-December 1986) -14 (28%); 3 (1987-1989) -17 (34%) and 4 group (1990-91) -11 people (22%).

In the clinical picture, patients of all groups had headaches (55-100%), dizziness (76-100%), joint pain (35.2-57.1%), pain in the lumbar region (52.9-75%), pain in epigastrium (29.4-75%), dysuric «fog» syndrome before the eyes (64-100%), decreased efficiency (36-100%), angina attacks (18-100%), hypertensive crises (24 %) and. The above clinical symptoms were more common in the 1 and 2 groups of patients who participated in the elimination of the accident from April to December 1986.

Along with cardiovascular pathology in the examined patients, there was a defeat of other organs and systems (Table 1).

Electrophysiological methods of investigation included: ECG, ECHO, daily monitoring of ECG and blood pressure.

The analysis of the obtained data was carried out on the basis of the programs Statistica 8.0 and "Microsoft Office Excel".

Results and Discussion

All patients underwent stratification and analysis in accordance with the terms of stay in an ecologically unfavorable zone (Table 2).

As can be seen from table 1 in the 2nd,3rd,4th groups there was AH 2 degree, whereas AH 3 degree was more often detected in the 1st and 2nd groups of people participating in the LCA from April to December 1986. At the same time, it should be noted that these were patients with a high and very high risk of developing cardiovascular complications.

Stress steno-cardia of FC 2 was mainly observed in patients of groups 3 and 4, Stress steno-cardia of FC 3 was detected mainly in patients of groups 1 (62%) and 2 (57.14%). To clarify the effect of ionizing radiation on the cardiovascular system, we conducted electrophysiological studies of all patients taking into account the time spent in an ecologically unfavorable zone.

Analysis of the electrophysiological study revealed that left ventricular hypertrophy, various variants of cardiac arrhythmias, and diastolic left ventricular dysfunction were most frequently observed in groups 1 and 2 participating in the LCA between April and December 1986, compared with other groups. Daily monitoring of BP showed that the maximum average figures of daily BP both systolic and diastolic were higher than normal values in all studied groups. However, higher figures of mean and average BP were observed mainly in 1-2 groups. Also, in this category of patients, there was a violation of the circadian rhythm of BP with the predominance of "non-dipper" (Table 3).

Table 4 shows that all studied patients, in addition to diseases of the cardiovascular system, had lesions of other organs and systems. As can be seen from the table, all patients have lesions of the nervous system, also often there is a defeat of the genitourinary, endocrine systems, gastrointestinal tract. It should be noted that a high percentage of occurrence in the anamnesis of ADCC and PICS, mainly in people who were in a dysfunctional zone from April to December of 1986. Thus, the participation of the examined patients in LCA at ChNPP in 1986 (groups 1 and 2) contributed to the development not only of the defeat of various organs and systems. Moreover, the clinical manifestations of these diseases were leveled, which was manifested by the development of hypertensive crises, acute violation of cerebral circulation, the occurrence of myocardial infarction.

The highest index of comorbidity (the Charlson index) was found in the first group and was 4.35, which is 53% when calculating the 10-year survival rate. In the remaining three groups, the Charlson index was 1.5, 1.7; 1.0 points.

The next stage of our study was the identification of the relationship between the clinical and functional characteristics of EAH and CHD in elderly people and the time spent in an unfavorable zone.

Table 1: The defeat of various systems in individuals with EAH and CHD.

	The defeat of the central and peripheral nervous system			Disorders of the urinary system			Gastrointestinal lesions		The defeat of the endocrine system		
	DE	Condition after ADCC	Left-sided hemiparesis	Chr. pyelonephritis	Chr. prostatitis	Hyperplasia of the prostate	Chr. cholecystitis	Chr. gastritis	Diabetes	Nodular goiter	Obesity
Group 1	100%	50%	37.5%	75%	50%	25%	62.5%	75%	37.5%	25%	25%
Group 2	100%	7.1%	-	64.2%	42.8%	21.4%	52.1%	42.8%	35.7%	13.3%	28.5%
Group 3	100%	-	-	52.9%	41.1%	5.8%	35.2%	29.4%	5.8%	11.7%	5.8%
Group 4	100%	-	-	63.6%	41.6%	9.09%	9.09%	9.09%	27.2%	9.09%	16.6%

Table 2: Stratification of patients with coronary heart disease and essential hypertension.

Indicators	Group 1 (n=8)	Group 2 (n=14)	Group 3 (n=17)	Group 4 (n=11)
AH 2 degree	-	21.4% (3)	29.4% (5)	36.3% (4)
AH 3 degree	100%(8)	78.5% (14)	70.5% (12)	63.6 (7)
High risk	25% (2)	28.5% (4)	29.4%(5)	27.2%(3)
Very high risk	75%(6)	71.4% (10)	70.5% (12)	72.7% (8)
Stable stenocardia FC 2	37.5% (3)	42.8% (6)	88.2% (15)	100% (11)
Stable stenocardia FC 3	62% (5)	57.14%(8)	11.7% (2)	-

Table 3: Indicators of ECG and ECHO CG. DMAD in LCA at the Chernobyl NPP.

Indicators	Group 1 (n=8)	Group 2 (n=14)	Group 3 (n=17)	Group 4 (n=11)
LVH	100% (8)	100% (14)	88.2%(15)	72.7%(8)
Diastolic dysfunction	100%(8)	85.7% (12)	76.4%(13)	82.7%(8)
Aortosclerosis	50% (4)	35.7%(5)	23.5%(4)	18.1% (3)
Reduction of contractility of the myocardium	87.5%(7)	42.8% (6)	23.5% (4)	0%
Rhythm disturbances	87.5%	71.4%	70.5%	63.6%
SBP max (day)	169*	165*	158	154
DBP max (day)	107	104	100	104
SBP min (day)	108	102.8	92.5	97
DBP min (day)	76	74	73.6	74.8

Table 4: The defeat of various systems in people with EAH and CHD.

Indicators	Group 1 (n=8)	Group 2 (n=14)	Group 3 (n=17)	Group 4 (n=11)
EAH+CHD+DE	100%	100%	100%	100%
EAH+CHD + D	37.5%	35.7%	5.8%	27.2%
EAH+CHD + Chr. pyelonephritis	75%	64.2%	52.9%	63.6%
EAH+CHD + Chr. gastritis	75%	42.8%	29.4%	9.09%
EAH+CHD + Chr. cholecystitis	62.5%	52.1%	35.2%	9.09%
EAH+CHD + ADCC in anamnesis	50%	7.1%	-	-
EAH+CHD + PICS in anamnesis	87.5%	48.2%	23.5%	0%

As can be seen from Table 5, a statistically significant dependence between symptoms such as headache, «fog» before the eyes, decreased performance, steno-cardia attacks, episodes of hypertensive crises, myocardial infarction in the anamnesis, and residence time of the liquidators involved in the aftermath of the accident in 1986 year (1 and 2 groups). Although these symptoms were observed in groups 3 and 4, but with a lower frequency of detection.

Thus, the effect of ionizing radiation on various organs and systems is beyond doubt. Our analysis of clinical and functional changes of the EAH in combination with CHD in elderly LCA indicates some clinical and functional features of the course of these diseases, which manifested in LCA who took part in the first year after the Chernobyl accident (group 1,2). This was characterized by frequent hypertensive crises, variability of AD with the predominance of “non dipper”, a history of myocardial infarction in the anamnesis

in different years of their life, left ventricular hypertrophy, various variants of rhythm disturbances and diastolic left ventricular dysfunction. Although it is understandable that in the long-term after the accident elderly people had a multicomponent pathogenesis and age-related changes, as well as other environmental influences, whose role and significance, taking into account age, cannot be ignored.

Conclusion

1. The presence of comorbid conditions in patients with EAH and CHD contributes to the enhancement of the effect of ionizing radiation, and also affects the deterioration of the clinical course of various diseases.
2. Ionizing radiation in conditions of emergency recovery at the Chernobyl nuclear power plant can be an additional risk factor for the development and progression of EAH in combination with CHD, in the elderly who participated in the liquidation of the consequences of the Chernobyl accident.
3. The clinical features (hypertensive crises, myocardial infarction in the anamnesis, violation of the circadian rhythm of blood pressure by type “non dipper”) were most pronounced in people with EAH in combination with CHD who participated in the liquidation of the consequences of the Chernobyl accident in 1986 (1-2 groups), as well as functional changes (left ventricular hypertrophy, left ventricular diastolic dysfunction, various heart rhythm disturbances).

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