Short Illustrated Review

Ochronosis and lumbar disc herniation

D. Gürkanlar, M. Daneyemez, I. Solmaz, and C. Temiz

Gulhane Military Medical Academy, Ankara, Turkey

Received July 8, 2005; accepted February 14, 2006; published online May 29, 2006
© Springer-Verlag 2006

Summary

Alkaptonuria is a rare, autosomal recessive metabolic disorder in which the homogentisic acid oxidase activity is absent. Its incidence is as low as 0.001%. Ochronosis is the pigmentation of connective tissues and this pigmentation leads to degenerative changes in alkaptonuric patients.

Alkaptonuria most prominently involves the lumbar region, but lumbar disc herniation as the presenting feature of alkaptonuria is not common. Only a few patients required surgical intervention.

Herewith we report a case of an alkaptonuric patient presenting with lumbar disc herniation requiring surgical intervention.

Literature review

A MEDLINE search by PubMed was performed to find all articles describing ochronosis and alkaptonuria associated with lumbar disc herniation and included all language publications from 1940 to 2005.

Analysis

Three articles with the key words “ochronosis and lumbar disc herniation”, 694 article with “alkaptonuria” and 572 articles with “ochronosis” were found. There were 119 articles related to these three main articles. These three main articles were related mostly to the subject and another 14 articles were identified by reviewing the references of these articles [3, 4, 13]. In the main three articles 5 cases and 14 autopsy cases were identified and possible mechanisms were discussed [3, 4, 13]. Surgery was offered for lumbar disc herniations and spinal cord compression when necessary [3, 6, 7, 17]. There is no effective treatment for the underlying metabolic disorder, but involvement of other systems is of great importance.

Illustrative case

A 45-year-old man had a one year history of low back with left leg pain and was admitted to our hospital. He first noted low back pain 16 years ago. On his neurological examination straight leg raising was
positive at 45° on the right and 30° on the left. Extension of the left hallucis longus muscle was moderately weak and there was hypoesthesia at L4 and L5 dermatomes on the left side.

Radiographs of the lumbar spine revealed narrow disc spaces, osteophytes in the vertebral bodies, and calcification. Computed tomography showed protrusions, vacuum phenomenon, osteophytes and degenerations of the facets (Fig. 1). Lumbosacral magnetic resonance imaging (MRI) revealed diffuse degenerative changes, narrowing of intervertebral disc spaces and left posterolateral disc herniation at L4-L5 intervertebral disc level (Fig. 2a, b).

Patient was operated upon in supine position under general anesthesia. Lumbar median skin incision was performed and there were no obvious discoloration of the skin, muscles or ligaments. Posterior longitudinal ligament and annulus fibrosus were incised at L4-L5 level. During L4-L5 discectomy it was realized that the extruded disc material was black and degenerated (Fig. 3). The pathological examination showed degeneration and pigmentation of the disc material. There was evidence of neither malignancy nor inflammation. Melanin bleaching test was also positive, there were melanin like pigments in the cytoplasms of chondrocytes (Fig. 4). Physical re-examination revealed blue discoloration of nasal and ear cartilages in our patient. Both patient’s and his daughter’s urine turned black after standing for several hours and homogentisic acid levels were high in the urine. The patient’s left leg pain disappeared completely and he was discharged one week after the surgery. There were no symptoms on follow up examination 6 months after the surgery.

Discussion

Alkaptonuria was first described in 1584 in a child whose urine was black [12]. The trait in alkaptonuria is rare (< one per 250 000 births). The alkaptonuria gene, human chromosome 3q21-q23 has been found to be responsible for encoding homogentisic acid oxidase, and this gene encodes a 445-aminoacid protein [14].

Ochronotic pigment occurring as a result of oxidation and polymerization of homogentisic acid binds to collagen irreversibly [5]. The clinical manifestations of ochronosis usually appear after the age of 30 and consist of blue pigmentation of external ear and tympanic membrane, black discoloration of the cerumen, blue, black or brown staining of the sclera and blue to black tinting of the skin in the axillary and genital regions [10, 16]. Accumulation of this molecule in the cartilage of joints and intervertebral discs causes degradation of the cartilage [5, 6, 14]. These changes may lead to intervertebral disc herniations [5, 6]. Alkaptonuria most prominently involves the lumbar region [3]. Stiffness of lumbar spine, gradual loss of lordosis and exaggeration of thoracic kyphosis are the initial presenting signs [12]. Vacuum disc phenomenon presumably represents areas of severe degeneration within the intervertebral disc [1]. Calcification

Fig. 1. Computed tomography showed protrusions, vacuum phenomenon, osteophytes and degenerations of the facets.

Fig. 2(a, b). MRI revealed diffuse degenerative changes, narrowing of intervertebral disc spaces and L4-L5 left posterolateral disc herniation.