The American Journal of Medical Sciences and Pharmaceutical Research (ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 24-29
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

Journal Website: https://theamericanjournals.com/index.php/tajmspr

Research Article

NEUROIMAGING CHARACTERISTICS OF ENCEPHALOPATHY IN CHRONIC KIDNEY DISEASE

Submission Date: May 14, 2023, Accepted Date: May 19, 2023,
Published Date: May 24, 2023 |
Crossref doi: https://doi.org/10.37547/TAJMSPR/Volume05Issue05-07

Rakhmatullayeva G.K.
Tashkent Medical Academy, Uzbekistan

Artykova M.A.
Tashkent Medical Academy, Uzbekistan

Khudayarova S.M.
Tashkent Medical Academy, Uzbekistan

ABSTRACT

According to WHO, vascular diseases of the brain in the developed countries of the world account for 15% of the total mortality. At the same time, acute and chronic encephalopathies occupy a special place in the structure of vascular diseases. In recent years, special attention has been paid to encephalopathies developing as a result of renal pathology, since kidney diseases, namely chronic kidney disease (CKD) is a huge socio-economic problem that leads to cerebral complications, with a significant deterioration in the quality of life, a sharp loss of working capacity, and a high percentage of mortality. In the diagnosis of various encephalopathies and other disorders of cerebral circulation, an invaluable role is played by MRI, MSCT, brain angiography with their wide diagnostic capabilities.

KEYWORDS

Chronic kidney disease (CKD), acute encephalopathy, chronic encephalopathy, acute cerebrovascular pathology, neuroimaging, MRI.

INTRODUCTION

According to world data, the global prevalence of CKD in the general population averages 14.4% [1, 3], which is comparable to such socially significant diseases as hypertension, coronary heart disease, diabetes

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 24-29
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

mellitus, obesity [2, 3]. Neurological complications arising from this disease are an integral part of this condition, because the kidneys and the brain have a similar anatomical structure of the vessels and similar physiological structure of the processes occurring in them. It is believed that cerebrovascular diseases among patients with CKD occur at least 2 times more often than in the general population and potentially determine the cardiovascular prognosis and the risk of cognitive impairment in patients with CKD, both in the predialysis and dialysis period [4,5,6]. According to the National Kidney Foundation USA, the incidence of cerebrovascular complications in patients of the predialysis stage is 65% and reaches 90% in patients undergoing treatment with programmed hemodialysis [7,8]. Early timely diagnosis of these complications allows to prevent fatal outcomes of this category of patients. Neuroimaging techniques play an important role in the diagnosis: MRI and MSCT of the brain using special modes. MRI is a sensitive method for detecting vasogenic edema of the brain. MR-changes in ESR are manifested in the form of an increase in signal intensity on T2-weighted images mainly in the posterior parts of the brain [9, 10] Disorders are best visualized in the FLAIR mode, in which the signal from the cerebrospinal fluid is suppressed and even subtle changes characteristic of ESR are detected [9, 11, 12]. The use of the DWI mode and ADC mapping makes it possible to distinguish vasogenic edema that occurs in ESR from cytotoxic edema characteristic of ischemic stroke. The area of vasogenic edema is visualized by hypo- or isointensive foci on DWI MRI and increased signal intensity during ADC mapping [13,14]. The predominant involvement of the posterior parts of the brain is explained by the comparative insufficiency of sympathetic iinervation of the vessels of the vertebro-basilar system. This makes them more sensitive to sudden rises in blood pressure and leads to premature loss of vasoconstrictor properties in response to the action of a damaging factor [15, 16-18].

Objective: To study neuroimaging characteristics of cerebral circulation disorders in patients with chronic kidney disease

MATERIAL AND METHODS

Were analyzed MRI images of 40 (39.6%) patients with acute, chronic encephalopathies and other acute disorders of cerebral circulation. The average age of all patients was 46.2±15.01 years. For the correct interpretation of the data, the patients were divided into 3 groups: group 1 patients with acute hypertensive encephalopathy (n=7); group 2 patients with chronic encephalopathy (chronic hypertensive, uremic, mixed) (n=28); and group 3 patients with ischemic and hemorrhagic stroke (n=5). MRI was performed using a 3T scanner (Intera Achieva; Philips Healthcare, Best, Netherlands) and a 1.5T scanner (Signa Excite; GE Healthcare, Milwaukee, Wisconsin).

RESULTS

During the analysis of the results obtained, the following symptoms were revealed in group 1 of patients: bilateral vasogenic cortical edema of occipital localization was detected in 3 (42.5%) patients; in 3 (42.5%) patients, the affected areas were localized in the parietal-occipital, frontal regions, and vasogenic edema of the brain stem was also detected. In one patient, along with occipital and parietal occipital localizations, the basal ganglia and lower hemispheres of the cerebellum were affected. In addition to vasogenic edema, changes in the brain included brain atrophy in 5 (71.5%), expansion of the ventricular system in 2 (28.5%) patients.

The American Journal of Medical Sciences and Pharmaceutical Research
(ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 24-29
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

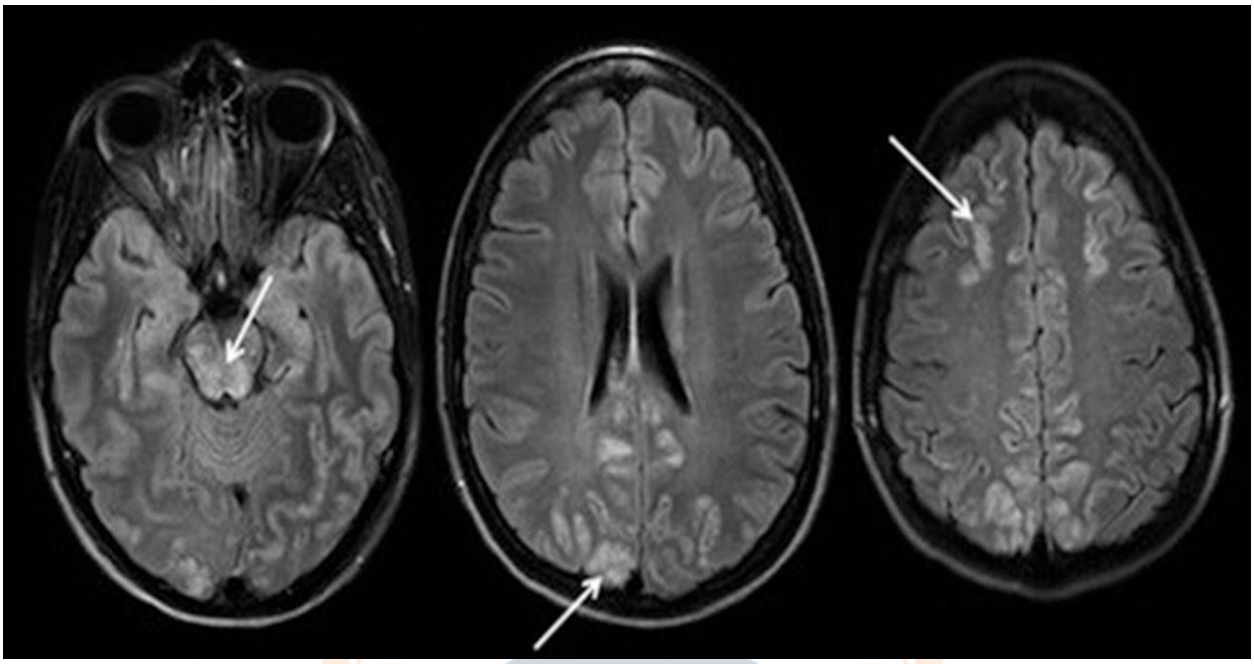

Fig.1. MRI image of a patient diagnosed with CKD 5, condition after surgery kidney transplant on the left from 07/19/2016 Recurrent nephropathy of the transplant Complication: Acute encephalopathy (PRES - syndrome of posterior reversible encephalopathy). MRI revealed diffuse lesions of the white matter of both hemispheres of the brain and areas of microishemia in the occipital lobe. Vasogenic edema in the parietal-occipital areas, as well as less common lesions in the frontal areas and brain stem

MRI characteristics of patients with chronic encephalopathies revealed local atrophy of the cerebral cortex in 15 (53.5%), single in 10 (35.7%), multiple in 18 (64.2%), areas of pathological intensity with fuzzy contours, rounded shape, 3-4 mm in diameter, areas of pathological intensity in the structure of the white matter of both hemispheres, located mainly subcortical. Expansion of the subarachnoid space 8 (28.5.2%); as well as expansion of the ventricular system (asymmetry) 9 (32.7%). Presence of periventricular ischemic foci in 20 (71.4%)

This table shows the identified neuroimaging changes in patients with chronic kidney disease

Table 1

Neuroimaging characteristics

Identified changes	Patients with acute encephalopaty N=7	Patients with chronic encephalopathy N= 28	Patients with ischemic and hemorrhagic stroke N=5

The American Journal of Medical Sciences and Pharmaceutical Research (ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 24-29
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

	A6c	%	A6c	%	A6c	%
Bilateral vasogenic edema of occipital localization	3	42,5*	-	-	-	-
Vasogenic edema in the parietal-occipital, frontal, brain stem	3	42,5*	-	-	-	-
Vasogenic edema of the occipital, parietal-occipital, basal ganglia and lower hemispheres of the cerebellum	1	14,2	-	-	-	-
Brain atrophy	5	71,5*	15	53,5	5	100
Single areas of pathological intensity	-	-	10	35,7	-	-
Multiple areas of pathological intensity	-	-	18	64,2**	-	-
Expansion of the subarachnoid space	-	-	8	28,5	2	40
Expansion of the ventricular system	2	28,5	9	32,7	-	-
The presence of periventricular ischemic foci	-	-	20	71,4*	2	40
Hypodensal focus in the periventricular region on the right (ischemic stroke in the middle cerebral artery basin)	-	-	-	-	2	40
Intracerebral hematoma of irregular shape in the thickness of the shell and the fence on the right (hemorrhagic stroke in the middle cerebral artery basin)	-	-	-	-	1	100
Periventrically on the left, closely adjacent to the front.the horns of the left lateral ventricle are hypodensic zone (ONMC we will look for.type in the SMA pool on the left)	-	-	-	-	2	100

Note: * - data reliability P<0.05 ; ** - P<0.01 ; * - P<0.001**

In addition to acute and chronic encephalopathies, cases of transient ischemic attack, ischemic and hemorrhagic stroke were detected among the total number of subjects: in 2 (40%) in the periventricular region on the right with the spread of an irregular hypodens focus into the projection of the inner capsule, with indistinct contours (ischemic stroke in the middle cerebral artery basin on the right). Also, 2 (40%) periventrically on the left, closely adjacent to the anterior horn of the left lateral ventricle, an irregularly shaped hypodensal focus is visualized (ischemic stroke in the middle cerebral artery basin on the left).

The American Journal of Medical Sciences and Pharmaceutical Research (ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 24-29
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

Among the examined there was 1 case of hemorrhagic stroke with a characteristic visualization picture: in the thickness of the shell and fence on the right, an irregular intracerebral hematoma, with clear uneven contours, dimensions 48×22×32 mm, density +55+63 HU with a zone of perifocal edema of the white matter of the brain (hemorrhagic stroke in the middle cerebral artery basin on the right).

DISCUSSION AND CONCLUSIONS

Based on the above data, it can be concluded that in acute encephalopathy (PRES), not only the posterior structures of the brain are involved in the pathological process, as described in the literature, but also the frontal lobes, brain stem, basal ganglia, and cerebellum. The involvement of these structures in the literature is described as an atypical picture of this syndrome [19]. It also draws attention to the fact that the edema in acute hypertensive encephalopathy is vasogenic, and as a result, the treatment tactics differ significantly from other types of complications that have developed. According to the results, neuroimaging changes in chronic renal encephalopathy practically do not differ from other encephalopathies of vascular genesis. They develop due to the effects of uremic toxins, discirculatory changes as a result of vascular remodeling and calcification, and manifest themselves in the form of single and multiple foci of pathological intensity, the appearance of pereventricular ischemic foci, as well as changes in the ventricular system, expansion of the subarachnoid space and brain atrophy.

REFERENCES

1 Chronic kidney disease: Clinical guidelines / Association of Nephrologists of Russia, 2019. Russian (Chronic Kidney disease: Clinical recommendations / Association of Nephrologists of Russia, 2019. URL: http://nonr.ru / wp-content / uploads / 2020 / 01 / Clin_guidlines_CKD_24.11_final-3–3. pdf (March 12, 2020)).

2 Rogova IV, Fomin VV, Damulin IV, et al. Vascular cognitive impairments in chronic kidney disease. Neurology, Neuropsychiatry, Psychosomatics 2015; 7 (1): 11–8. Russian (Rogova I. V., Fomin V. V., Damulin I. V., etc. Vascular cognitive impairment in chronic kidney disease. Neurology, neuropsychiatry, psychosomatics 2015; 7 (1): 11-8).

3 Mark PB. Strategies to manage cardiovascular risk in chronic kidney disease. Nephrology Dialysis Transplantation 2017; 33 (1): 23–5.

4 Nikitina AA, Khrulev AE. Cerebrovascular disorders of the predialysis period of chronic kidney disease and development mechanisms. Medical Almanac 2018; 56 (5): 28–32. Nikitina A. A., Khrulev A. E. Cerebrovascular disorders of the predialysis period of chronic kidney disease and the mechanisms of their development. Medical Almanac 2018; 56 (5): 28-32).

5 Khrulev AE, Studyanikova SF, Langraf SV, et al. Cognitive impairment in patients on hemodialysis. Neurology Bulletin 2019; 51 (2): 36–40. Russian (Khrulev A. E., Studyanikova S. F., Langraf S. V., etc. Cognitive impairment in patients undergoing programmed hemodialysis. Neurological Bulletin 2019; 51 (2): 36-40).

6 Nathan E., Penersen S.E. Dialysis encephalopathy // Acta.Pediatrics. Scand. — 1980. — №69. — P. 793-796.

7 Raskin Neil H. Neurological Aspects of Renal Failure //Neurology and general medicine / Ed. by M.J. Aminoff. — 3rd ed. —2001. — P. 231-246.

The American Journal of Medical Sciences and Pharmaceutical Research (ISSN – 2689-1026)
VOLUME 05 ISSUE 05 Pages: 24-29
SJIF IMPACT FACTOR (2020: 5. 286) (2021: 5. 64) (2022: 6. 319) (2023: 7. 396)
OCLC – 1121105510
Publisher: The USA Journals

8 Etgen T, Chonchol M, Förstl H, Sander D. Chronic kidney disease and cognitive impairment: A systematic review and meta-analysis. Am J Nephrol 2012; 35 (5): 474–82.

9 Fugate JE, Claassen DO, Cloft HJ, Kallmes DF, Kozak OS, Rabinstein AA. Posterior reversible encephalopathy syndrome: associated clinical and radiologic findings. Mayo Clinic Proceedings. 2010;85:427-432. https://doi.org/10.4065/mcp.2009.0590

10 Ahn KJ, You WJ, Jeong SL, Lee JW, Kim BS, Lee JH, Yang DW, Son YM, Hahn ST. Atypical manifestations of reversible posterior leukoencephalopathy syndrome: findings on diffusion imaging and ADC mapping. Neuroradiology. 2004;46(12):978-983. https://doi.org/10.1007/s00234-004-1276-1

11 Fugate JE, Rabinstein AA. Posterior reversible encephalopathy syndrome: clinical and radiological manifestations, pathophysiology, and outstanding questions. The Lancet Neurology. 2015;14(9):914-925. https://doi.org/10.1016/s1474-4422(15)00111-8

12 Stevens CJ, Heran MKS. The many faces of posterior reversible encephalopathy syndrome. The British Journal of Radiology. 2012;85(1200):1566-1575. https://doi.org/10.1259/bjr/25273221

13 Garg RK. Posterior leukoencephalopathy syndrome. Postgraduate Medical Journal. 2001;77(903):24-28. https://doi.org/10.1136/pmj.77.903.24

14 Zeeman GG. Neurologic complications of Pre-eclampsia. Seminars in Perinatology. 2009;33(3):166-172. https://doi.org/10.1053/j.semperi.2009.02.003

15 Skvortsova V.I., Gubsky L.V., Melnikova E.A. Posterior reversible encephalopathy syndrome. Journal of Neurology and Psychiatry named after S.S. Korsakov. 2010;110(5):104-109. Skvortsova VI, Gubskiy LV, Melnikova EA. Posterior reversible encephalopathy syndrome. Zhurnal Nevrologii i Psikhiatrii im. S.S. Korsakova. 2010;110(5):104-109. (In Russ.).

16 Chou SO, Lai PH, Yeh LR, Yuan MK, Liang HL, Chen C, Pan HB, Yang CF, Li JY, Lo YK. Posterior reversible leukoencephalopathy syndrome: magnetic resonance imaging and diffusion-weighted imaging in 12 cases. The Kaohsiung Journal of Medical Sciences. 2004;20(8):381-388. https://doi.org/10.1016/s1607-551x(09)70174-3

17 Ay H, Buonanno FS, Schaefer PW, Le DA, Wang B, Gonzalez RG, Koroshetz WJ. Posterior leukoencephalopathy without severe hypertension: utility of diffusion-weighted MRI. Neurology. 1998;51:1369-1376. https://doi.org/10.1212/wnl.51.5.1369

18 Zeeman GG. Neurologic complications of Pre-eclampsia. Seminars in Perinatology. 2009;33(3):166-172. https://doi.org/10.1053/j.semperi.2009.02.003

19 Kastrup O., Schlamann M., Moenninghoff C., Forsting M., Goericke S. Posterior reversible encephalopathy syndrome: the spectrum of MR imaging patterns. Clin. Neuroradiol. 2015; 25(2): 161–71. DOI: 10.1007/s00062-014-0293-7).