Location of the "Zero Zone" and its Role in the Pathogenesis of Cervical Spondylosis*

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Summary. Significant correlation between the location of the "zero zone" and spondylosis was found in the cervical spine. The possible role of the zero zone in the development of spondylosis is suggested and the deleterious effect of counteracting forces as compared with a unidirectional traction is stressed.

Die Stelle der "Nullzone" und ihre Rolle in der Pathogenese der zervikalen Spondylose

Zusammenfassung. Die Ergebnisse der dynamischen Studien scheinen darauf hinzuweisen, daß ein Zusammenhang zwischen den häufigsten Stellen der Nullzone und der Spondylose besteht. Es scheint, daß das Bindegewebsystem der Halswirbelsäule auf die Überlastung durch entgegengesetzte Zugkomponenten sehr empfindlich ist und durch diese stärker beschädigt wird als durch eine Traktion, die nur in einer Richtung ausgeübt wird.

The segments C₅₋₇ are the most frequent sites of cervical osteochondrosis. The spondylotic changes can also be seen far less frequently, but not rarely, at the level of C₃₋₄ segment. There has been no satisfactory explanation of these facts. It has been suggested that the segments C₅₋₇ are subject to the greatest dynamic strain, but this does not explain why the segment C₄₋₅, the function of which is at least equal to that of the segment C₅₋₆, is very rarely affected. Further, the proximity of the less mobile thoracic segments has been considered the probable cause of the frequent damage of the lower cervical segments. However, this is in disagreement with the fact that the segment C₆₋₇ shows bony changes less frequently than the more distant segment C₅₋₆. No attempt has been made to explain satisfactorily the frequency of impairment of the segment C₃₋₄.

Therefore we looked for the explanation in the results of our recent roentgenological studies of the dynamics of the cervical spine. These have shown that the postural reaction of cervical vertebrae on lateral flexion of the head and neck is the result of counteracting traction of various structures. The level at which these forces are in balance, where no postural changes occur, is the "zero zone". We expressed the opinion that the absence of postural changes at this level is not a sign of dynamic inactivity. On the contrary, there is a greater strain exerted on the ligamentous structures than in the other segments.

We have endeavoured to assess the most frequent location of zero zones and the possible relation to the most frequent location of spondylotic changes.

In a group of 247 instances of lateral flexion, the zero zone was found at the level of C₄₋₇ vertebrae in 83.4% and at the level of C₅₋₇ vertebrae in 66.7% of cases. The mathematical-statistical analysis has shown that this agglomeration is not accidental.

In another group of 50 individuals it appeared...
that on maximum rotation of the head the C_2 and C_3 vertebrae are tilted dorsally in the great majority of cases, while C_4 vertebra is tilted ventrally in about 75% and C_5 vertebra in nearly 100% of cases. Thus, a zero zone is located most frequently at the level of dynamic segment C_3–4.

In these cases the spondylosis is very often limited to this segment and very little or no bony changes can be seen in the lower cervical segments.

Occasionally, a compensatory hypermotility develops at this level or a protrusion of the intervertebral disc can be found on air myelography.

Fig. 2. On anteflexion spondylotic block of C_2–7 segments; compensatory hypermotility is more pronounced at C_3–4 than at C_4–5.

Fig. 3. Pneumomyelography, autotomogram; protrusion of the intervertebral disc C_3–4, no changes at C_5–6.

It appears that on lateral flexion of the head and neck the most frequent sites of the zero zone are the segments C_5–7 which are also the most frequent sites of spondylosis. On the contrary, on rotation of the head, the zero zone is located at C_3–4 vertebrae. In

We found very severe osteochondrotic changes at the level of C_3–4 and C_4–5 vertebrae in a patient with athetosis and very pronounced, constant, involuntary rotatory movements of the head and neck. No spondylosis had developed in the lower cervical segments.