Intervertebral disc lesions in diffuse idiopathic skeletal hyperostosis (DISH)

C. di Girolamo, N. Pappone, C. Rengo, E. Miniero, C. Crisci, I. Olivieri

Rehabilitation Unit, “Salvatore Maugeri” Foundation IRCSS, Località S. Stefano in Lanterria, 82037 Telese (BN), Italy.

Carlo di Girolamo, MD, Consultant Rheumatologist; Nicola Pappone, MD, Consultant Rheumatologist; Carlo Rengo, MD, Chief Consultant Radiologist; Enzo Miniero, MD, Consultant Radiologist; Claudio Crisci, MD, Chief Consultant of the Rehabilitation Unit; Ignazio Olivieri, MD, Chief Consultant of the Rheumatology Unit.

Please address correspondence and reprint requests to: Carlo di Girolamo, MD, “Salvatore Maugeri” Rehabilitation - IRCCS, Località S. Stefano in Lanterria, 82037 Telese T. (BN), Italy. E-mail: cardigi@tin.it

Received on September 14, 2000; accepted in revised form on January 17, 2001.

© Copyright CLINICAL AND EXPERIMENTAL RHEUMATOLOGY 2001.

Key words: Hyperostosis, degenerative disc disease, diagnostic criteria.

ABSTRACT

Objective
In order to evaluate the relationships between DISH and vertebral osteochondrosis (degenerative disc disease), the radiographs of the spine of 69 DISH patients were compared to those of 68 controls.

Methods
Radiographs of 69 patients affected by DISH according to Resnick’s criteria and of 68 control subjects affected by diseases other than DISH, were evaluated in order to determine the prevalence of vertebral osteochondrosis, diagnosed by the occurrence of moderate to severe reduction in the intervertebral disc height and of the extensive radiographic changes typical of degenerative disc disease, including vacuum phenomena and vertebral body marginal sclerosis. The rate ratios with 95% confidence intervals were computed, with stratification by age groups.

Results
Thirty-eight DISH patients (55.1%) and 34 controls (50%) showed vertebral osteochondrosis. Stratification by age revealed an increased prevalence of vertebral osteochondrosis in younger DISH patients with respect to controls (p < 0.05).

Conclusion
Our results show that vertebral osteochondrosis may be associated with DISH and underline the differences between classification and diagnostic criteria. Moreover, it could be hypothesized that DISH plays a predisposing role in the development of vertebral osteochondrosis during the early stages of the disease, causing an early modification in the physiological curves of the spine.

Introduction
First described in 1938 by Meyer and Förster (1), Diffuse Idiopathic Skeletal Hyperostosis (DISH) is a skeletal disease characterized by ligamentous ossification of the antero-lateral side of the spine. DISH is more frequent in males and the prevalence rate rises with age, mainly affecting subjects over the age of 40 (2). Its present definition was codified by Resnick and coworkers in 1975 (3), who later suggested a set of classification criteria (4) that are still widely accepted. These criteria clearly distinguish DISH from vertebral osteochondrosis (VO), degenerative disc disease), a degenerative disc lesion also affecting the elderly. In fact, the presence of “a relative preservation of the intervertebral disc height in the involved areas and the absence of extensive radiographic changes of ‘degenerative’ disc disease, including vacuum phenomena and vertebral body marginal sclerosis” (4) is needed for the diagnosis of DISH.

On the other hand, the disc narrowing associated to DISH has been described (2,4,5), showing that these two disorders could be associated. No systematic analysis exists concerning this association, however. In order to evaluate the relationship between these two conditions, we studied the radiographs of 69 patients with DISH attending our clinic.

Materials and methods
The complete spine radiographs available for 247 patients admitted to the Units of Rehabilitation, Cardiology, Pneumology and Plastic Surgery of the Medical Center of the “Salvatore Maugeri” Foundation in Campoli MT (BN) between January 1989 and June 1990 were retrospectively evaluated for DISH. The radiographs of the 69 patients (22 males, 47 females, mean age 64.97 ± 8.83 years) who met the...
Resnick’s criteria (4) for DISH (6) were further evaluated in order to detect the presence of VO along hyperostotic spine segments other than those analysed for the diagnosis of DISH and along spine segments without hyperostosis.

A control group of 68 patients (24 males, 44 females, mean age 64.79 ± 8.62 years) was drawn from the same pool of 247 patients described above. Controls were selected to obtain a stratification by age, sex (Tables I and II) and Hospital Unit comparable to DISH patients. Sixty patients had spondylosis deformans, 4 seronegative spondyloarthritides, 16 bone fractures and 18 scoliosis. No patient had a normal spine and some were affected by more than one disease.

In both groups VO was diagnosed by the occurrence of moderate to severe reduction of the intervertebral disc height and extensive radiographic changes of degenerative disc disease, such as vacuum phenomena, disc space narrowing, vertebral body marginal sclerosis and osteophyrosis (4, 7, 8).

Spine radiographs were taken using the standard methods in the frontal and lateral projections. Cervical, dorsal and lumbar spine x-rays were available for each subject and were evaluated independently by two experienced observers (CdG rheumatologist, EM radiologist). Discordant results were solved by discussion.

The prevalence rates of VO were determined in both the patient and control groups, and the rate ratio with 95% confidence interval (C.I.) was computed according to Clayton and Hills (9) with stratification by age group.

The medical charts of the DISH patients and stated that significant disc narrowing in a small portion of DISH patients and stated that “disc space narrowing was not frequent within areas of hyperostosis”. Later another report described disc

### Results

Thirty-eight DISH patients (55.1%) [11 males (M), 27 females (F), mean age 65.8 ± 8.8 years] were affected by VO. Among the controls, 34 patients (50%) [11 M, 23 F, mean age 66.3 ± 7.9 years] had VO. The rate ratio was 1.102 (95% C.I. = 0.85 - 1.44). Stratification by age of the prevalence rates for both groups, the rate ratio and 95% C.I. are reported in Table III.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Prevalence rate (%)</th>
<th>Rate ratio</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISH</td>
<td>Controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-59</td>
<td>56.3</td>
<td>35.0</td>
<td>1.61</td>
</tr>
<tr>
<td>60-69</td>
<td>42.9</td>
<td>56.0</td>
<td>0.77</td>
</tr>
<tr>
<td>70-up</td>
<td>66.7</td>
<td>56.5</td>
<td>1.18</td>
</tr>
<tr>
<td>Total</td>
<td>55.1</td>
<td>50.0</td>
<td>1.10</td>
</tr>
</tbody>
</table>

C.I.: confidence interval. *: statistically significant

### Discussion

In 1974 Harris et al. reported that 19.3% of 34 DISH patients with cervical involvement showed disc narrowing (10). In 1976 Resnick et al. proposed a set of classification criteria for DISH: the ossification must include at least 4 contiguous vertebral bodies and no evident disc narrowing should be present along these 4 vertebrae (4). Nevertheless, the author described in the same paper the occurrence of significant disc narrowing in a small portion of DISH patients and stated that “disc space narrowing was not frequent within areas of hyperostosis”.

Later another report described disc

### Table III. Prevalence of osteochondrosis vertebralis in DISH patients and controls stratified according to age group.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Prevalence rate (%)</th>
<th>Rate ratio</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISH</td>
<td>Controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-59</td>
<td>56.3</td>
<td>35.0</td>
<td>1.61</td>
</tr>
<tr>
<td>60-69</td>
<td>42.9</td>
<td>56.0</td>
<td>0.77</td>
</tr>
<tr>
<td>70-up</td>
<td>66.7</td>
<td>56.5</td>
<td>1.18</td>
</tr>
<tr>
<td>Total</td>
<td>55.1</td>
<td>50.0</td>
<td>1.10</td>
</tr>
</tbody>
</table>

C.I.: confidence interval. *: statistically significant

### Table IV. Mean extent of vertebral osteochondrosis in DISH patients.

<table>
<thead>
<tr>
<th>VO</th>
<th>VO₁</th>
<th>VO₂</th>
<th>VO₃</th>
<th>VO₄</th>
<th>VO₅</th>
<th>VO₆</th>
<th>VO₇</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=38</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
</tr>
<tr>
<td>n=18</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
</tr>
<tr>
<td>n=16</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
</tr>
<tr>
<td>n=4</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
<td>n</td>
<td>m</td>
</tr>
</tbody>
</table>

VO: patients with vertebral osteochondrosis along spine segments with and without hyperostosis
VO₁: patients with vertebral osteochondrosis along spine segments without hyperostosis
VO₂: patients with vertebral osteochondrosis along spine segments with hyperostosis
VO₃: patients with vertebral osteochondrosis along spine segments with and without hyperostosis
m: extent of vertebral osteochondrosis (mean of number of intervertebral discs)

### Discussion

In 1974 Harris et al. reported that 19.3% of 34 DISH patients with cervical involvement showed disc narrowing (10). In 1976 Resnick et al. proposed a set of classification criteria for DISH: the ossification must include at least 4 contiguous vertebral bodies and no evident disc narrowing should be present along these 4 vertebrae (4). Nevertheless, the author described in the same paper the occurrence of significant disc narrowing in a small portion of DISH patients and stated that “disc space narrowing was not frequent within areas of hyperostosis”.

Later another report described disc

### Discussion

In 1974 Harris et al. reported that 19.3% of 34 DISH patients with cervical involvement showed disc narrowing (10). In 1976 Resnick et al. proposed a set of classification criteria for DISH: the ossification must include at least 4 contiguous vertebral bodies and no evident disc narrowing should be present along these 4 vertebrae (4). Nevertheless, the author described in the same paper the occurrence of significant disc narrowing in a small portion of DISH patients and stated that “disc space narrowing was not frequent within areas of hyperostosis”. Later another report described disc
Degenerative disc disease and DISH criteria / C. di Girolamo et al.

Lesions in DISH patients (5).

Since a systematic study of this topic was lacking, we evaluated 69 patients with DISH and 68 controls attending our clinic. The latter group was not restricted to healthy subjects, because ethical considerations do not allow the taking of complete spine x-rays in individuals without symptoms. Moreover, considering the mean age of the DISH patients, it is difficult to find absolutely considering the mean age of the DISH patients, it is difficult to find absolutely asymptomatic individuals for comparison. The mean age of our sample was comparable to that previously reported in other DISH studies (10, 11) and x-rays were taken using standard methods and read according to Resnick (4).

Our data reveal that the overall association rate of VO to DISH is not statistically different from the rate for controls (55.1% and 50.0%, respectively). This figure could be explained by an over-representation of rheumatic complaints. In addition, although the analysis of medical charts was restricted to DISH patients, they were mostly involved in jobs requiring heavy or medium labour, and the bias of a low representation of patients involved in light physical activities and consequently with less exposure to injuries should be considered.

This issue has never before been thoroughly evaluated, and the lack of reported data may be due to the clear-cut distinction between DISH and VO suggested by Resnick’s criteria which discouraged further investigations. On the other hand, classification criteria have a high specificity and a low sensitivity and therefore generally select those clinical findings which both identify the disease and separate it from others. They do not include the full spectrum of manifestations of a disease and thus are not appropriate for use in the diagnosis of the individual patient. In our DISH patients, VO was identified in hyperostotic spine segments other than those analysed for DISH, and it could easily be argued that there may be patients affected by both DISH and VO but who do not meet Resnick’s criteria.

When stratified by age, our data reveal a higher prevalence rate of VO in younger DISH patients than in controls (rate ratio: 1.61; 95% C.I.: 1.24 - 2.09). It may be hypothesized that spine hyperostosis causes an early modification of the physiological curves of the spine, with a different distribution of forces between the discs and interapophyseal joints in the same segment or in segments far from the involved area, leading to an accentuation of disc stress. This physical modification could play a predisposing role in the development of early VO in spine segments with or without hyperostosis in DISH patients. In elderly DISH patients, other pathogenetic factors of VO could play a predominant or overlapping role, and the association between the two diseases appears to be as common as in other conditions.

These arguments present an intriguing material for discussion. In fact, in order to increase the sensitivity of the classification criteria for early DISH, a revision of Resnick’s criteria has been proposed by other authors (2). In this effort, the hypothesis supported by our data should be taken into account in the analysis of DISH patients with early disease, because the exclusion of DISH subjects with VO might lower the sensitivity of Resnick’s criteria in this age group. The boundary extent of VO in order to classify a patient as having DISH should also be determined. In order to confirm this hypothesis, relationships between the duration of DISH and the development of VO have to be determined. Unfortunately, DISH can only be diagnosed on the basis of x-rays, and the patient’s age at the time of the first diagnosis of the condition does not represent a useful method to determine the onset of the hyperostotic disease. Cross-sectional data cannot give any additional support to this hypothesis. In conclusion, longitudinal studies are needed in order to fully answer these questions, identifying the actual onset of hyperostotic disease and of VO.

References