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RESEARCH ARTICLE

DIFFUSE IDIOPATHIC SCLEROTIC HYPEROSTOSIS' – DISH

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ABSTRACT

Background: Diffuse idiopathic skeletal hyperostosis (DISH) also known as Forestier's disease, senile ankylosing spondylosis, and ankylosing hyperostosis, is a non-inflammatory spondyloarthropathy of the spine. It is characterized by spiny ankylosis and enthesopathy (ossification of the ligaments and entheses). It most commonly affects the thoracic and thoraco-lumbar spine, but involvement is variable and can include the entire spine.
Objective: This ia a rare disorder that made us to report this case.
Method: C.E.C.T . Scan of Neck (Plain & Contrast) and Barium Swallow. 30 ml of barium contrast is given orally to patient, films were taken in AP and RAO views.
Results: In CECT Scan of neck the observations made were: Gross bridging of the osteophytes over the anterior aspects of bodies of C2-C6 levels, atlas and clivus with mass effects? Diffuse Idiopathic Sclerotic Hyperosteosis (DISH). The barium swallow shows smooth narrowing of the pharyngeal lumen from C2 to C7vertebra with suspicion extrinsic compression. In Barium Swallow there was smooth narrowing of pharyngeal lumen from C2 to C7 with suspicion of extrinsic compression.
Conclusions: DISH is a disease which involves the calcification of the anterior longitudinal ligament of the spine and can be associated with numerous clinical presentations and comorbidities

INTRODUCTION

Forestier's disease was first described by Jacques Frostier and his student Jaume Rotes-Querol in 1950 under the name "senile ankylosing vertebral hyperostosis". (Forestier *et al*., 1950) However, it is now known that this disease is neither limited to the spine nor to older subjects. In 1976, Resnick and Niwayama coined the term "diffuse idiopathic skeletal hyperostosis" (DISH), which is currently widely utilized. Independently of how this condition is named, it consists in a systemic non inflammatory disease characterized by ossification of the entheses – the bony attachment of tendons, ligaments, and joint capsules. Although many external and genetic factors have been reported as being contributors of the pathogenesis of DISH, most of the current theories focus on the pathologic calcification of the anterior longitudinal ligament of the spine. The majority of these theories postulate that this process is due to the abnormal growth and function of the osteoblasts in the osteoligamentary binding. However, it is important to clarify that not all authors accept the association between pathologic calcification and increased bone mineral density. Although the exact prevalence and incidence remains undetermined, it is well known that DISH is more frequent in men, and the incidence increases with age mainly affecting patients over the age of 40 years. This case- report describes a patient with Diffuse Idiopathic Sclerotic Hyperostosis. Because of its rarity the case is reported.

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Case Summary

A 51 year old male patient came to the surgery outpatient department complaining the following features. Dysphagia to solid foods since 1 year. Dry cough since 3 days. Nasal obstruction since 3 days. There was no previous history of any gastritis, neck pain, Hypertension, Diabetes Mellitus and any previous surgeries. Family history is healthy. Nasal endoscopy was normal. Barium Swallow Procedure: The patient was sent for barium swallow investigation. About 30 ml of barium contrast was given orally to the patient; films were taken in AP & RAO views.

Findings: There was no pooling of contrast in pyriform fossa. There is evidence of smooth narrowing of hypopharynx. The residual lumen is seen towards the right, with an oval shaped well marginated filling defect seen extending from C4 to C6 vertebral levels. There is no shouldering or upholding of the contrast. Features suggestive of extrinsic polypoid mass narrowing hypopharynx and cervical portion of oesophagus. Ther is evidence of an oval shaped filling defect seen arising

from right lateral wall of oesophagus extending into the oesophageal lumen likely to present oesophageal web. Gastrooesophageal junction is normal in position and no evidence of any leak.

Impression: Smooth narrowing of pharyngeal lumen from C4 to C6 with suspicion of extrinsic compression. C.E.C.T. of neck (Plain and Contrast)

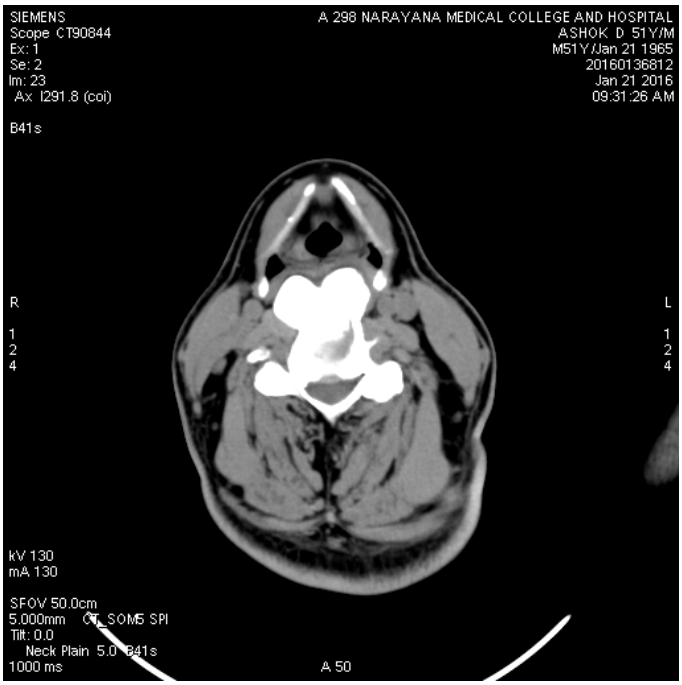
Technique: On a 16 serial slice scanner in helical mode, 5mm sections of neck from the mandible to the level of the superior mediastinum are taken with this section, saggital, Coronal reconstruction and 3D volume rendering.

Findings: There is gross bridging of osteophytes over the anterior aspects of bodies of C2-C7. Vertebral levels. Osteophytes are also noted in the clivus and atlas vertebra. There are old healed fractures of few of the osteophytes. Ther are old healed fractures of the few of the osteophytes.Mas effect is noted in the form of displacement of cervical oesophagus to the right side. The great vessels of the neck are normal. The nasopharynx, oropharynx an hypopharynx are normal. No evidence of any airway obstruction seen. Retropharyngeal or prevertebral soft tissues are normal. No evidence of soft tissue noted. Note is made on hyperpneumatisation of bilateral mastoid air cells.

Impression: Gross bridging of the osteophytes over the anterior aspects of bodies of C2-C7 levels, atlas and clivus with mass effects.? Diffuse Idiopathic Sclerotic Hyperosteosis (DISH). The barium swallow shows smooth narrowing of the pharyngeal lumen from C2 to C7vertebra with suspicion extrinsic compression.

DISCUSSION

The portion of the spine that is classically involved in DISH is the thoracic spine (Utsinger *et al*., 1985). Its most common clinical presentation is stiffness and a decreased range of spinal motion, and there be mild pain if ankylosis has occurred. The condition is recognized radio graphically by the presenceof"flowing"ossificationalong the anterolateralmargins of at least four contiguous vertebrae and the absence of the changes associated with spondyloarthropathy or degenerative spondylosis (Resnick *et al*., 1978). Even in patients presenting with lumbar or cervical complaints, the radiographic findings are almost always seen on the right side of the thoracic spine. The ossification is not always localized to the anterior longitudinal ligament, but is Sometimes more extensive (Ehara *et al*., 1988). DISH is frequently associated with OPLL and ossification of the ligamentum flavum, but the distribution of the ossifications show a clear trend: DISH in the thoracolumbar spine, OPLL in the cervical spine, and ossification of the ligamentum flavum in the lower spine (Ehara *et al*., 1998 and Resnick *et al*., 1978) (Table 1). The potential sequelae of hyperostosis in the cervical and lumbar spine include lumbar stenosis, dysphagia, cervical myelopathy, and dense spinal cord injury resulting from even minor traumas (Hukuda *et al*., 1983; Sharma *et al*., 2001; Federici *et al*., 2003; Ebo, ?; Takasita *et al*., 2000). In older patients, osteophyte compression resulting from DISH (Federici *et al*., 2003) or cervical spondylosis may cause dysphagia because cervicodorsal spine radiographs reveal large anterior osteophyte creating pharyngeal encroachment. There may be a delay in the diagnosis of spinal fractures in DISH patients because they often have a baseline level of spinal pain and the injury may be relatively trivial. The incidence of delayed neurologic injury resulting from such fractures is high as a result of the unrecognized instability and subsequent deterioration (Hukuda *et al*., 1983 and Takasita *et al*., 2000). DISH is a common disorder of unknown etiology, although genetic, metabolic, endocrinologic, anatomic, environmental, and toxic factors have all been suggested as playing a possible pathogenetic role in the new bone growth characterizing it (Fig. 1).Studies of human leukocyte antigen factors have led to conflicting results (Denko *et al*.,1994). There are published reports that the thoracic spine is more frequently involved, but the ligament ossification requires the two preexisting components of disuse related to vertebral immobility and rarefaction of the adjacent bone (Resnick *et al*., 1979 and Oppenheimer, 1942). Furthermore, Smith *et al*. (1955) suggested that immobilization may increase the likelihood of dedifferentiated connective tissue being transformed into bone. Resnick and Niwayama found that thoracic abnormalities were more frequent in the 7th to 10th thoracic vertebrae, and also noted a lower incidence in the upper thoracic vertebrae (Resnick, 1976). On the basis of anatomic comparisons of the lower and upper thoracic vertebrae, the cartilage of the lower five ribs does not join the sternum.



Axial Sections of Neck Shows Large Anterior Osteophyte

Because this contributes to making the lower thoracic vertebrae freer and more movable (especially in flexion and extension), the theory of thoracic spine immobility as a predisposing factor for DISH seems unlikely. Furthermore, it does not explain the involvement of DISH in the lumbar and cervical spine or extra spinal sites. One pathologic study found a significant increase in the number and width of the nutrient foramina (which indicates hyper vascularity of the involved ossified ligaments and vertebrae), and a significant increase in the size of the affected vertebrae. This suggests that a vascular disorder may be involved in the pathogenesis of the disease (El Miedany, 2000).

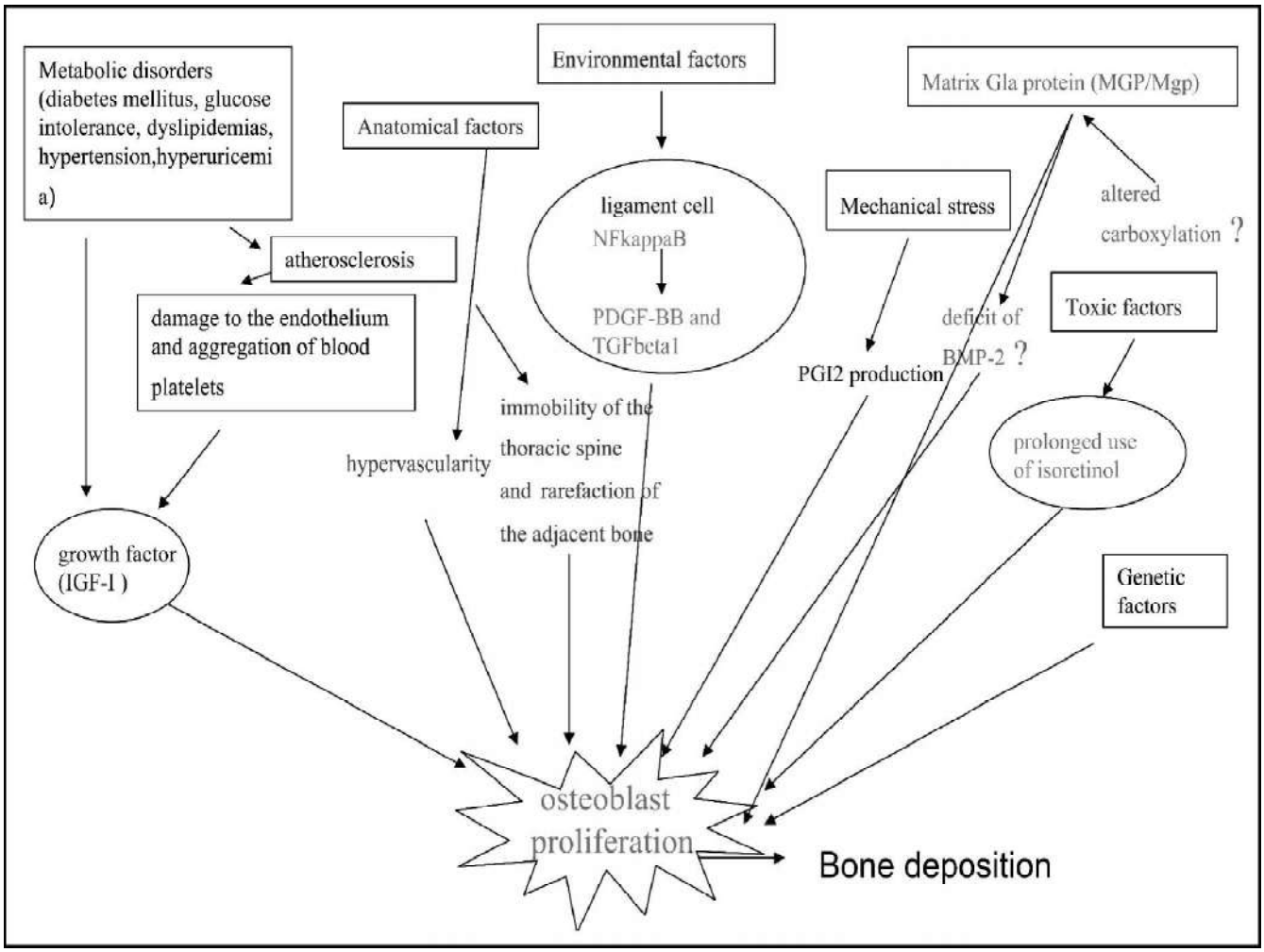
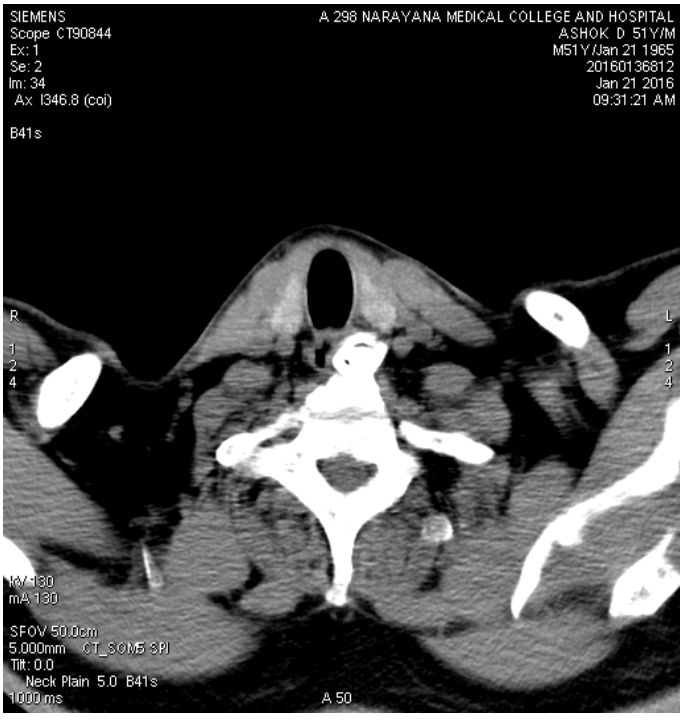


Figure 1. Possible pathogenetic mechanism driving bone deposition

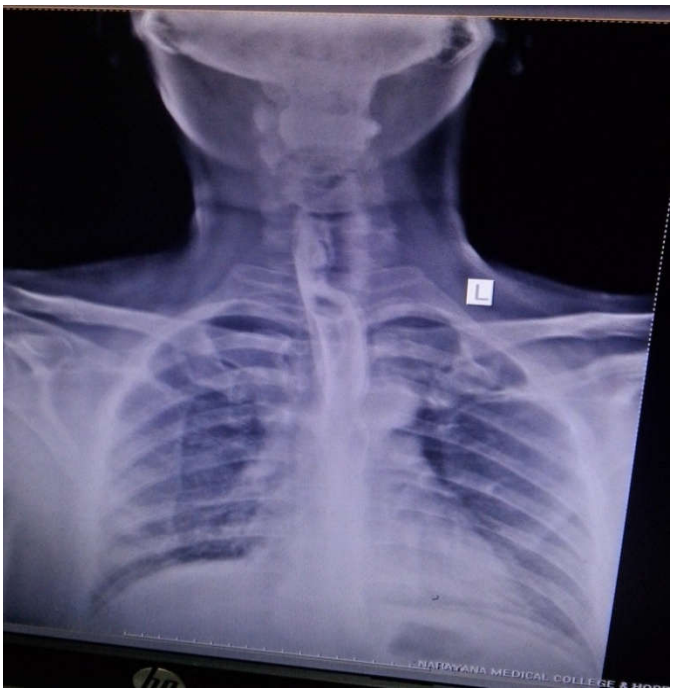


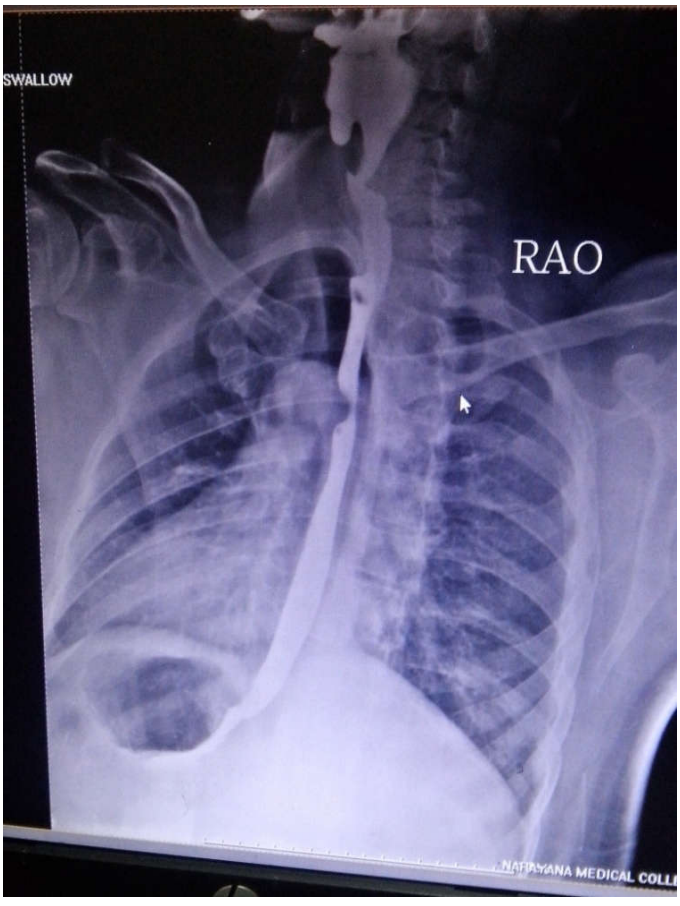
Axial sections of CT scan neck showing large Osteophyte causing extrinsic compression over Oesophagus

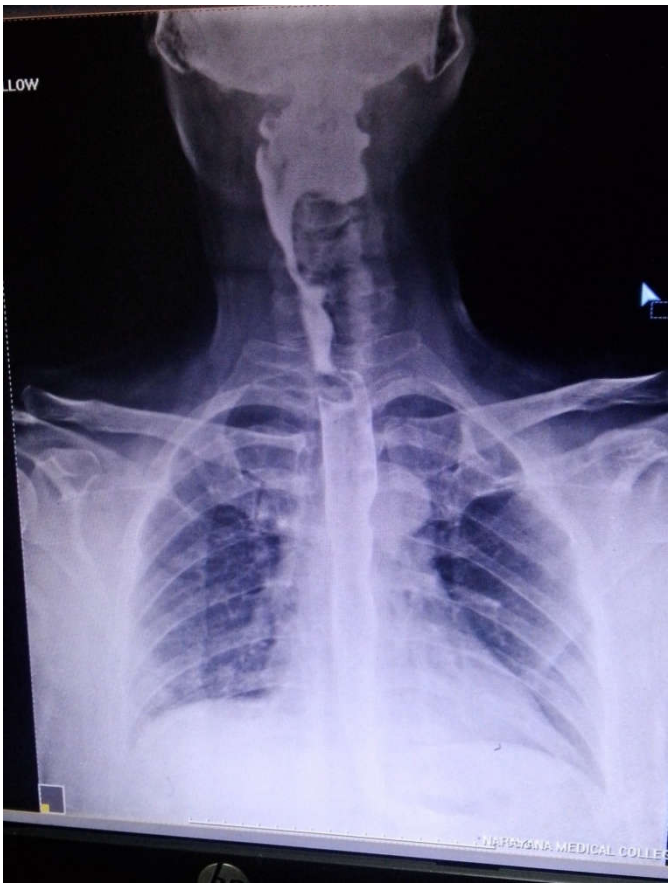
Metabolic disorders such as obesity; hyperlipidemia, diabetes mellitus, and hypertension are frequent in patients with DISH (Kiss, 2002). How is the process initiated and what is the link between these metabolic disorders and new bone formation? The ossification process starts in the innermost layer of the anterior longitudinal ligament, at the site of its attach-ment to the vertebral body, and then extends to meet theother arm of ossification coming from the vertebra aboveand/or below. It is believed that this new formation is theresult of abnormal osteoblast cell growth/activity in the bony–ligamentous region, which may be a clue to the pathogenesis of DISH (El Miedany *et al*., 2000).

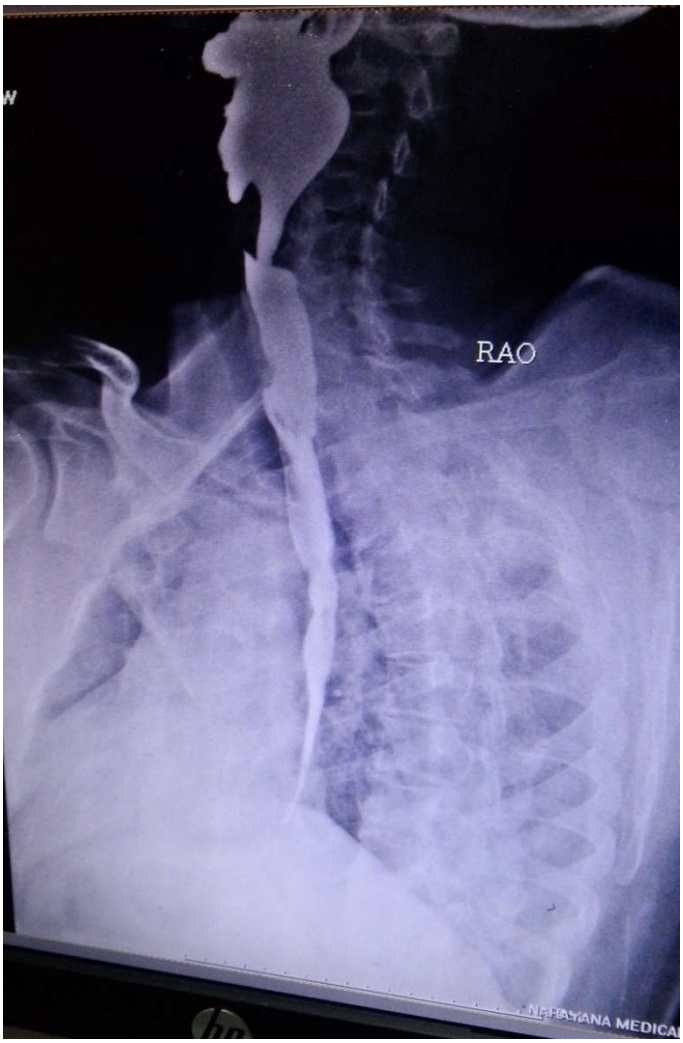
The growth of osteoblasts is maintained by a number of growth factors that may not be confined to bone (Fawcett *et al*., 1994). It has been found that insu- linlike growth factor-I stimulates alkaline phosphatase activity and type II collagen in osteoblasts (Vetter *et al*., 1986), and that growth hormone can induce the local production of insulin like growth factor-I and insulinlike growth factor- binding proteins in chondrocytes and osteoblasts. Denko *et al*. (Denko *et al*., 1994) found that DISH patients had high insulin and growth hormone levels, which may explain the osteoblast cell growth/proliferation. Because the ossification starts in certain sites, El Miendany etal. (El Miedany *et al*., 2000) suggested that hypervascularity could be the localizing factor in the process. Furthermore, in predisposed patients with hyperlipidemia, diabetes mellitus, or

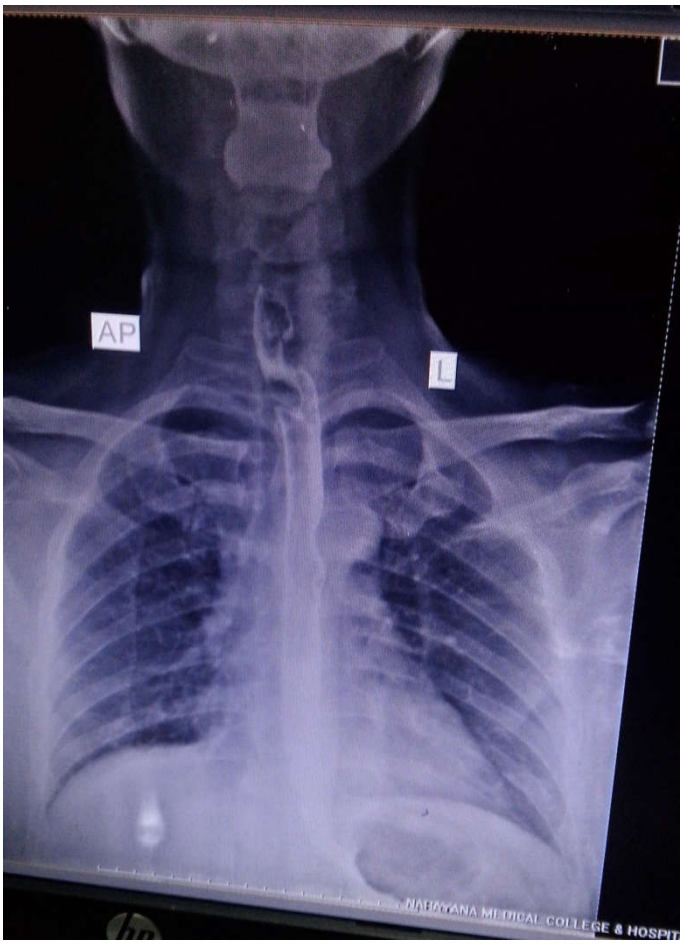
(possibly) hyperinsulinemia, there is an increased likelihood of atherosclerosis, the earliest stages of which leads to endothelial damage and the aggregation of blood platelet-derived growth factor, with the end result of osteoblast proliferation (Fawcett *et al*., 1994). The pathogenesis of OPLL is still unclear, but some etiologic factors have been identified. High serum levels of retinol and retinol-binding protein have been observed in DISH patients (Kodama *et al*., 1998), which suggests that vitamin A may play a role in the development of OPLL.











Barium swallow showing the compression of pharynx

Kosaka *et al*. (2000) indicate the possibility that, after being stimulated by environmental factors involving platelet-derived growth factor-BB and transforming growth factor-1in ligament cells, nuclear factor B influences the osteoblastic differentiation of undifferentiated mesenchymal cells. Ohishi *et al*. (2003) suggested that mechanical stress on the posterior ligaments is an important factor in the progression of OPLL. They found that uniaxial cyclic stretching enhances the expression of prostaglandin-I2 (PGI2) synthase and the production of PGI2, which interacts with a specific G protein-coupled cell surface receptor known as IP, and the PGI2/cAMP system activates osteogenic differentiation probably in spinal ligament cells.Matrix Gla protein (MGP) is a member of the family of extracellular mineral-binding Gla proteins expressed in Figure 1. Possible pathogenetic mechanism driving bone deposition Diffuse idiopathic skeletal hyperostosis Sarzi–Puttini and Atzeni 289 several tissues with a high accumulation of bone and cartilage (Rutsch *et al*., 2003) Although its precise molecular mechanism of action remains unknown, all the available data indicate that it plays a role in inhibiting mineralization by suppressing bone morphogenetic protein-2 (BMP-2), a potent osteogenic factor (El-Maadawy *et al*., 2003; Zebboudj, 2002; Dhore *et al*., 2001 and Zebboudj *et al*., 2003). The function of human MGP is mediated by vitamin K-dependent carboxylation of MGP glutamate residues, and the expression of the MGP gene depends on growth factor (Schurgers *et al*., 2001 and Stheneur *et al*., 2003) Sarzi–Puttini *et al*. (Sarzi–Puttini *et al*., 1995) found higher serum MGP concentrations in male and female DISH patients than in healthy control subjects (5.7 nmol/L vs3.3nmol/L,P< 0.001), and concluded that MGP may be amarker of hyperostosis because it is produced in largeramounts by patients with hyperostosis-inducing osteo-metabolic syndromes such as DISH.

In conclusion, DISH is a widespread systemic condition that is most probably related to abnormal bonegrowth/activity reflecting the influence of the metabolic,environmental, genetic, and endocrinologic factors that lead to new bone deposition. Vertebral blood supply is a predisposing factor that contributes to the onset, progression, and/or localization of DISH. MGP deficiency or altered carboxylation causes a high level of BMP-2 activity that leads to hyperostosis. References and recommended reading Papers of particular interest, published within the annual period of review,are highlighted as:•••Of special interest Of outstanding interest

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