ANNALES
UNIVERSITATIS MARIAE CURIE-SKŁODOWSKA
LUBLIN — POLONIA
VOL. DLVII, N 1, 13 SECTIO D 2002

2nd Department of Medical Radiology, Medical University of Lublin

INGRID RÓŻYŁO-KALINOWSKA

Diagnostic imaging of ameloblastoma

Ameloblastomas are destructive odontogenic tumors derived from tissue of the type characteristic of the enamel organ. They are characterized by slow and steady growth and can develop to a considerable size. They can be locally invasive, but some may undergo malignant degeneration (8).

Ameloblastomas are rare neoplasms, but they are the most often-encountered odontogenic tumors. They are usually seen in patients over 30 years old, but sometimes also in younger patients. Usually the age range is from 45 to 64. Ameloblastomas are most commonly located in the mandible in the molar ramus area, but can also be found in the maxilla invading the antrum, the floor of the nose, the orbit or the base of the skull. Teeth in the vicinity of the lesion can be tilted, displaced and often resorbed. Although ameloblastoma causes destruction of bone, nearly in all cases there exists a thin layer of bone over the lesion (8). Ameloblastoma usually remains covered by a thin layer of bone, but when the lesion occurs in the mandibular ramus it can break through its anterior surface (2).

There are three types of ameloblastoma: multilocular, unilocular and rare peripheral (extraosseous) type (2).

The multilocular radiolucent appearance is the most commonly encountered radiological image of ameloblastoma. The margin of the lesion is distinct, irregular and corticated. Within the radiolucent cystic lesion there can be perceived curved radiopacities causing the multilocular appearance. Such bone septa can cause the "honeycomb" or "soap bubbles" form, more frequently encountered in the maxilla than in the mandible. Around the main radiolucent mass there can be seen small circular radiolucencies corresponding to the so-called "daughter cysts" (8).

Unilocular ameloblastoma is a single, well-defined osteolytic lesion and comprises about 20% of cases. The prognosis is better in this type of ameloblastoma and recurrence rate is considerably lower (3). The unilocular type may mimic many radiolucent lesions (2).

The peripheral type is rare (2). It is an odontogenic tumor with the histological characteristics of an intraosseous ameloblastoma that occurs only in the soft tissues covering the tooth-bearing parts of the jaws (3).

MATERIAL AND METHODS

In order to discuss the value of various radiological techniques in cases of ameloblastoma there were analysed radiograms and the results of diagnostic imaging methods of patients examined in the Department of Dental and Maxillofacial Radiology as well as in the 2nd Department of Medical Radiology of the Medical University of Lublin in the years 1995-2000.

RESULTS AND DISCUSSION

Basic radiograms in diagnostics of ameloblastoma are PA and lateral views of maxillofacial region as well as panoramic X-ray (1). Additionally occlusal and intraoral dental radiograms are of use (4).

Characteristic "soap bubbles" appearance of multilocular ameloblastoma is well visible on a conventional radiogram, usually on a panoramic X-ray (Fig. 1). Intraoral dental or occlusal radiograms of the affected area are supplementary. Small "soap bubbles" dis-

Fig. 1. Panoramic X-ray demonstrates multilocular radiolucency in left mandibular body (arrows)

Fig. 2. Coronal CT scan with a soft-tissue window shows the mixed cystic and solid components of ameloblastoma as well as mandibular body expansion

Fig. 3. Coronal CT scan of with a bone window – evident margins of the cortical bone covering the lesion as well as displacement of teeth in the affected region

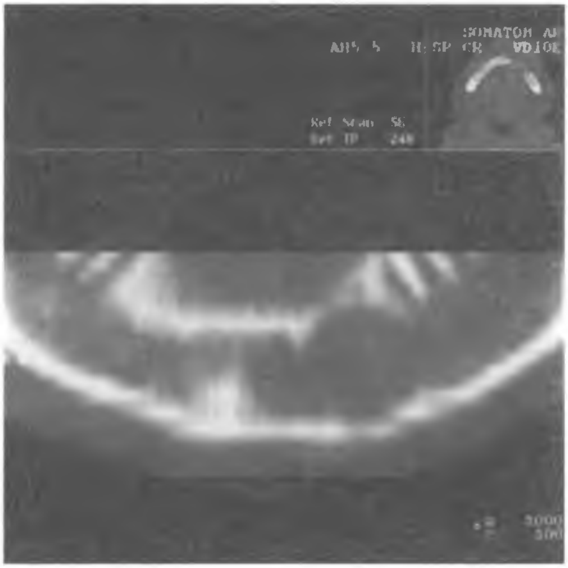

Fig. 4. CT multiplanar reconstruction along an irregular line imitating panoramic X-ray demonstrates intact cortical bone around an expansile lesion of mandibular body

tinctive for the tumor are more obvious on conventional radiograms than in magnetic resonance imaging (MRI) or computed tomography (6). Detection of this feature of radiologic image helps in differentiation between ameloblastoma and dentigerous cyst (6, 8).

Computed tomography demonstrates mixed cystic and solid components of ameloblastoma (7) – Fig. 2. This type of examination allows precise determination of the extent of the tumor, the destruction of cortical bone and the expansion of the pathological mass to the tissues in its vicinity (Fig. 3). However, such findings are not pathognomonic for ameloblastoma (3, 6). Computed tomography is especially valuable in cases of small tumors with intact cortical bone in the affected area (6) – Fig. 4. After intravenous injection of contrast medium internal septa, composed of thin bone trabeculae and soft tissues, are better visible (Fig. 2).

Three-dimensional computed tomography (3D CT) reconstructions demonstrate enlargement of bone caused by tumor with thinning and perforation of cortical bone. Although the 3D reconstructions are considered to be rather coarse and do not define the exact limits of the lesion, nevertheless they supply additional information that is useful in planning a surgery. Such 3D images provide excellent geography of the tumor, its relationship to surrounding tissues and the limits of the affected bone enlargement. The tumor and the jaws can be viewed from different angles thus allowing proper preoperative assessment and ensuring complete excision without excessive removal of uninvolved bone (1) – Fig. 5.

Fig. 5. CT three-dimensional reconstruction displays enlargement of mandibular ramus caused by a large ameloblastoma

It should be mentioned that if surgical resection of ameloblastoma within the limits of healthy tissues is planned, it is the magnetic resonance imaging that is of great importance as it presents the tumor in many planes. MRI reveals expansile lesions varying in size from small cystic masses to extensive areas of bone destruction. The signal intensity is intermediate on T1-weighted images and high on T2-weighted images. A honeycomb structure, characteristic of the tumor, is often well visible (7). As the internal septa in ameloblastoma are built mainly of soft tissue with very thin bone layers, multilocular appearance of the tumor is better identified on magnetic resonance scans. MR imaging is more helpful when a lesion is shown clinically and/or radiologically to have extensively invaded adjacent soft tissues (6).

However, one of the pitfalls is the inferiority of magnetic resonance imaging in visualization of bone structures. Thus on the basis of MR scans it is probable to overestimate tumor extent when the thin bone layer surrounding the lesion is not distinctly perceivable (3). Due to this it is imperative to correlate the results of computed tomography and magnetic resonance imaging of a patient.

Ultrasonography is useful in cases of ameloblastomas that destroy cortical layer of bone. Then it is possible to show internal mixed echogenicity of tumors (Fig. 6).

Recurrence rate of ameloblastoma in mandible is 90% and reaches 100% in maxilla in patients treated only with curretage. If an ameloblastoma recurs following surgical removal, there is a tendency for it to cause a series of discrete radiolucencies, some of which may unite (3).

Fig. 6. Ultrasound scan shows mixed echogenicity of ameloblastoma destroying mandibular cortical bone – echogenic soft tissues and hyperechoic internal septa

Due to high recurrence rate of ameloblastoma frequent follow-up studies are indispensable. Mainly panoramic X-rays as well as PA, oblique lateral and occlusal views are applied (5). However, the first control computed tomography examination should be performed in 2-3 weeks after surgical removal of tumor in order to serve as a reference scans. It is advised that the next computed tomography examination should be scheduled in 6 months after surgery, followed by annual follow-up until 5 years after treatment (3).

Magnetic resonance imaging is believed the most accurate diagnostic method in cases of recurrence after surgical removal as it allows differentiation of neoplastic tissues and postoperative fibrosis on T2-weighted images (6).

CONCLUSIONS

Diagnostic imaging of ameloblastoma requires both conventional radiograms and modern imaging techniques such as computed tomography, magnetic resonance imaging and ultrasonography. It is imperative to correlate the results of computed tomography and magnetic resonance imaging in cases of recurrence.

REFERENCES

1. Altini M. et al.: Three-dimensional computed tomography reconstruction in treatment planning for large ameloblastoma. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 81, 619, 1996.
2. Chidzonga M. M. et al.: Ameloblastoma. The Zimbabwean experience over 10 years. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 82, 38, 1996.
3. Feinerg S. E., Steinberg B.: Surgical management of ameloblastoma. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 81, 383, 1996.
4. Kawai T. et al.: A unique case of desmoplastic ameloblastoma of the mandible. Report of a case and brief review of the English language literature. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 87, 258, 1999.
5. Kawai T. et al.: Healing after removal of benign cysts and tumors of the jaws. A radiologic appraisal. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 79, 517, 1995.
6. Minami M. et al.: Ameloblastoma in the maxillomandibular region: MR imaging. Radiology, 184, 389, 1992.
7. Vogl T. J. et al.: Differential Diagnosis in Head and Neck Imaging. A Systematic Approach to the Radiologic Evaluation of the Head and Neck Region and the Interpretation of Difficult Cases. Thieme, Stuttgart–New York 1999.
8. White S. C., Pharoah M.J.: Oral Radiology. Principles and Interpretation. Mosby, St. Louis, 4th Edition, 2000.

2001.05.30

SUMMARY

The value of various radiological techniques in cases of ameloblastoma was discussed on the basis of analysis of radiograms and the results of diagnostic imaging methods of patients examined in the Medical University of Lublin in the years 1995-2000. It was concluded that diagnostic imaging of ameloblastoma requires both conventional radiograms and modern imaging techniques such as computed tomography and magnetic resonance imaging. It is imperative to correlate the results of computed tomography and magnetic resonance imaging in cases of recurrence.

Diagnostyka obrazowa szkliwiaka

Omówiono wartość różnych technik obrazowania diagnostycznego w szkliwiaku na podstawie analizy zdjęć rentgenowskich i wyników badań obrazowych pacjentów badanych w AM w Lublinie w latach 1995-2000. Stwierdzono, że diagnostyka obrazowa szkliwiaka wymaga zarówno konwencjonalnej rentgenodiagnostyki, jak też zastosowania nowoczesnych technik obrazowania, takich jak tomografia komputerowa i tomografia magnetycznego rezonansu jądrowego. Korelacja wyników badań metodą tomografii komputerowej i tomografii magnetycznego rezonansu jądrowego jest niezbędna w przypadkach wznowy pooperacyjnej.