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## THE CERVICAL SYNDROME OBSERVED IN OSTEOLOGICAL MATERIAL FROM ANCIENT POLISH CEMETERIES

**ABSTRACT:** *The problem of cervical syndrome in paleopathology is presented: the general essence and symptoms of it, the morphological changes of transversal foramina and degenerative changes of cervical vertebrae. Table 2 presents some cases of cervical vertebrae with changed transversal foramina originated from ancient Polish cemeteries.*

**KEY WORDS:** *Cervical syndrome — Prehistoric populations — Poland.*

In paleopathology, as we know, a bone lesion can inform us, with more or less probability, about the disease which caused it. So we are able to recognize e. g. rickets, tuberculosis or leprosis. But as is also known there are cases in which we can recognize the syndrome of a disease. Such an example may be the Morgagni syndrome. The characteristic symptoms on the bones like *hyperostosis cranii interna* and very expansive degenerative changes mainly in the vertebral column and in the joints of lower extremities are very typical for this syndrome (J. Gładkowska-Rzeczycka 1988).

The bone lesions are not the only proof of diseases or a syndrome of diseases. Also some developmental disorders, not even very serious ones, can be the cause of dramatic symptoms. I suppose that one such developmental variation may be the double transversal foramen of cervical vertebrae. Probably this deviation is connected with the cervical syndrome. This syndrome is also known as cervico-vertebral, Barré-Liéou, syndrome sympathique postérieur or as cervical migraine.

The general essence of this syndrome is the disturbance of the blood flow in the organs supplied by the vertebral arteries. However the basis of disturbances in these arteries may be e. g. atherosclerosis, embolism, trauma or morphological disorders in the cervical vertebrae (Dryjski J., J. Szymanowski 1966). Because the symptoms of this syndrome are evident mostly after

50 years of life the degenerative lesions are considered as the main reason of the cervical syndrome.

The symptoms of cervical syndrome are very differentiated. This depends on where the lesion is, in other words on the cause of blood supply disturbance. Up to the present it is not known what percentage of cervical syndromes are the results of transversal foramina deviations. In the opinion of radiologists the X-ray picture is not of great value in interpretation, that means that the X-ray of the transversal foramina and the vertebral arteries which pass through these foramina are very difficult to interpret. Such an opinion cannot exclude the possibility of the deviated foramina influencing on the origin of the cervical syndrome.

In 1853 Schützenberg thought that many symptoms like dizziness, swooning etc. are connected with pathological changes in the cervical vertebrae (according to Kochanowski B. 1974).

In 1925 Barré and in 1928 Liéou wrote that dizziness, headaches, dysacusis and skin disaesthesia in the region innervated with cervical nerves are the result of morphologically changed cervical vertebrae. Bartschi-Rochaix (1924) designated some similar symptoms as cervical migraine. He was of the opinion that the cause of this syndrome was trauma of cervical vertebrae (according to Kochanowski B. 1974).

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The author of the term „cervical syndrome“ was H. Decher (1963). He considered that the essence of this syndrome is short-lasting blood supply in the vertebral and basilar arteries region. These arteries supply not only the posterior part of the brain but also the cerebellum and internal ear, both being closely connected with the sense of equilibrium.

There are three theories explaining the mechanism of disturbances in the cervical syndrome. According to the vascular theory the vertebral arteries are pressed by the bone exostoses or by other deformed parts of vertebrae even by lesions (e. g. atherosclerosis) in the arterial wall. Both factors press the artery and cause ischemia. According to the natural theory the deformed vertebrae, mainly their exostoses, irritate the sympathetic nerves which constrict the artery. According to the vascular – neural theory both factors occur at the same time.

In paleopathology we possess only bone material. Therefore the morphological condition of the transversal foramina of cervical vertebrae and the diameter of the vertebral arteries connected with them is of the greatest interest.

In 1915 Stopford noted that the diameter of a section of vertebral arteries is very variable. An identical diameter of both arteries was found only in 8%. However in 70% the diameter of one artery was two times higher. Yasargil (1962) noted on 400 bodies: 26% of the arteries were identical, in 32% the right and in 42% the left artery was broader. Adachi (1928) noted: 29% of the arteries were identical, in 45% the left, and in 26% the right one was broader.

The vertebral arteries passing the transversal foramina are closely connected with the bone and are exposed to pressure especially during extreme positions of the neck.

From the monograph dealing with the morphology of cervical vertebrae (J. Loth-Niemirycz 1916) we know that the transversal foramina are very variable. There are seven types: dual, incomplete dual and of different shape (Figure 1).

The genesis of the origin of the dual foramina is not clear. Perhaps the main reason is the process of

ossification of the connective tissue between the vessels and nerves passing through the transversal foramen.

It is interesting that the dual foramina were not observed in apes and that only 0.5% of apes have incomplete dual foramina. Among humans this feature is very differentiated (Table 1).

The dual vertebral foramina are present mainly on C<sub>6</sub>, C<sub>5</sub>, C<sub>4</sub> and C<sub>7</sub> (in Europe) and on C<sub>6</sub>, C<sub>5</sub>, C<sub>7</sub> and C<sub>4</sub> (in Africa, Australia).

Table 1. The frequency of dual complete and incomplete transversal foramina in cervical vertebrae (according to J. Loth-Niemirycz 1916).

Continents	dual (%)	incomplete dual (%)
Europe	96.5	39.5
Africa	55.6	39.1
Asia	45.5	38.7
Australia, Australasia	33.1	40.4

The vertebral arteries are also very differentiated, not only in their diameters but also in their origin, the level on which they enter the transversal foramina. In 23% of 145 cases Loth-Niemirycz noted an anomalous origin of the arteries, in 0.7% the artery was double but both of them fused and entered the transversal foramen of C<sub>5</sub>.

Generally the vertebral artery enters the transversal foramen of C<sub>6</sub> (Bochenek-Reicher 1960) but as is known it can also enter the transversal foramen of C<sub>7</sub>, C<sub>5</sub>, C<sub>4</sub>, C<sub>3</sub> and C<sub>2</sub>. Loth-Niemirycz (1916) noted: C<sub>5</sub> – 2.7%, C<sub>4</sub> – 2.0%, and C<sub>3</sub> – 0.7% (5.4%). According to Bochenek-Reicher (1960) the order of entering the transversal foramen is: C<sub>6</sub>, C<sub>5</sub>, C<sub>7</sub> and C<sub>4</sub>.

The material presented in this article is not the best. Therefore the information (Table 2) gives us only some orientation, that is what we know and what we must follow if we want to get more detailed information about cervical syndrome in the past.

The material comes from two Neolithic, and from four Medieval cemeteries (Table 2).

In Mierzanowice (Tarnobrzeg distr.), Neolithic, there were 143 skeletons, 49 of them having altogether 171 cervical vertebrae. Only one individual had dual, symmetrical transversal foramina in two vertebrae. Degenerative changes were determined in four individuals.

In Złota (Sandomierz distr.), Neolithic, the osteological material was very mixed (it was excavated in 1927). 218 skeletons were distinguished. Only 59 skeletons had altogether 124 incomplete cervical vertebrae; most of them destroyed. It is difficult to say how many individuals had the dual transversal foramina, in which vertebrae and whether they were symmetrical, asymmetrical or presented other combinations. In cervical vertebrae of eleven individuals degenerative changes were observed, in two cases both changes (degenerative and dual transv. foram.) were noted. The dual transversal foramina were noted on four vertebrae of four or more skeletons.

Suraz (Łapy distr.), XI – XIVth cent. A. D., yielded 55 skeletons. 47 of them had altogether 196 cervical vertebrae and two individuals had vertebrae with dual transversal foramina (1C<sub>5</sub>, 2C<sub>6</sub>). Degenerative changes were observed in five skeletons. In one case there were both changes: degenerative and dual transversal foramina.

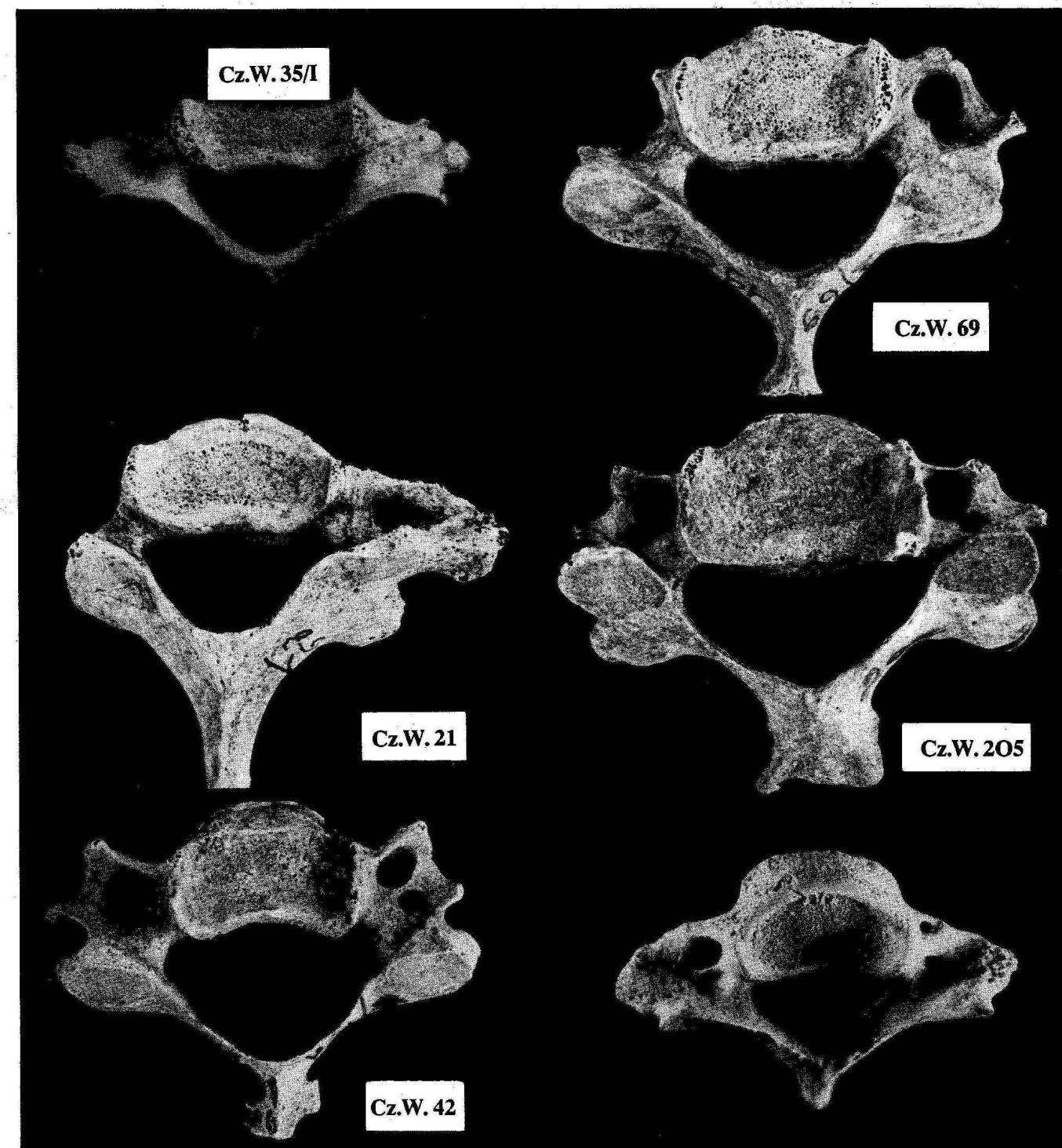


Figure 2. Some variants of transversal foramina of cervical vertebrae from ancient Polish cemeteries (Photo by I. Karoń).

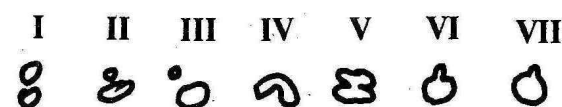
In Czersk (Warsaw distr.), XII – XIIIth cent. A. D., 624 skeletons were distinguished with altogether 378 cervical vertebrae. They belonged to 114 individuals. Nine of them had dual foramina in 24 vertebrae. They were mainly symmetrical (22 vertebrae). Degenerative changes were observed on 26 skeletons and both changes (degenerative and dual transv. foram.) in three.

In Ostrów Lednicki (Poznań distr.), X – XIIth cent. A. D., there were 1126 skeletons and 1814 cervical

vertebrae. Only 8 individuals (represented by 12 vertebrae) had dual transversal foramina. On 8 vertebrae they were symmetrical. Degenerative changes on cervical vertebrae occurred in 68 skeletons, both changes in 7.

Czarna Wielka (Białystok distr.), XII – XIVth cent. A. D., yielded 250 skeletons. Altogether 493 cervical vertebrae belonged to 127 individuals. 23 of them had dual transversal foramina in 44 vertebrae. On 28 they

#### TYPES:



#### VARIANTS:

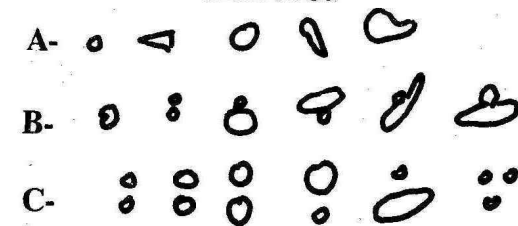


Figure 1. Types of transversal foramina of cervical vertebrae (according to J. Loth-Niemirycz 1916).



Table 2. Some features of cervical vertebrae from ancient Polish cemeteries.

Cemetery	Mierzanowice Tarnobrzeg distr.	Złota Sandomez distr.	Suraz Łapy distr.	Czersk Warsaw distr.	Czarna Wielka Białystok distr.	Ostrów Lednicki Poznań distr.
Period	Neolithic	Neolithic	XI – XIVth cent. A. D.	XII – XIIIth cent. A. D.	XII – XIVth cent. A. D.	X – XIIth cent. A. D.
Number of skeletons	143	218	55	624	250	1126
State of preservation	±30%	±40%	±70%	±50%	±60%	±80%
Number of cervic. vertebrae/ Number of skeletons	171/49	124/59	196/47	378/114	493/127	1814/430
Number of skel. with dual transv. for.	1	4(6?)	2	9	23	8
Number of cerv. vert. with dual transv. for.	2	4(6?)	3	24(?)	44(5)	12
	symm. asymm.	?	symm. asymm.	symm. asymm.	symm. asymm.	symm. asymm.
C <sub>3</sub>	–	–	–	–	2	1
C <sub>4</sub>	1	–	–	–	5	2
C <sub>5</sub>	1	–	–	1	7	1(3)
C <sub>6</sub>	–	–	1	1	5	5(1)
C <sub>7</sub>	–	–	–	–	6	4
C <sub>2</sub>	–	–	–	–	3	–
Degen. changes of cerv.vert.	4	11	5	26	25	68
Degen. change and dual transv. for.	–	2	1	3	1	7
Deviations of vert.art.groove	5	4	1	1	9	32

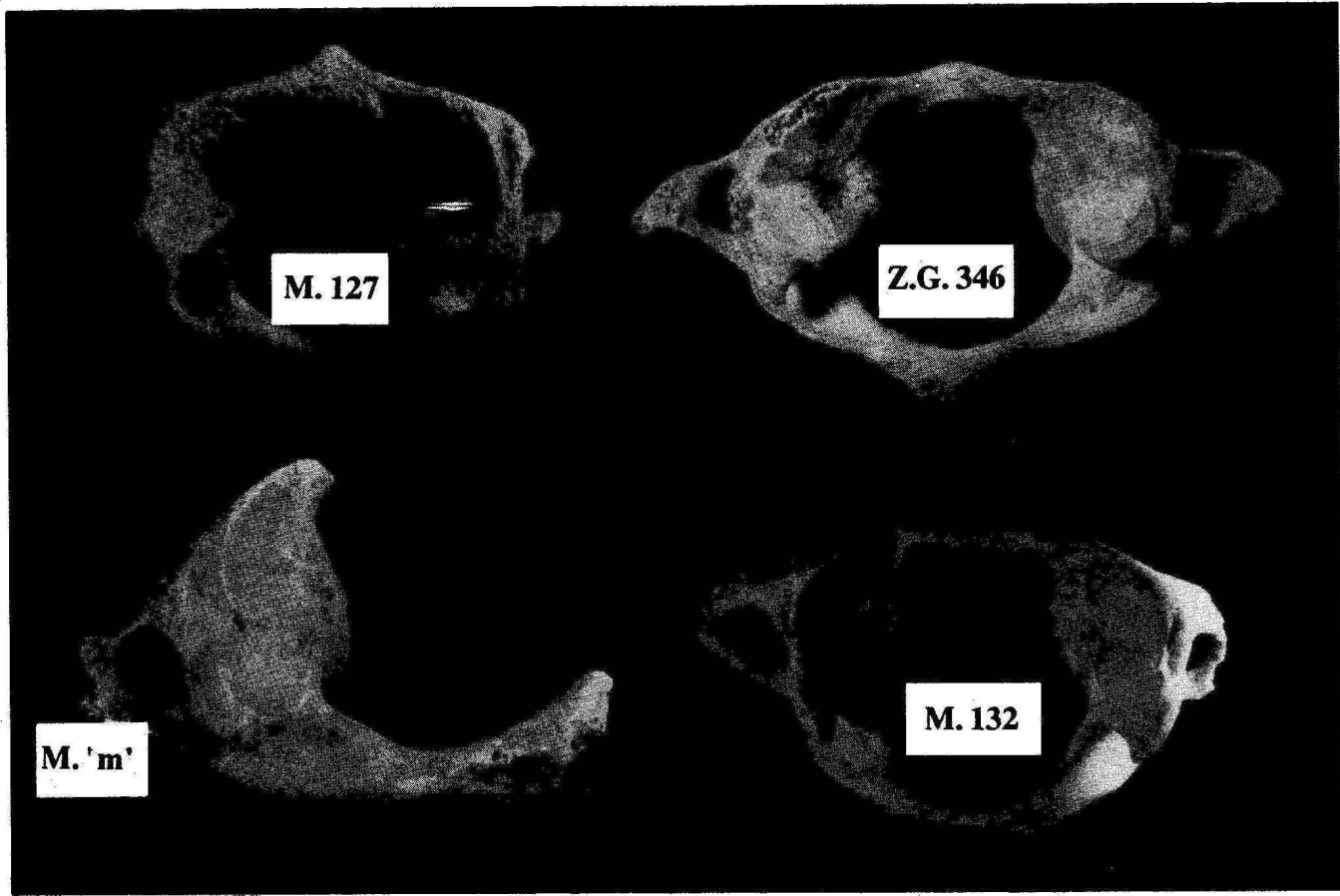


Figure 3. Some variants of vertebral artery groove on C<sub>1</sub>: a,b,c,d (Photo by I. Karoń, D. Jeżyk).

were symmetrical. Degenerative changes occurred in 25 skeletons, both changes in one.

In Table 2 there is also the number of skeletons with a variation of the vertebral artery groove on the first cervical vertebra (C<sub>1</sub>). We can only note that this variation is most frequent in the skeletons from the Neolithic Period. As is known this is very frequent in apes – it is a regressive variation.

The frequency of shape variations and dual transversal foramina (Loth-Niemirycz 1916) suggests that the cervical syndrome is rather frequent. From medical practice the dizziness, dysacusis etc., characteristic of this syndrome, are generally frequent after 50 years of life.

The fact that the cervical syndrome is not frequent in young people and the dual transversal foramina are present in a high percentage (Table 1) suggests that the vertebral artery bypasses the vertebra with small foramina (such cases are mentioned by Testut 1905), or that it has numerous anastomoses. Perhaps the dual foramina begin to occur after the 50th year only, that means that the ossification of the connective tissue takes place only after 50 years of life.

As we see the material presented here is rather scanty. So my article may serve as a stimulation to observing this problem on better preserved material, and also in a laboratory where the process of the dual transversal foramina formation can be determined. More detailed information from physicians about the connection between the cervical syndrome and dual transversal foramina can also provide a deeper insight into the history of the cervical syndrome in paleopathology.

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