Rethinking diffuse idiopathic skeletal hyperostosis

CT investigation of DISH

This editorial refers to The natural course of bridging osteophyte formation in diffuse idiopathic skeletal hyperostosis: retrospective analysis of consecutive CT examinations over 10 years, by Gal Yaniv et al., pages 1951–57.

In recent years the scientific community has shown renewed interest in DISH. The article by Yaniv et al. [1] in this issue of Rheumatology describes the natural evolution of DISH, providing important new insights into this condition. The article presents a study that used CT, a highly sensitive three-dimensional imaging modality for assessing new bone formation, to identify DISH patients and examine their spines for a period of 3–10 years. This observation period was long enough to obtain a good overview of the natural progression of abnormal spinal bone formation in DISH patients.

The causes of DISH are not yet fully understood, and HLA-B27 is no more common in DISH patients than in the general population. In a study of cadaveric specimens from the 1970s, DISH had a prevalence of 12% [2]; however, more recent estimates suggest that the prevalence may be as high as 30% [3]. While the exact causes remain to be determined, there is growing evidence that obesity and old age are the most important predictors of DISH [3].

Investigators disagree as to whether DISH is a disease with clinical symptoms, such as morning stiffness and thoracic pain, or a morphological condition without clinical symptoms [4, 5].

DISH is among the most common causes of enthesopathy and might be considered the link between mechanical and metabolic causes [6]. In 1950, Forestier and Rotes-Querol [7] were the first to draw attention to a new condition, which they distinguished from AS and called ankylosing hyperostosis, that was characterized by flowing outgrowths of the anterior longitudinal ligament (ALL). More than 25 years later, Resnick and Niwayama [2] state that ‘DISH may not represent a disease per se but rather a vulnerable state in which extensive ossification results from an exaggerated response’. They present many cases and a detailed description of pathological and radiological features, concluding that the bony excrescences are located in the interwoven fibres of the annulus fibrosus and the ALL [2]. In some specimens they identified ‘hypervascularity and an occasional mild chronic inflammatory cellular infiltrate surround the ALL adjacent to the degenerating annulus’ [2]. This finding might explain clinical symptoms such as back pain and limited spinal mobility reported by some patients presenting with DISH. So far, however, a direct correlation between such symptoms and imaging findings (e.g. MRI) remains to be established. As the disease progresses, complications arising from abnormal bone formation, such as dysphagia, myelopathy and oesophagus compression, become predominant [8]. On the other hand, vertebral fractures are a serious complication in DISH patients [9].

In the routine clinical setting, DISH may be confused with the radiographic changes seen in AS. It is indeed difficult at times to interpret the radiographic findings correctly, especially when no radiographs of the SI joints are available. In a recent study, Baraliakos et al. [10] investigated progression of bony outgrowths of the cervical and lumbar spines in a large population of patients with DISH and AS. Those results are discussed by Yaniv et al. [1]. In brief, compared with DISH patients, patients with AS were younger and had more new bone formation initially [10]. However, degenerative osteophytes were found to be present in the majority of patients with DISH and AS [10]. As expected, syndesmophytes were more common in AS patients [10]. On the other hand, there was no difference between these entities in the progression of abnormal bone formation over time, with an average annual increase of 1.3 in the modified Stoke Ankylosing Spondylitis Spinal Score (mSASSS) [10].

These observations provide the background to the study of Yaniv et al. [1], who retrospectively analysed a similar cohort investigated by CT. A salient advantage of Yaniv et al.’s study, however, is that they also include the thoracic spine in their analysis. While not directly comparable to the study of Baraliakos et al. [10], the investigation of Yaniv et al. [1] confirms the observation that abnormal bone formation progresses slowly over time in patients with DISH. Specifically, the annual progression was found to be 0.68 units using the new CT-based DISH scoring system and 1.3 based on the radiographic mSASSS [1]. Only 23% of patients had no progression of abnormal bone formation over time [1].

With its three-dimensional visualization, CT lends itself to the detailed evaluation of bony processes. CT is the unofficial gold standard for evaluating new bone formation and bone destruction (e.g. erosions). This is why it is highly appreciated that Yaniv et al.’s article [1] presents a validated scoring system for DISH-associated spinal bone outgrowths. The method is straightforward to use...
and easy to learn, where sagittal CT scans and three-dimensional displays are combined, as confirmed by high intraclass correlation coefficients [1].

In patients with a score of 6—which describes fully confluent bridging osteophytes of a vertebral segment—two patterns are distinguished: a more vertically oriented type of bridging (6a) and a pattern of horizontal bone bridges (6b) [1]. While there is no doubt that variations in spinal ossification patterns exist in DISH and that there is a need for clearly defining the different patterns, we think that further discussion is warranted to come to a conclusion as to how these patterns should be designated. In our opinion, the ALL is an integral component of anterior vertebral body anatomy. It surrounds the anterior quarter of the vertebral body and is intimately interwoven with the annulus fibrosus (Fig. 1A and B). This means that, in the case of abnormal bone formation in patients with DISH, it is virtually impossible that this process spares the ALL (Fig. 1C and D). However, definitive patho-anatomical proof of this assumption is still lacking.

The recent scientific literature shows that interest in DISH is undiminished 64 years after it was first described. One reason for this interest is that technical advances have improved the early diagnosis of spondyloarthritis, and the clinical workup of patients presenting with inflammatory back pain also includes a search for mechanical or metabolic underlying causes. DISH is a possible differential diagnosis in these patients, but data on early imaging features of DISH are scarce. Therefore the next step should be a prospective investigation using MRI to screen for inflammatory vertebral manifestations in individuals with a high risk of DISH. The study of Yaniv

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**Fig. 1** Anterior longitudinal ligament in a normal individual and a patient with DISH

(A) A non-contrast-enhanced sagittal T1-weighted image and (B) a contrast-enhanced axial T1-weighted image of a 19-year-old man showing normal appearance of the anterior longitudinal ligament (ALL). The ALL is clearly demarcated from the vertebral body as a dark linear structure (arrowheads). The normal appearance is compared with the (C) sagittal and (D) axial CT images of an 86-year-old patient with incidentally detected DISH. The CT images show the typical candle wax-like bone formations anterior to the spine and fully involving the region of the ALL. Simultaneous analysis of sagittal and axial slices is important to fully appreciate these features.
et al. [1] provides an important basis for understanding the pathomechanism of DISH.

Funding: None.

Disclosure statement: K.-G.A.H. has received honoraria for lecturing from AbbVie, MSD, Pfizer and UCB. The other author has declared no conflicts of interest.

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Accepted 28 July 2014
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