Malignant Sarcomatous Transformation of Fibrous Dysplasia

Stacey K. Mardekian · Madalina Tuluc

Received: 28 July 2014 / Accepted: 20 August 2014 / Published online: 27 August 2014
© Springer Science+Business Media New York 2014

Abstract A case of osteosarcoma developing from fibrous dysplasia of the sphenoid bone in a 59-year-old female will be discussed. The characteristic radiologic and histologic features of the entity will be described.

Keywords Fibrous dysplasia · Monostotic · Osteosarcoma · Sphenoid

History

A 59-year-old female presented to the emergency department for a 2-week history of progressively worsening dull headache, blurry vision and diplopia. Clinical examination revealed cranial nerve III palsy with ptosis of the right eye and diplopia with gaze. The patient reported a history of similar but milder symptoms 2 years prior, and subsequent computed tomography (CT) scan of the head was reported as fibrous dysplasia (FD) of the right sphenoid bone. The patient had no previous history of radiation therapy.

Radiographic Features

CT of the sinuses revealed a large osseous expansile ground-glass lesion involving the right-sided pterygoid,

middle fossa cranial base, and sphenoid sinus region, most consistent with FD (Fig. 1). A central area suspicious for malignant degeneration was further characterized by magnetic resonance imaging (MRI), which showed a soft tissue mass with a significant enhancing portion centered in the sphenoid sinus, with extension to the clivus posteriorly and the sella turcica superiorly (Fig. 2).

Diagnosis

Intraoperative frozen sections were performed of the right sphenoid bone and hemorrhagic soft tissue mass within the right sphenoid sinus. Initial samples from the sphenoid bone were consistent with FD, as they consisted of a fibroblastic proliferation surrounding irregular trabeculae of woven bone (Fig. 3). Some tissue fragments displayed the architecture of FD with an increased number of atypical stromal cells, representing the transition between the benign fibro-osseous lesion and the obvious malignancy (Fig. 4). Sections of the soft tissue mass revealed a spindle cell sarcoma containing pleomorphic spindle cells with hyperchromatic pleomorphic nuclei, numerous typical and atypical mitotic figures, and osteoid formation by the malignant cells, consistent with high-grade osteosarcoma, osteoblastic type (Fig. 5). These findings support the diagnosis of malignant sarcomatous transformation of the FD into high-grade osteosarcoma.

Discussion

FD is a benign fibro-osseous lesion in which normal bone is replaced by a proliferation of fibrous connective

S. K. Mardekian (✉) · M. Tuluc
Department of Pathology, Thomas Jefferson University, 285
Main Building, 132 S. 10th St, Philadelphia, PA 19107, USA
e-mail: Stacey.Mardekian@jefferson.org

Fig. 1 Computed tomography (CT) of sinuses, axial view, shows a ground-glass lesion in right sphenoid sinus consistent with fibrous dysplasia, with a central area of possible malignant degeneration

Fig. 2 Magnetic resonance imaging (MRI) of brain, sagittal view, shows a large mass with heterogeneous post-contrast enhancement centered in the sphenoid sinus, with extension to the clivus posteriorly and the sella turcica superiorly

tissue and immature osseous tissue [1]. The disease may present in a monostotic or polyostotic form, affecting one or multiple bones, respectively. FD typically

presents in childhood, causing pain, swelling and bony deformities, and it usually becomes dormant by adulthood. However, there is a very small risk for malignant transformation, as indicated by several individual case reports dating as far back as 1945 [2]. Malignant transformation may occur during childhood or adulthood [3]. The reported time interval between the initial presentation of FD and the initial presentation of malignant transformation ranges widely among case series. In some reports the diagnoses of FD and sarcoma were established concurrently [4].

The risk for malignant transformation is estimated at less than 1 % in the monostotic form and up to 4 % in the polyostotic form [5]. Risk factors for malignant change are concomitant McCune-Albright or Mazabraud's syndromes and history of radiation therapy to the site of disease [6]. The most frequent sites involved in malignant transformation are the craniofacial bones (46 %) and proximal femur (25 %). The humerus, pelvis, tibia and scapula are less commonly involved [4]. Warning signs that should alert clinicians to consider malignant transformation include rapidly increasing pain without apparent trauma, increase in serum alkaline phosphatase, or a significant rapid change in radiologic appearance [1, 7].

The classic radiologic findings of FD include replacement of healthy bone by a more radiolucent "ground-glass" pattern, with no visible trabecular pattern [5]. Sarcomatous transformation may manifest as moth-eaten or cystic areas of osteolysis, cortical destruction and gradual formation of a soft tissue mass with heterogeneous contrast enhancement [6].

Histologically, FD consists of irregularly-shaped bone trabeculae without osteoblastic rimming, surrounded by a hypocellular fibrous stroma [5]. When there is accompanying malignant transformation, some stromal areas may contain more cellularity and atypia, indicating transition into the malignant component. The most common associated malignancy is osteosarcoma (~70 %), which consists of high-grade spindle cells that produce an osteoid matrix unconnected by cartilage. Fibrosarcoma, chondrosarcoma and malignant fibrous histiocytoma are less often reported malignancies in association with FD [5].

Currently there is no cure for FD, nor is there a way to prevent malignant transformation. Patients with FD should receive lifelong follow-up in order to detect malignant transformation early and maximize the response to treatment. Yearly X-rays are advocated for screening, and patients must be educated to

Fig. 3 Area of pure fibrous dysplasia consisting of a bland fibroblastic proliferation surrounding irregular trabeculae of woven bone

Fig. 4 Transition area showing fibrous dysplasia architecture with a more cellular stroma composed of atypical spindle cells

seek prompt medical attention upon experiencing a sudden change in the quality or severity of their symptoms. Treatment options for sarcomatous

transformation of FD include conventional chemotherapy, in addition to radical resection if the tumor location is amenable to surgical excision [8].

Fig. 5 Section of soft tissue mass showing pleomorphic spindle cells with hyperchromatic pleomorphic nuclei and numerous scattered mitotic figures, consistent with high-grade osteosarcoma

Conflict of interest None.

References

1. Kaushik S, Smoker WR, Frable WJ. Malignant transformation of fibrous dysplasia into chondroblastic osteosarcoma. *Skeletal Radiol.* 2002;31:103–6.
2. Coley BL, Stewart FW. Bone sarcoma in polyostotic fibrous dysplasia. *Ann Surg.* 1945;121(6):872–81.
3. Huvo AG, Higinbotham NL, Miller TR. Bone sarcomas arising in fibrous dysplasia. *J Bone Joint Surg Am.* 1972;54(5):1047–56.
4. Ruggieri P, Sim FH, Bond JR, Unni KK. Malignancies in fibrous dysplasia. *Cancer.* 1994;73(5):1411–23.
5. Riddle ND, Bui MM. Fibrous dysplasia. *Arch Pathol Lab Med.* 2013;137:134–8.
6. Doganavsargil B, Argin M, Kececi B, Sezak M, Sanli UA, Oztop F. Secondary osteosarcoma arising in fibrous dysplasia, case report. *Arch Orthop Trauma Surg.* 2009;129:439–44.
7. Kim GT, Lee JK, Choi BJ, Kim J, Han SH, Kwon YD. Malignant transformation of monostotic fibrous dysplasia in the mandible. *J Craniofac Surg.* 2010;21(2):601–3.
8. Cheng J, Yu H, Wang D, Ye J, Jiang H, Wu Y, et al. Spontaneous malignant transformation in craniomaxillofacial fibrous dysplasia. *J Craniofac Surg.* 2013;24:141–5.