THE CAUCASUS JOURNAL OF MEDICAL & PSYCHOLOGICAL SCIENCES
კავკასიის მედიცინის და ფსიქოლოგიის მეცნიერებათა ჟურნალი
КАВКАЗСКИЙ ЖУРНАЛ МЕДИЦИНСКИХ И ПСИХОЛОГИЧЕСКИХ НАУК

2023, Volume 1, Number 4
eISSN 2720-8788
pISSN 2720-877X

NONINVAZIVE DIAGNOSTICS OF EXTRACRANIAL ARTERIES TORTUOSITY

Dudana G. Gachechiladze, Rusudan T. Kharadze, Merab V. Beraia, Michael V. Okujava[1]

ABSTRACT

Deformations of carotid artery – deviation, tortuosity, coiling, hold the 2nd place among other carotid pathologies. They are the cause of 10-17% of cerebrovascular disorders. It should also be noted that this pathology is common for a relatively young age. It is considered that in the elderly carotid deformation is an acquired lesion most commonly seen in patients suffering from arteriosclerosis and hypertension, while in children and younger patients, the kinks and coils are congenital. For diagnostics of deformations of magistral arteries, highly efficient non-invasive methods are applied: ultrasound duplex-scanning, MR angiography, and multi-slice CT angiography. We have studied deformations of magistral carotid and vertebral arteries in cases of isolated atherosclerosis, isolated arterial hypertension, and a combination of atherosclerosis and hypertension. Out of 205 patients we diagnosed deformations of carotid arteries in 93 (30%) cases, and deformations of vertebral arteries in 64 (21%) cases. Bilateral deformation of carotid arteries was diagnosed in 43 (17%) cases. C- or S-shaped deformations in 55 (81%) cases were located in proximal or medial parts of CCA or ICA. 76% of patients with this pathology had arterial hypertension. In the case of C- or S-type deformation rate amounted to 30%, in the case of coiling increase of flow it reached 50%, and in the case of kinking – exceeded 60%. In the case of C- or S-type elongation, flow volume (Q) is practically within the normal range - 488±38 ml/min. In the case of spiral shape elongation, it showed the tendency of decrease -402±22 ml/min, which is more obvious in the case of kinking - 332±22 ml/min. The frequency of elongations is practically the same in the case of isolated atherosclerosis or hypertension, however, in the case of their combination the frequency increases. In order to study the impact of the deformation of magistral arteries on intracranial hemodynamics, we examined 84 patients without any hemodynamically significant atherosclerotic pathology of carotids. We found a total of 91 elongations: In the case of C- or S-shaped deformation, flow parameters remain within the normal range, as in the case of spiral elongation or coiling. In the case of kinking, there is an obvious tendency for a decrease in flow rate

[1] Todua Clinic, Tbilisi, Georgia

KEYWORDS: Carotid pathology, magistral arteries, spiral elongation, spiral deformation

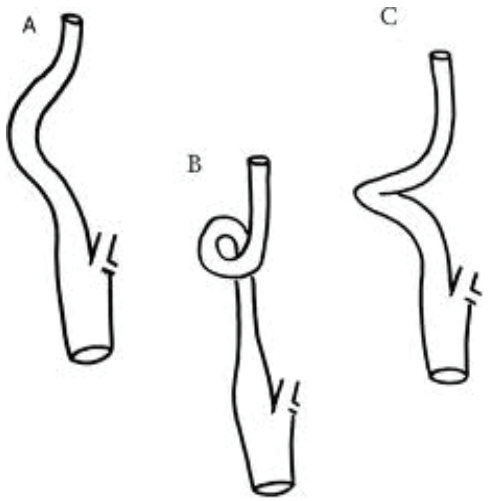
Cite: Gachechiladze D.G., Kharadze R.T, Beraia M.V, Okujava M.V. Noninvasive diagnostics of extracranial arteries tortuosity. *Cauc J Med & Psychol Sci.* 2023; 56-701(4): 60-72. DOI: https://doi.org/10.61699/cjmps-v1-i4-p60-72

– the average flow rate is 20% below the normal value. Our data correspond to similar data of other authors, who revealed the tendency of a 20-35% decrease of flow rate in the ipsilateral middle cerebral artery, in case of significant tortuosity or kinking of the carotid artery.

Deformations and elongations of the carotid artery – deviation, tortuosity, and coiling, hold the second place among other carotid pathologies. Their frequency in population is 12-43%. They are the reason for 10-17% of cerebrovascular disorders. It should also be noted that this pathology is common at a relatively young age. Considering that 16-20% of people with deformations have transitory or stable cerebral circulatory disorders in anamnesis, the medical and social importance of the problem becomes obvious [1, 2]. It is considered that in the elderly carotid deformation is an acquired lesion most commonly seen in patients suffering from arteriosclerosis and hypertension, while in children and younger patients, the kinks and coils are congenital. Such anomalies occur in 15% of infants and children, and in 44-55% of young adults without congenital atherosclerosis. It is often bilateral [3]. Coiling is mostly disembriogenetic. 50% of coilings revealed in childhood are bilateral, symmetric, and often accompanied by other vascular pathologies [4]. Deviation and kinking in adults are mainly related to the weakening of elastic arterial carcass, atherosclerotic changes, and malformation of the cervical segment of the spine. The elastic and muscular tissue of the carotid artery is substituted by loose connective tissue, configuring a metaplasia of tunica media. Deformations of magistral arteries are regarded by some authors as a defense mechanism to mitigate the pulsating wave in conditions of arterial hypertension [5, 4]. The disease of often for a long time asymptomatic and clinically presents during the 6-7th decade of life. Cerebral ischemia with underlying congenital deformation sometimes leads to arterial hypertension. According to our data, malformation of carotids in 60-62% of cases is accompanied by arterial hypertension and atherosclerosis [7, 14]. It is assumed that physical examination of patients with deformations is ineffective. Systolic heart murmurs in the area of deformation can be heard in approximately 17% of cases. At the same time, the presence of murmurs and their intensity are not correlated to the type of deformation or arterial hypertension. Deformations of magistral arteries are divided into three main groups according to their shape [8]:

I. Tortuosity
– C-or S-shaped elongation with angles >90°
II. Coiling
– Coiling of the vessel up to 360 °.
III. Kinking
– Kinking with angles <90° (Fig.1)

The most comprehensive definition is that of Metz et al (1961), who refer to the bend of the ICA as due to an elongation of the vessel and defined it as the abrupt angulation of the vessel axis from 90° or less, and in turn classified into three grades: grade 1: angle of 90-60°; grade 2: 60 to 30°; grade 3: <30° [9]. Coiling is usually found 4-8cm distal of the carotid



Fig, 1. *Schematic representation of the types of vessel elongation: a) C-or S-shaped elongation with angles >90º ; b) Coiling of the vessel; c) Kinking with angles <90º.*

bifurcation without any age dependency and side-to-side preference. C- and S-type tortuosity more often involves CCA, subclavian artery, and proximal part of ICA. Due to the increase of lumen and damage of elastic membrane, it causes hyperpulsation, which requires to be differentiated from aneurism. C-type deformation or deviation, as well as simple S-type deformation, is hemodynamically insignificant, while the expressed S-type tortuosity may be hemodynamically significant. For diagnostics of deformations of magistral arteries, highly efficient non-invasive methods are applied: ultrasound duplex-scanning, MR angiography, and multi-slice CT angiography. The diagnostic accuracy of ultrasound is 90-96% [10, 11]. Deformations are easily visualized on grey-scale ultrasound images. Arterial lumen is tortuous and seen in different planes. Deformations are seen in any segment of the artery, most frequently in its proximal part. For a full image of tortuosity, several planes of a single location, hence different angulations of the detector are needed. Color Doppler enables quick identification of malformed, folded, or coiled vessels. The color image shows not only a tortuous artery, but also turbulent segments inside; expressed mosaicism is visible in the lumen, and "fragmentation" of mapping - in the area of angulation. Power Doppler and Canon exclusive Advanced Dynamic Flow (ADF) mode provide additional information about the tortuosity of the artery and map the segment, which because of limited angle is not visible in color Doppler mode (Fig. 2,3).

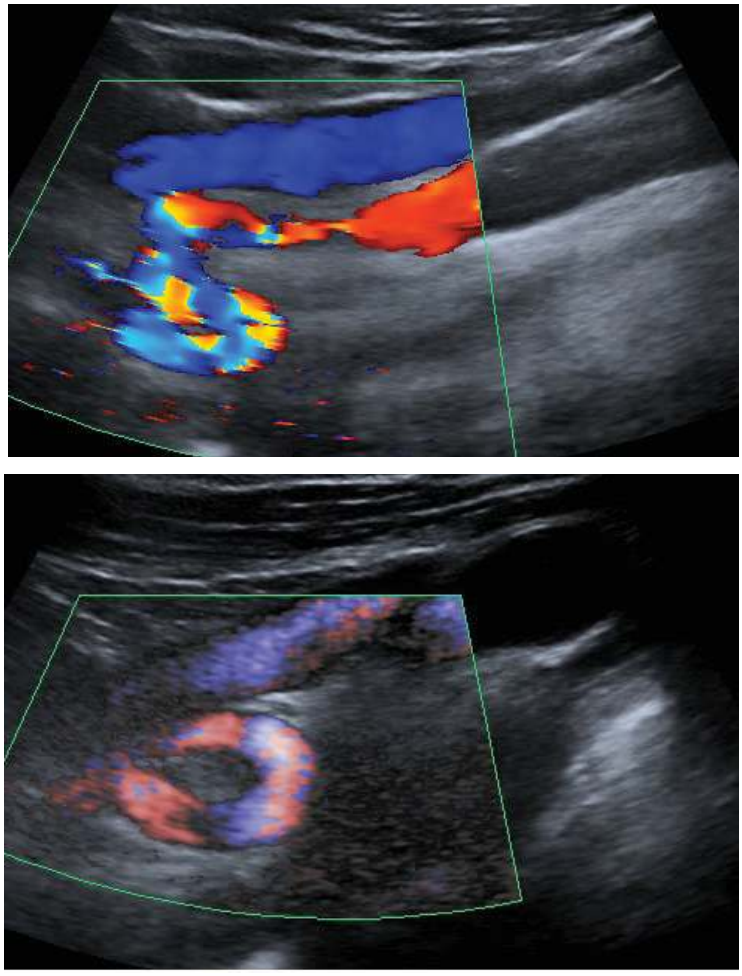


Fig. 2. *Internal carotid artery elongation. A) Kinking. Color Doppler mode. Longitudinal plane.b) Coiling; ADF mode. Longitudinal plane.*

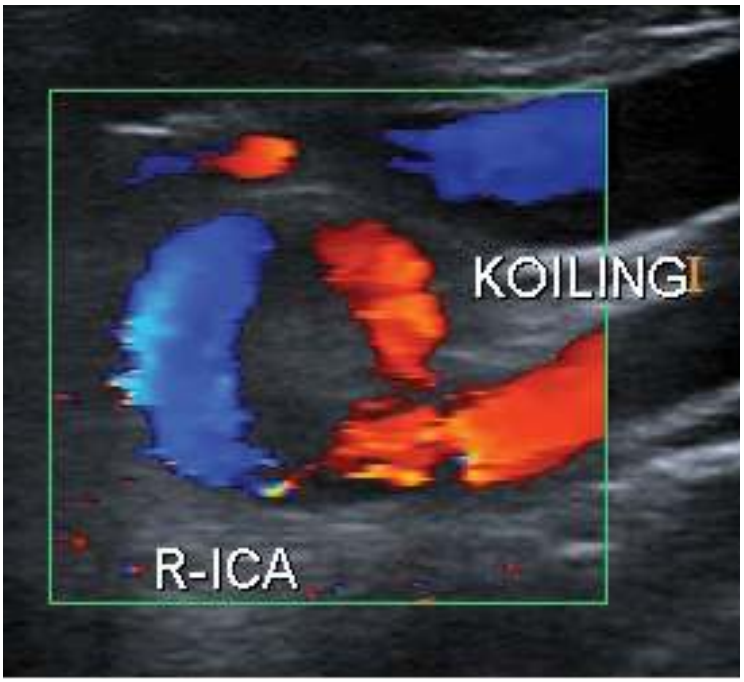
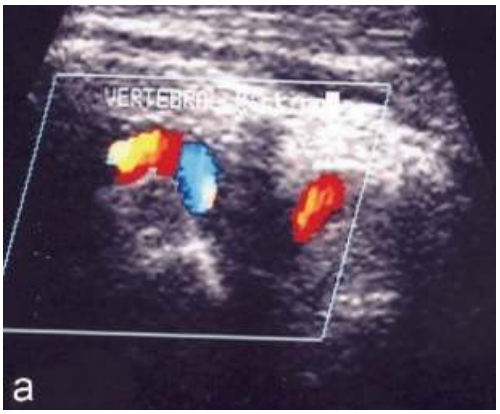


Fig. 3. *Internal carotid artery coiling. Color Doppler mode. Longitudinal plane.*

Doppler spectrum visualizes changes in flow parameters and direction in tortuous segments, as well as turbulence in the "knee" area. It should be noted that rotation of the head may increase the degree of deformation and reduce cerebral circulation. Currently, there is no common approach to the assessment of the hemodynamic importance of elongation and its management. There are no ultrasound criteria of the hemodynamic significance of elongations. Some authors suggest that hemodynamically significant is the elongation with an angle of deviation over 600 and in such cases recommend surgery. Lately, the most accepted criterion is maximal systolic flow velocity in elongated segments; however different authors have different views on the value of flow rate, above which changes may be considered hemodynamically significant. Some authors suggest that the critical value is 150 cm/s, others – 200 cm/sc [5,12]. According to some authors, an increase of flow rate by more than 60% in the angulation zone following head rotation, may be considered an indication for surgical treatment. Another important criterion is expressed turbulence and speed gradient of ≥2.9 in the angulation area. MRA and CTA are fairly considered highly informative non-invasive methods of diagnostics of deformations of magistral arteries. Both methods enable to examination of extra- and intracranial parts of brachiocephalic arteries along their whole length and assess the spread of deformation, its scale, and contact with surrounding structures (Fig. 4-6)



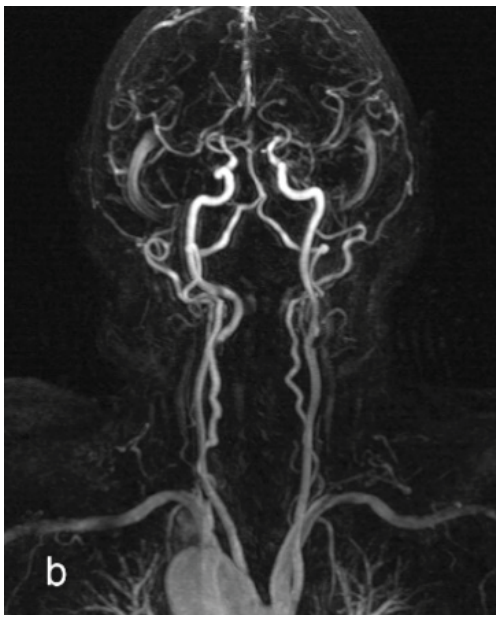


Fig. 4. *Vertebral artery S shaped elongation. A) Color Doppler mode. Longitudinal plane. b) MR angiography Gad-fl-2D-tof-MIP.*

Fig. 5. *Vertebral artery coiling.MDCT – curviplanar reformatted image.*

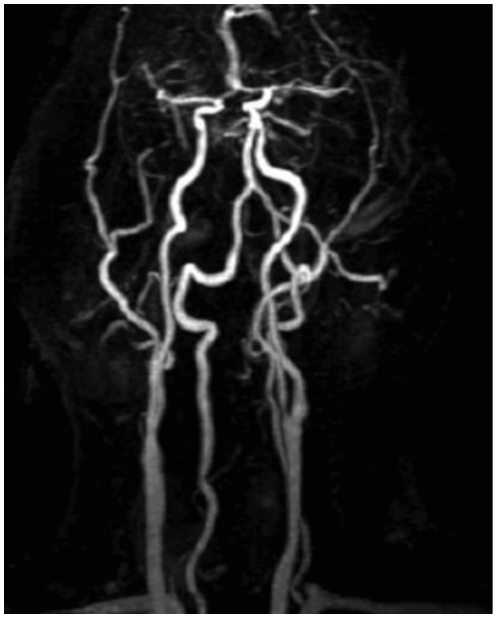


Fig. 6. Left internal carotid artery coiling, external carotid artery S-shaped elongation, right Vertebral artery S-shaped elongation. MR angiography Gad-fl-2D-tof-MIP.

The accuracy of MRA in diagnostics of deformations of brachiocephalic arteries is 87.9-94.6%, while the accuracy of CTA is 96% [11].

The above methods, in complex with ultrasound examination, provide practically exhausting information about the type, size, and hemodynamic significance of deformation. In comparison with CTA, MRA has certain limitations: in case of expressed turbulence in angulation zones, the signal may be lost, which limits adequate assessment of that area (Fig. 7).

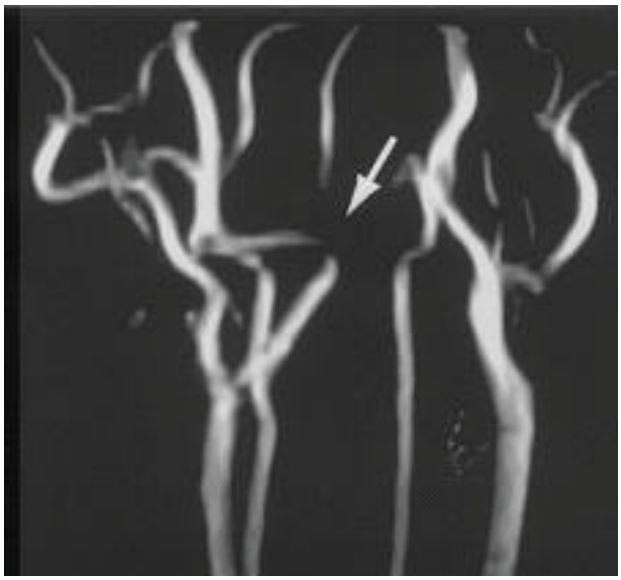


Fig. 7. *Right internal carotid artery kinking. MR angiography Gad-fl-2D-tof-MIP. Signal loss in the site of the angulation due to turbulent flow.*

Purpose: We have studied deformations of magistral carotid and vertebral arteries in case of isolated atherosclerosis (AT), isolated arterial hypertension (AH), and a combination of atherosclerosis and hypertension (AT+AH). We have studied 205 patients both with isolated atherosclerosis (AT)-n= and a combination of atherosclerosis and arterial hypertension.

Out of 205 patients we diagnosed deformations of carotid arteries in 93 (30%) cases, and deformations of vertebral arteries in 64 (21%) cases.

Bilateral deformation of carotid arteries was diagnosed in 43 (17%) cases. We diagnosed the following deformation of carotid arteries:

I. C- and S-shaped – 69 (74%)
II. Spiral/coiling – 6 (7%)
III. Kinking 14 (14%)
IV. Double kinking – 4 (4%)

In 51 (56%) cases deformations were accompanied by different degrees of carotid stenosis. In 24 cases C- or S-shaped malformations were found in both CCA and ICA. In 3 cases they were revealed together arterial kinking. C- or S-shaped deformations in 55 (81%) cases were located in proximal or medial parts of CCA or ICA. It should be mentioned that 76% of patients with this pathology had arterial hypertension. In color and power Doppler modes, expressed turbulence in the malformed area – increase of speed gradient by >20%, derangement of flow (aliasing effect) was mainly seen in case of spiral malformation or kinking. While in the case of C- or S-type deformation increase of flow rate amounted to 30%, in the case of spiral deformation it reached 50%, and in the case of kinking – exceeded 60%. In the case of kinking of ICA, systolic flow velocity in the angulation zone amounted to 127.8±47.7 cm/sec, and gradient – to 2.6±0.72. As for spiral deformation, systolic flow rate, and gradient were lower than in the case of kinking and amounted to 98.4±45.2 cm/sec and 1.92±0.66 respectively. All cases of deformations of magistral arteries were confirmed by multi-slice CTA or MRA. Modes and reconstructions used in both examinations enabled to adequately assess the damaged part of the artery in all planes, diagnosed deformation, and adjusted the results of duplex-scanning, mainly when elongation extended to intracranial segments and was hardly available for ultrasound examination. We studied flow volume rate (Q) in CCA by different types of malformation (Fig.8).

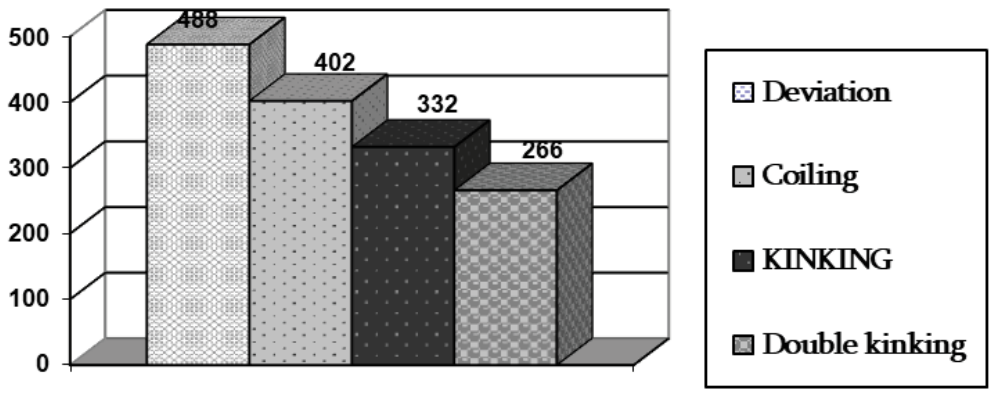


Fig. 8 *Fow volume (Q) in CCA by different types of malformation*

As seen in the above diagram, in the case of C- or S-type elongation, flow volume (Q) is practically within the normal range - 488±38 ml/min. In the case of spiral elongation, it showed the tendency of decrease -402±22 ml/min, which is more obvious in the case of acute deviation (kinking) - 332±22 ml/min (difference in flow rates by different types of elongation is statistically insignificant – p>0.05). As for double deviation, it has the biggest effect on hemodynamics, Q - 266±34 ml/min, which is practically 40% of the normal value.

Different type of elongation were presented with the following frequencies (**Table 1**).

contribute to arterial deformations. We studied the frequency of elongation in relation to the clinical signs of cerebrovascular pathologies. 13 cases of C- or S-type, 1 case of spiral and 2 cases of kinking elongations were asymptomatic. In all other cases, different types of cerebrovascular disorders were presented: out of 5 cases of spiral elongations 2 (40%) presented with TIA, 2 (40%) – with DE, and 1 – with ischemic stroke. Kinking mainly presented with DE (7 patients), 2 patients presented with TIA, one – with ischemic stroke, and one – with subarachnoid hemorrhage. As for vertebral arteries, we revealed 53 cases of C- or S-type elongations

Table 1. ICA elongation cases by groups

Type of elongation	N	Atherosclerosis n / %	Hypertension n / %	Atherosclerosis+AH n / %
C- or S- type	69	16(24%)	24(35%)	29(43%)
Coiling	6	3(50%)	1(17%)	2(33%)
Kinking	14	4(31%)	5(34%)	5(38%)
Double kinking	4	1(25%)	1(25%)	2(50%)
Total	93	24(26%)	29(32%)	38(42%)

As seen in the above Table, the frequency of elongations is practically the same in the case of isolated atherosclerosis or hypertension, however in the case of their combination the frequency increases.

C - or S-type deformations are mostly associated with Arterial hypertension (total 76%). 50% of coiling and spiral deformation cases were not associated with hypertension. This means that apart from AH, other mechanisms also

and 6 cases of spiral tortuosity. At the C2 level mean flow velocity was moderately decreased – 28 cm/sec, as well as flow volume, Q – 86 ml/min. Spiral tortuosity had a bigger impact on hemodynamics – the average flow velocity was 22 cm/sec, and as flow volume was almost half of the normal value – 52 ml/min.

C- or S-type elongations, like in carotids, were associated with hypertension – 34 (64%). 3 spiral elongations were revealed with

the combination of atherosclerosis and hypertension, 2 – with isolated atherosclerosis, and 2 – with isolated hypertension. In order to study the impact of defors of magistral arteries on intracranial hemodynamics, we examined 84 patients without any hemodynamically significant atherosclerotic pathology of carotids. We found a total of 91 elongations: I type (C- or S-type deviations)-n=71, II type (spiral deformation or coiling)-n=6, and III type (kinking)-n=14. In order to assess the impact of carotid elongations on intracranial hemodynamics, we studied the flow parameters in the ipsilateral medial cerebral artery (**Table 2**).

Table 2. Flow Velocity cm/s in ipsilateral to elongation Middle cerebral artery (MCA)

Type of elongation	Vmean MCA cm/s
I n=71	56.4±15.1
II n=6	53.1 8.7
III n=14	47.2±11.8

As seen in the Table above, in the case of I-type deformation, flow parameters remain within the normal range, as in the case of II-type deformation spiral elongation, or coiling. In the case of III-type elongations, there is an obvious tendency for a decrease in flow rate – the average flow rate is 20% below the normal value. From this view, 3 cases of kinking are particularly notable, where the flow rate decreased up to 41.6±7.3 cm/sec, which is 30% below the normal value and indicates a significant impact on intracranial hemodynamics.

Our data correspond to similar data of other authors, who revealed the tendency of a 20-35% decrease of flow rate in the ipsilateral medial cerebral artery, in case of significant tortuosity or kinking of the carotid artery [13].

Conclusion: The present study shows that the coexistence of extracranial vessel pathologic elongation in patients with ATH and AH is a common finding. CDUS study may be a valuable tool in the screening of patients with neck vessel deformation; the Doppler spectrum visualizes changes in flow parameters and direction in tortuous segments, enabling the assessment of the hemodynamic importance of elongation and its management. MDCT and MRA appear as useful noninvasive tools for the evaluation of the above-mentioned pathology. Complex use of CDUS and MDCT / MRA gives complete information about vessel structural hemodynamic changes in patients' vessel pathologic deformation.

References

1. Togay-Işikay C, Kim J, Betterman K, et al. Carotid artery tortuosity, kinking, coiling: stroke risk factor, marker, or curiosity? Acta Neurol Belg. 2005;105(2):68-72.
2. Pokrovsky A.V., Beloyartsev D.F., Mitina I.E., Adyrkhaev Z.A. Clinical manifestations and diagnosis of pathological deformation of the internal carotid artery. Angiology and vascular surgery.2011; 17 (3): 7-18
3. Zenteno M, Viñuela F, Moscote-Salazar LR, et al. Clinical implications of internal carotid artery tortuosity, kinking and coiling: a systematic review. Romanian Neurosurgery 21.1 (2014): 51–60.
4. Del Corso L, Moruzzo D, Conte B, et al. Tortuosity, kinking, and coiling of the carotid artery: expression of atherosclerosis or aging?. Angiology. 1998;49(5):361-371. doi:10.1177/000331979804900505
5. Kazanchyan P.O., Valikov E.A. Pathological deformities of internal carotid arteries. - Moscow : MEI Publishing House, 2005. - 134. [1] p.
6. Gacheciladze D. Hemodynamic parameters of the brain in conditions of atherosclerosis and arterial hypertension : Med. Science. Doc. (in radiology). Tbilisi[Ed.], 2005.
7. Todua F, Shakarashvili R, Gachechiladze D. Non-invasive diagnosis of cerebrovascular diseases. Tbilisi:metsniereba, 2007.
8. Weibel J, Fields WS. Tortuosity, kinking and coiling of the ICA. Etiology and radiographic anatomy. Neurology 1965;15:7-18. doi:10.1212/wnl.15.1.7
9. Metz H, Murray-Leslie RM, Bannis-

Список литературы

1. Togay-Işikay C, Kim J, Betterman K, et al. Carotid artery tortuosity, kinking, coiling: stroke risk factor, marker, or curiosity? Acta Neurol Belg. 2005;105(2):68-72.
2. Покровский А.В., Белоярцев Д.Ф., Тимина И.Е., Адырхаев З.А. Клинические проявления и диагностика патологической деформации внутренней сонной артерии. Ангиология и сосудистая хирургия.2011; 17 (3): 7-18
3. Zenteno M, Viñuela F, Moscote-Salazar LR, et al. Clinical implications of internal carotid artery tortuosity, kinking and coiling: a systematic review. Romanian Neurosurgery 21.1 (2014): 51–60.
4. Del Corso L, Moruzzo D, Conte B, et al. Tortuosity, kinking, and coiling of the carotid artery: expression of atherosclerosis or aging?. Angiology. 1998;49(5):361-371. doi:10.1177/000331979804900505
5. Казанчян П.О., Валиков Е.А. Патологические деформации внутренних сонных артерий. - Москва : изд-во МЭИ, 2005. - 134. [1] с.
6. გაჩეცილაძე დ. თავის ტვინის ჰემოდინამიკური პარამეტრები ათეროსკლეროზისა და არტერიული ჰიპერტენზიის პირობებში : დის...მედ. მეცნ. დოქტ. 14.00.19 / სამეცნ. კონსულტ.: ფრიდონ თოდუა ; საქ. მეცნ. აკად. სამედ. რადიოლოგიის ინ-ტი. [თბ.], 2005
7. თოდუა ფ, შაქარაშვილი რ, გაჩეჩილაძე დ. ცერებროვასკულური დაავადებების არაინვაზიური დიაგნოსტიკა. თბილისი: მეცნიერება,2007.
8. Weibel J, Fields WS. Tortuosity, kinking and coiling of the ICA. Etiology and radiographic anatomy. Neurology 1965;15:7-18. doi:10.1212/wnl.15.1.7
9. Metz H, Murray-Leslie RM, Bannister

ter RG, Bull JW, Marshall J. Kinking of the internal carotid artery.Lancet. 1961;1(7174):424-426. doi:10.1016/s0140-6736(61)90004-6

10. Poulias GE, Skoutas B, Doundoulakis N, Haddad H, Karkanias G, Lyberiadis D. Kinking and coiling of internal carotid artery with and without associated stenosis. Surgical considerations and long-term follow-up. Panminerva Med. 1996;38(1):22-27.

11. Catallano A, Porelli R. et al. Spiral CT-angiography in the determination of ICA severe stenosis. Radiology, 2001; 211(2):76

12. Ballotta E, Thiene G, Baracchini C, et al. Surgical vs medical treatment for isolated internal carotid artery elongation with coiling or kinking in symptomatic patients: a prospective randomized clinical study. J Vasc Surg. 2005;42(5):838-846. doi:10.1016/j.jvs.2005.07.034

13. Smirnova IuV. On the advisability of surgical treatment of children with kinking of the internal carotid artery. Angiol Sosud Khir. 2007;13(1):101-107. (in Russian)

14. Todua, F., Gachechiladze, D. (2018). Deformation of Extracranial Arteries. In: Noninvasive Radiologic Diagnosis of Extracranial Vascular Pathologies. Springer, Cham. https://doi.org/10.1007/978-3-319-91367-4_14

RG, Bull JW, Marshall J. Kinking of the internal carotid artery.Lancet. 1961;1(7174):424-426. doi:10.1016/s0140-6736(61)90004-6

10. Poulias GE, Skoutas B, Doundoulakis N, Haddad H, Karkanias G, Lyberiadis D. Kinking and coiling of internal carotid artery with and without associated stenosis. Surgical considerations and long-term follow-up. Panminerva Med. 1996;38(1):22-27.

11. Catallano A, Porelli R. et al. Spiral CT-angiography in determination of ICA severe stenosis. Radiology, 2001; 211(2):76

12. Ballotta E, Thiene G, Baracchini C, et al. Surgical vs medical treatment for isolated internal carotid artery elongation with coiling or kinking in symptomatic patients: a prospective randomized clinical study. J Vasc Surg. 2005;42(5):838-846. doi:10.1016/j.jvs.2005.07.034

13. Смирнова Ю.В. К вопросу целесообразности хирургического лечения патологической извитости внутренних сонных артерий у детей. Ангиология и сосудистая хирургия. 2007; 13 (1): 101-107.

14. Todua, F., Gachechiladze, D. (2018). Deformation of Extracranial Arteries. In: Noninvasive Radiologic Diagnosis of Extracranial Vascular Pathologies. Springer, Cham. https://doi.org/10.1007/978-3-319-91367-4_14

РЕЗЮМЕ

НЕИНВАЗИВНАЯ ЛУЧЕВАЯ ДИАГНОСТИКА ДЕФОРМАЦИЙ ЭКСТРАКРАНИАЛЬНЫХ АРТЕРИЙ

Гачечиладзе Д.Г., Харадзе Р.Т., Окуджава М.В, Берая М.В.[1]

[1]Клиника им. Ф.И. Тодуа

Деформации сонной артерии – отклонение, извитость, скручивание, занимают 2-е место среди других патологий сонных артерий. Они являются причиной 10-17% нарушений мозгового кровообращения. Следует также отметить, что данная патология характерна для относительно молодого возраста. Считается, что у пожилых людей деформация сонной артерии является приобретенным поражением, наиболее часто наблюдаемым у пациентов, страдающих атеросклерозом и гипертонической болезнью, в то время как у детей и пациентов младшего возраста перегибы и витки являются врожденными. Для диагностики деформаций магистральных артерий применяются высокоэффективные неинвазивные методы: ультразвуковое дуплексное сканирование, МР-ангиография и мультисрезовая компьютерная томография. Мы изучали деформации магистральных сонных и позвоночных артерий при изолированном атеросклерозе, изолированной артериальной гипертензии и сочетании атеросклероза и артериальной гипертензии. Из 205 пациентов мы диагностировали деформации сонных артерий в 93 (30%) случаях и деформации позвоночных артерий в 64 (21%) случаях. Двусторонняя деформация сонных артерий была диагностирована в 43 (17%) случаях. С- или S-образные деформации в 55 (81%) случаях локализовались в проксимальных или медиальных отделах ОСА или ВСА. У 76% пациентов с данной патологией наблюдалась артериальная гипертензия. В случае деформации С- или S-типа скорость составила 30%, в случае намотки увеличение расхода достигло 50%, а в случае перегиба – превысило 60%. В случае удлинения С- или S-типа объем потока (Q) практически находится в пределах нормы - 488±38 мл/мин. В случае удлинения спиральной формы наблюдалась тенденция к снижению -402±22 мл/мин, что более очевидно в случае перегиба - 332±22 мл/мин. Частота удлинений практически одинакова в случае изолированного атеросклероза или гипертонической болезни, однако в случае их сочетания частота увеличивается. С целью изучения влияния деформации магистральных артерий на внутричерепную гемодинамику мы обследовали 84 пациента без какой-либо гемодинамически значимой атеросклеротической патологии сонных артерий. Мы обнаружили в общей сложности 91 удлинение: в случае С- или S-образной деформации параметры потока остаются в пределах нормы, как и в случае спирального удлинения или намотки. В случае перегиба наблюдается очевидная тенденция к снижению расхода – средний расход на 20% ниже нормального значения. Наши данные соответствуют аналогичным данным других авторов, которые выявили тенденцию к снижению скорости кровотока в ипсилатеральной средней мозговой артерии на 20-35% в случае значительной извитости или перегиба сонной артерии.

Ключевые слова: патология сонных артерий, магистральных артерий, спиральное удлинение, спиральная деформация

რეზიუმე

ეკსტრაკრანიალური არტერიების დეფორმაციის არაინვაზიური სხივური დიაგნოსტიკა

გაჩეჩილაძე დ.გ., ხარაძე რ.ტ. ოკუჯავა მ.ვ, ბერაია მ.ვ.[1]

[1] ფ. ი. თოდუას კლინიკა

საძილე არტერიის დეფორმაციები - გადახრა, დარკალვა, დაკლაკნილობა - მე-2 ადგილს იკავებს საძილე არტერიების პათოლოგიებს შორის და 10-17% შემთხვევაში ტვინში სისხლის მიმოქცევის დარღვევის მიზეზი ხდება. ასევე უნდა აღინიშნოს, რომ ეს პათოლოგია დამახასიათებელია შედარებით ახალგაზრდა ასაკისთვის. ხანდაზმულ ადამიანებში საძილე არტერიის დეფორმაცია ითვლება შეძენილ პათოლოგიად, რომელიც ყველაზე ხშირად აღენიშნებათ ათეროსკლეროზითა და ჰიპერტენზიით დაავადებულ პაციენტებს. ხოლო, ბავშვებში და ახალგაზრდა პაციენტებში კინკინგი და კოილინგი თანდაყოლილი პათოლოგიებია. მაგისტრალური არტერიების პათოლოგიური დეფორმაციების დიაგნოსტირებისათვის გამოიყენება მაღალეფექტური არაინვაზიური მეთოდები: ულტრაბგერითი დუპლექს სკანირება, მაგნიტურ-რეზონანსული ანგიოგრაფია და მრავალშრიანი კომპიუტერული ტომოგრაფია. ჩვენს მიერ შესწავლილ იქნა მაგისტრალური საძილე და ვერტებრალური არტერიების დეფორმაციები იზოლირებული ათეროსკლეროზის, იზოლირებული არტერიული ჰიპერტენზიის და ათეროსკლეროზისა და არტერიული ჰიპერტენზიის თანხლებით. 205 პაციენტიდან 93 (30%) შემთხვევაში დადგინდა საძილე არტერიის დეფორმაცია და 64 (21%) შემთხვევაში, ვერტებრალური არტერიის დეფორმაცია. საძილე არტერიების ორმხრივი დეფორმაციის დიაგნოზი დაისვა 43 (17%) შემთხვევაში. 51 (56%) შემთხვევაში დეფორმაციას თან ახლდა კაროტიდის სხვადასხვა ხარისხის სტენოზი. ჩ - ან შ სახის დეფორმაცია 55(81%) შემთხვევაში ლოკალიზებული იყო საერთო ან შიგნითა საძილე არტერიის პროქსიმალურ ან მედიალურ ნაწილში. არტერიული ჰიპერტენზია დაფიქსირდა ამ პათოლოგიის მქონე პაციენტების 76%-ში. იმ დროს, როცა ჩ- ან შ ტიპის დეფორმაციის შემთხვევაში სიჩქარე 30% იყო, სპირალური დეფორმაციის შემთხვევაში 50%-ს მიაღწია, ხოლო კინკინგის დროსს 60%-ს გადააჭარბა. ჩ ან შ სახის პათოლოგიური დეფორმაციის დროს მოცულობითი სიჩქარე () პრაქტიკულად არ განსხვავდება ნორმისაგან -453□38მლ/წთ, სპირალისებრი დეფორმაციის შემთხვევაში დაფიქსირდა კლების ტენდენცია - 402 ± 22 მლ/წთ, რაც უფრო თვალსაჩინო იყო კინკინგის შემთხვევაში - 332 ± 22 მლ/წთ. პათოლოგიური დეფორმაცია პრაქტიკუ-

ლად თანაბარი სიხშირითაა იზოლირებული ათეროსკლეროზისა და ჰიპერტენზიის დროს: თუმცა, მისი სიხშირე იმატებს ამ ორი დაავადების თანხლების პირობებში. ინტრაკრანიალურ ჰემოდინამიკაზე მაგისტრალური არტერიების დეფორმაციის გავლენის შესასწავლად, ჩვენ გამოვიკვლიეთ 84 პაციენტი, რომელთაც არ აღენიშნებოდათ საძილე არტერიების ჰემოდინამიურად მნიშვნელოვანი ათეროსკლეროზული პათოლოგია. ჩვენი მონაცემები ძირითადად ემთხვევა სხვადასხვა ავტორების მონაცემებს, რომლებმაც გამოავლინეს ნაკადის სიჩქარის 20-35%-ით შემცირების ტენდენცია იფსილატერალურ მედიალურ ცერებრალურ არტერიაში, კაროტიდული არტერიის მნიშვნელოვანი კინკინგის და ტორტუოზის არსებობისას.

საკვანძო სიტყვები: საკვანძო სიტყვები: საძილე არტერია, მაგისტრალური არტერიები, კინკინგი, კოილინგი