

Diffuse Idiopathic Skeletal Hyperostosis and Its Relation to Back Pain Among Older Men: The MrOS Study

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Objectives: To estimate the prevalence of diffuse idiopathic skeletal hyperostosis (DISH) in a cross-sectional study of elderly men age 65 to 100 years and to examine back and neck pain as possible correlates of DISH.

Methods: DISH was defined using Resnick's criteria and scored according to Mata on lateral spine radiographs of 298 randomly selected participants from the MrOS Study. Standardized self-reported questionnaires were used to assess the frequency and severity of back and neck pain, and the relation of these to DISH status was estimated with χ^2 tests, as well as prevalence ratios and 95% confidence intervals using log-binomial regression models.

Results: DISH was observed in 126 older men (42%), increased with age (30%, 39%, 48%, and 56% for ages 65-69, 70-74, 75-79, and ≥ 80 respectively), and was positively associated with body mass index (BMI) ($P = 0.04$) and blood pressure ($P = 0.02$). Significantly less back pain in the past 12 months was reported among men with DISH as compared to men without (59% vs 71%, $P = 0.03$), which remained after adjustment for age, BMI, and blood pressure (prevalence ratios = 0.73, 95% confidence interval = 0.57-0.95). Back pain severity ($P = 0.07$) and frequency ($P = 0.06$) were also less frequent among men with DISH compared to men without, whereas reported neck pain was similar between groups ($P = 0.39$).

Conclusions: Among community-dwelling elderly men, DISH prevalence is high, increases with age, and is positively associated with BMI and blood pressure. Frequency of self-reported back pain over the past 12 months was lower in older men with DISH as compared to those without DISH.

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Diffuse idiopathic skeletal hyperostosis (DISH) is an age-related disorder characterized by ossification and calcification of soft tissues like entheses and joint capsules. Evidence of the ossification can be found throughout the body, but is best visualized in the spine (1). DISH involving the spine is identified radiographically by flowing ligamentous ossification and calcification of the anterolateral aspect of the vertebral body with relatively well-preserved disc space (2). Resnick and Niwayama specifically defined DISH as the radiographic finding of calcification or ossification along the anterolateral aspects of at least 4 contiguous vertebral levels (across 3 disc spaces) with relative preservation of disc height in the involved vertebral segments without degenerative disc disease (3). In 1998, Mata and coworkers developed a scoring system for DISH so that the presence of DISH

could be reproducibly assessed. This system scores individuals that fulfill the Resnick criteria by numerically classifying each vertebral level based on the amount of ossification and whether partial or complete bridging of the disc space is present (4).

DISH is observed mainly in the elderly with increasing prevalence according to age (5,6). Men are much more frequently affected by DISH than women, with US prevalence estimates of 25% in men and 15% in women age 50 and older; estimates increase with age, up to 35% for men and up to 26% for women among those 80 years and older (7). The etiology of DISH is unknown, although metabolic disturbance is hypothesized to be a factor (8-12).

Although DISH affects the spine, few studies have evaluated the association of DISH and back pain (11,13,14). Two of 3 studies reported increased back pain frequency at the study visit in those with and without DISH (11,13), and the other study reported no association between DISH and back pain in the past 6 months (14). One study that compared visual analog back pain scores at the study visit among DISH cases and noncases (13) may have been flawed because history of back pain was an exclusion criterion for recruitment of control patients but not DISH patients. All 3 studies were limited by small sample sizes and were drawn from clinic populations that may be more symptomatic than community-dwelling individuals. Furthermore, none of these studies reported sex-specific associations between DISH and pain. Current data indicate that DISH is more prevalent in men, which suggests that gender influences pathology (6,15-17). Given the sex differences in prevalence estimates, it may be important to study the relation of DISH and back pain separately among men and women. Study cohorts of older community-dwelling individuals, who have not been preselected for disease or pain status, may provide a less biased estimate of the magnitude of the association between DISH and back pain.

The objective of this study was to estimate the prevalence of radiographic DISH in the thoracic and lumbar spine among elderly men and to determine its association with a history of back pain in the past 12 months, as well as back pain severity and frequency. We also explored the relation of DISH in the thoracic and lumbar spine with neck pain. We used a cross-sectional design and data collected from community-dwelling men age 65 to 100 years participating in the Osteoporotic Fractures in Men (MrOS) study.

METHODS

Parent Cohort

The MrOS Study enrolled 5995 men from March 2000 through April 2002 as described elsewhere (18,19). Briefly, recruitment occurred at 6 US academic medical centers in Birmingham AL, Minneapolis MN, Palo Alto, CA, Pittsburgh PA, Portland OR, and San Diego, CA.

Men aged 65 years and older who were able to walk unassisted and had at least 1 natural hip for femoral bone density measurement were eligible for the study. The MrOS study was approved by the Institutional Review Boards at all participating institutions. All participants in the cohort provided informed consent. At enrollment, men completed a self-administered questionnaire and attended a clinic visit at their local site, which included the ascertainment of thoracic and lumbar radiographs.

Spine radiographs were obtained at all enrollment sites using the same standardized protocol. Participants were placed on their left side in the lateral position with legs flexed and both arms at right angles to the body. The long axis of the spine was set parallel to the table and the midaxillary (coronal) plane of the body was aligned to the table midline. Images were obtained from T2 to S1. All films were sent to the MrOS San Francisco Coordinating Center for central quality review, digitization, and archiving. This protocol was designed primarily for the ascertainment of vertebral fracture in the cohort.

Selection of the Study Sample

To establish initial data on spinal conditions other than vertebral fracture, 300 MrOS participants were randomly sampled at baseline using a computer-generated random number. Available radiographs were transferred to the authors for the assessment of DISH. Two of the films were unreadable, resulting in a study sample of 298 men.

Assessment of DISH

Ossification of each disc space level from T2 to S1 was assessed and then graded according to the Mata scoring system (4). We did not include T1 in our assessment because it tended to be difficult to visualize on most films. Each vertebral level was scored as follows: 0) no ossification, 1) ossification without bridging, 2) ossification with incomplete bridging, and 3) ossification with complete bridging of the disc space. DISH was defined according to the Resnick criteria and required the presence of flowing ossification or calcification along the anterolateral aspect of at least 4 contiguous vertebral levels (3 disc spaces), with relative preservation of disc height (3). These 3 contiguous disc spaces had to have a Mata grade of 2 or 3 to be considered suitable for fulfilling the Resnick criteria.

Inter- and intrarater reproducibility was assessed by having 2 raters (PD, JY) independently evaluate DISH on 35 randomly chosen images. Interrater and intrarater agreement regarding presence or absence of DISH were both excellent with κ values of 0.88 and 0.89, respectively. Intraclass correlation coefficients for agreement on the number of levels affected were also high, being 0.97 for interrater reproducibility and 0.98 for intrarater reproducibility.

Because several men had ossification with at least some bridging, but not at 3 contiguous levels, we created an ossification severity variable to count the number of ver-

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