

Vertebral osteophytosis in cetacea

Spondylosis or spondylitis?

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Pathological deformations of the vertebral column in cetacea are commonly diagnosed as spondylitis deformans (SLIJPER 1931, 1936; VAN BREE and NIJSSEN 1964; COWAN 1966; VAN BREE and DUGUY 1970; PATERSON 1984; KINZE 1986). Others speak of spondylosis or ankylosing hyperostosis of the spine (LAGIER 1977), ankylosing spondylosis (MARTINEAU et al. 1988) or spondylosis deformans (KLIMA 1992).

Spondylosis and spondylitis are two different diseases with apparently the same appearance. A differential diagnosis is, however, often possible. The question arises whether both diseases occur in cetacea, or that one is misdiagnosed for the other.

Spondylosis deformans is also known as vertebral osteophytosis, spondylosis hyperostotica or Forestier syndrome (LEIBER and OLBRICH 1972; STEINBOCK 1976). In man, spondylosis deformans is a very common condition being present in almost all persons over sixty years of age. The initial lesion of spondylosis deformans occurs in the intervertebral disk, especially in the interior part: the nucleus pulposus. With increasing age this nucleus becomes more collagenous. The vertebrae are firmly attached along their marginal ridges by fibers from the annulus fibrosus and longitudinal ligaments. As result of degenerative tearing of the annulus fibers, the nucleus protrudes against the anterior ligaments. This protrusion provokes new bone formation, produced by the periosteum, as a result of which marginal osteophytes are formed. These osteophytes of adjoining vertebrae impinge on one another, while after fusing they produce a bony ankylosis. This impingement of osteophytes and ankylosing fusing is clearly shown in the vertebrae of the Harbour porpoise (*Phocoena phocoena*) in the figure.

Ankylosing spondylitis (spondylitis ankylopoetica) is also known as spondylitis deformans, rheumatoid spondylitis, Bechterew-Marie-Strümpell disease or fibrositis ankylopoetica (LEIBER and OLBRICH 1972; STEINBOCK 1976). In man, the disease starts in the sacro-iliac joints and spreads upward involving the synovial joints of the vertebrae and spinal ligaments. The initial lesion is a rheumatoid inflammation of the synovial (apophyseal and costoverbral) joints. Ankylosis of these joints develops during this process, often in the entire vertebral column ('Bamboo spine'). Paravertebral fusing starts, as in spondylosis deformans, in the annulus fibrosus, caused by inflammation of fibrous tissue.

Progressive cases of spondylosis may have the same appearance as ankylosing spondylitis, but in ankylosing spondylitis the bony bridge between the vertebrae occurs close to the vertebral body, contrary to the thick and irregular osteophytes in spondylosis. These fused osteophytes are situated several millimeters from the vertebral bodies.

There is an alternate use of the terms spondylitis and spondylosis throughout the zoological and veterinary literature. HANSEN (1951) appeared to be the first in veterinary literature to use the term spondylosis. The lesions in cetacea present characteristics similar to the deformations caused by spondylosis in other mammalian species. It is striking that the disease is common in man and other mammals moving in upright position, as well as in



Impingement of osteophytes and ankylosing fusing in vertebrae of *Phocoena phocoena*

Cetacea. Due to man's anatomy, the intervertebral discs are subject to constant strain for which they were not originally designed. As a result of this, degeneration commonly occurs with increasing age. Cetacea use their vertebral column, especially the lumbar and caudal vertebrae, for locomotion. The similarity between man and other mammals living upright lies in the overload of the vertebral column. KLIMA (1992) mentioned the same analogy between man and Cetacea. This could be the answer to the problem in the latter, but does not solve the question regarding the cause of this disease in quadrupedal mammals.

Changes within the annulus fibrosus appears to play a major part in the development of vertebral osteophytes. Changes occurring within the ventral annulus fibrosus seem to be degenerative. Stresses on the outer annular lamellae seem to cause avulsions of their attachments, after which formation of the osteophyte occurs in fibrous tissue on the outside of the annulus fibrosus. The development of osteophytes on the marginal ridges of the vertebrae is a slow, non-inflammatory process. Use of the term spondylitis is without justification since inflammation takes no part in the pathogenesis.

Concluding, spondylosis deformans or vertebral osteophytosis is the term to be used for this disease in Cetacea. It seems evident that this phenomenon has little to do with inadequate feeding conditions, often offered as an explanation for this disease (Hous-

SEMAYNE DU BOULAY 1976; KINZE 1986). Spondylosis in man is very common, even in 'well-fed' communities (BOURKE 1967).

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