Sonographic detection and follow up of an atypical pineal cyst: a comparison with magnetic resonance imaging

Case report

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The incidental ultrasonographic detection of an asymptomatic cystic pineal lesion in a young woman is described and compared with findings on magnetic resonance (MR) images. Follow-up studies obtained using both imaging modalities are presented. The results indicate that transcranial ultrasonography may represent an easy and cost-effective imaging technique for follow up of cystic lesions of the pineal gland, especially in patients unable to undergo MR imaging.

KEY WORDS • pineal gland • intracranial cyst • brain tumor • transcranial ultrasonography • harmonic imaging

PINEAL CYSTS are commonly an incidental and asymptomatic finding. Several authors believe that the interpretation of cystic pineal lesions from MR images can be rather difficult and that certainty about the true nature of the entity may only be obtained by performing a histopathological analysis. Other authors state that the lesions’ pattern on MR images is characteristic in most cases, and diagnosis should therefore be straightforward. In addition, MR imaging is the follow-up imaging modality commonly used to document stability in the size of these cysts, especially in cases of atypical lesions (that is, cysts >1 cm or cysts with solid portions). According to a study conducted by Barboriak and colleagues, however, even larger pineal cysts commonly remain unchanged in size on serial MR imaging studies. They found small increases in size in only a few patients, and these changes were not associated with specific clinical findings; this finding is supported by additional studies. Therefore, Babbariak and colleagues have suggested that even large asymptomatic pineal cysts may be observed clinically rather than with repeated MR imaging.

We report the case of a young woman who underwent a transcranial ultrasonographic examination as a proband in a study of transcranial harmonic imaging in healthy volunteers. Ultrasonographic images incidentally revealed the presence of an atypical pineal cyst, which was confirmed by MR imaging. In this report we describe and compare initial and follow-up ultrasonography and MR imaging studies of a benign pineal cyst along with the clinical course of this patient, testing the assumption that transcranial harmonic ultrasonography may be an alternative imaging technique for observation of these lesions over time.

Case Report

History. This 25-year-old woman participated as a healthy volunteer in an ultrasonographic study in which the aim was to evaluate brain perfusion with harmonic perfusion imaging. Transcranial ultrasonography revealed the incidental finding of a pineal cystic lesion, which was confirmed by MR imaging.

Ultrasonographic Studies. The examination was performed using a Sonos 5500 duplex device (Philips Medical Systems, Best, Netherlands) coupled with a 1.8/3.6-MHz sector transducer capable of fundamental and harmonic imaging. Harmonic imaging is based on the reception of the harmonics of the fundamental frequency with the objective of improving delineation of brain structures and lesions. The transtemporal native B-mode examination in the axial insonation plane revealed a round hypoechogenic lesion located posterior to the third ventricle; the maximal diameter of the lesion was 1.7 cm, and there was a small, slightly hyperechoic zone at its right lateral margin (Fig. 1a). The contents of the cyst were slightly hyperechoic compared with CSF in the third ventricle. Native harmonic imaging depicted the lesion even more clearly. For contrast harmonic imaging, 4 g (400 mg/ml) of a galactose-based ultrasonography con-
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Fig. 1. a: Native B-mode image obtained in the transverse–axial insonation plane revealing a round hypoechoic cyst located posterior to the third ventricle (arrow). There is a small slightly hyperechoic portion at the right margin of the cyst (arrowhead). On both sides of the third ventricle, the thalamus is depicted. On the left side of the lesion the strongly hyperechoic plexus can be seen (double arrow). b: Peak-intensity-parameter image obtained from the contrast-enhanced ultrasonographic studies. The third ventricle (white arrow) and the lesion (red arrow) do not display any contrast enhancement, similar to the near-field, the lateral parts, and a striplike section in the middle of the image, where typically less enhancement is seen for technical reasons. c: Contrast-enhanced T1-weighted MR image depicting the cystic pineal lesion in the same insonation plane as that shown in panel a (to match the ultrasound image, the MR image is mirrored). The contrast-enhancing crescentlike solid portion is marked with an arrowhead, and the third ventricle is marked with an arrow. Only a smaller part of the plexus (double arrow) is seen when compared to panel a because the ultrasonographic image is obtained with a slight angulation, unlike the MR image.

Contrast agent (Leovist; Schering AG, Berlin, Germany) was administered as an intravenous bolus by an infusion pump (Pulsar, Medrad, Inc., Indianaola, PA) at a rate of 2.5 ml/second into the antecubital vein, which had been cannulated with an 18-gauge catheter. After the contrast agent had been given, the lateral portion of the cyst displayed a visibly detectable contrast enhancement, whereas the main part of the lesion did not enhance. Consistent with this finding, the calculated parameter image of the peak contrast intensity depicted no contrast enhancement in the cystic part of the lesion, but only in adjacent tissue (Fig. 1b). Follow-up imaging of the cyst 15 months after the initial study did not demonstrate any difference in the size of the lesion or in the appearance of the contrast enhancement.

Magnetic Resonance Studies

Magnetic resonance imaging was performed using a 1.5-tesla clinical imaging unit (Gyroscan Intera; Philips Medical Systems) equipped with a standard circular polarized head coil. The MR imaging studies were obtained in the sagittal, coronal, and axial planes, and included native and contrast enhanced spin-echo T1- and T2-weighted images (TR 500 msec, TE 25 msec echo train length 11) with a slice thickness of 3 mm, an interslice gap of 0.3 mm, and an acquisition matrix of 256 × 256; turbo–spin echo T2-weighted images (TR 2500 msec, TE 90 msec, echo train length 11) with a slice thickness of 3 mm, an interslice gap of 0.3 mm, and an acquisition matrix of 256 × 256; and FLAIR (TE 6000 msec, TE 110 msec, TI 2000 msec) images with equal slice thickness and interslice gap, and an acquisition matrix of 256 × 256. Both T1- and T2-weighted images revealed a cystic lesion, which displayed a high intensity signal on T1-weighted images and a hypointense signal on T2-weighted and FLAIR images, that contained a right-sided crescent-like solid portion, which displayed an isointense signal. The contents of the cyst exhibited a slightly higher signal intensity than the CSF on all three sequences. No compression of the quadrigeminal plate was observed, and the maximum diameter of the lesion viewed on a midline axial T1-weighted image was 1.8 cm. Contrast-enhanced T1-weighted images (Fig. 1c) revealed strong enhancement of the solid portion of the lesion, which together with its size was consistent with the presence of an atypical pineal cyst. The follow-up examination conducted 15 months later to reevaluate the lesion’s size and to exclude development of a cystic tumor of the pineal gland demonstrated no differences in the appearance of the lesion and no growth.

Clinical Course

The patient had no symptoms before or during the entire study period. The neurological examination yielded normal findings and revealed no signs specifically referable to tumors of the pineal region such as oculomotor deficits or signs of increased intracranial pressure.

Discussion

Benign pineal cysts can be found in up to 4.3% of MR images obtained in healthy volunteers and are commonly asymptomatic. The majority of MR studies on pineal cysts lack histopathological confirmation of the diagnosis. Hence, the typical MR features of pineal cysts are controversial because pineal regions that contain cystic portions may be identified on histopathological examination to be a pinealocytoma, astrocytoma, or teratoma, among other tumors, or just a benign glial cyst. On the other hand, true pineal cysts, especially large ones, may have MR imaging characteristics suggestive of a pineal parenchymal or germ
cell tumor rather than a benign pineal cyst. In clinical practice a typical pineal cyst is commonly diagnosed when the MR image contains a round-to-oval cystic lesion in the pineal region that has smooth margins and a homogeneous content that is either slightly hyper- or isoechoic to CSF on T₁-, T₂-weighted, and FLAIR images. Typically, the lesion exhibits no rim of contrast enhancement but surrounding pineal tissue may strongly enhance. Biopsy or total resection is only performed if the patient has symptoms, the initial images remain inconclusive regarding the lesion’s possible malignancy, or follow-up images reveal significant lesion growth.

The patient described in this report harbored a cyst that met the clinical and MR imaging criteria of an atypical pineal cyst because of its size and the solid portion. Although its appearance has to be regarded as atypical, we suppose that the solid portion represents asymmetrically compressed pineal tissue, which typically displays strong contrast enhancement because it lacks a blood–brain barrier. The entirely unchanged imaging characteristics on the follow-up MR image supported the diagnosis of a benign pineal cyst. Although currently MR imaging is widely available, shrinking financial resources in health care force clinicians to reevaluate when to conduct repetitive MR imaging. According to several investigators, serial MR studies generally reveal no changes in size, even in cysts measuring more than 1 cm; consequently, some authors have suggested that patients harboring such lesions be observed only clinically.

We found harmonic ultrasonography studies to be comparable to MR imaging studies in the assessment of cyst size and appearance on initial and follow-up examinations. We therefore suggest that harmonic ultrasonography be used as an easy, cost-effective imaging technique to follow pineal cysts once the diagnosis has been established. The additional application of a contrast agent may facilitate the detection of a lesion on initial ultrasonographic imaging, but this is not regarded as necessary for follow-up purposes.

Conclusions

Transcranial harmonic imaging has recently been shown to enable the assessment of brain tumor perfusion as well as the assessment of perfusion parameters that correlate well with those obtained from perfusion-weighted MR sequences. Based on this case report we propose transcranial harmonic ultrasound imaging as an alternative imaging technique for the follow-up evaluation of pineal cysts; this mode of imaging is easy and rapidly applicable, and furthermore meets the current financial restrictions in health care. Nevertheless, a comparative trial with a larger number of patients should be undertaken before this technique can be recommended for routine follow up of pineal cysts.

References
