Annals of Nuclear Medicine Vol. 15, No. 2, 149–151, 2001

The role of Tc-99m RBC scintigraphy in the differential diagnosis of orbital cavernous hemangioma

Elvan SAYIT,* İsmet DURAK,** Gamze CAPAKAYA,*** Mustafa YILMAZ*** and Hatice DURAK***

*Department of Nuclear Medicine, Celal Bayar University, School of Medicine, Manisa, Turkey
Departments of **Ophthalmology and ***Nuclear Medicine,
Dokuz Eylül University, School of Medicine, İzmir, Turkey

The cavernous hemangioma is the most common benign orbital tumor in adults. Its presentation is during the forth to fifth decades with a slowly progressive unilateral proptosis. Intraconal cavernous hemangiomas may be difficult to differentiate from other intraconal lesions such as schwannomas, meningiomas and hemangiopericytomas. We report a case of orbital cavernous hemangioma diagnosed by Tc-99m RBC scintigraphy. Tc-99m RBC scintigraphy revealed a typical scintigraphic pattern in which there is intense focally increased uptake on the delayed image. We conclude that Tc-99m RBC scintigraphy can be a useful method in the differential diagnosis of orbital cavernous hemangioma as in hepatic hemangioma.

Key words: hemangioma, Tc-99m RBC scintigraphy, orbit

INTRODUCTION

THE CAVERNOUS HEMANGIOMA is the most common benign orbital tumor in adults. Although the tumor may develop anywhere in the orbital cavity, it most frequently occurs within the fat space just behind the globe. The female prepondarence is 70%. Presentation is during the fourth to fifth decades with a slowly progressive unilateral proptosis. Intraconal cavernous hemangiomas may be difficult to differentiate from other intraconal lesions such as schwannomas, meningiomas and hemangiopericytomas. Treatment by surgical excision is required in the majority of cases as the tumor gradually enlarges.[1] We report a case of orbital hemangioma diagnosed primarily by using Tc-99m labeled red blood cell (RBC) scintigraphy.

CASE REPORT

A 59-year-old woman was admitted to the ophthalmology department with the complaint of progressive proptosis of the left eye for 8 years. She had had non-insulin dependant diabetes mellitus for 12 years and her blood sugar level was under control with oral antidiabetics.

In her ophthalmologic examination, visual acuity was full with correction. Her left eye was proptotic in appearance, without any palpable mass. The proptosis was non-pulsatile and was not associated with a bruit. Exophthalmometric measurement from the orbital rim was 19 mm for the right eye and 23 mm for the left eye. Eye movements were normal in all gaze directions. Funduscopic examination did not reveal any abnormality.

On ultrasonographic (USG) examination, a mass lesion of heterogeneous echogenicity which had multiple acoustic shadows due to calcifications was observed in the retrobulbar space on the nasal side between the optic nerve and the rectus muscle in the left eye. Doppler USG examination demonstrated the presence of vasculature in the lesion suggesting more of a vascular origin.

On orbital CT, a retrobulbar multiple hyperdense space containing lesions of millimetric sizes was observed in the left orbita. These lesions also included punctate calcifications. On dynamic CT scan the findings of enhancement were in favor of a vascular lesion.

On orbital MRI, an intraconally localized mass lesion, 15 mm in diameter, was detected in the retrobulbar space of the left orbita. It was hyperintense on T2-weighted sequences and hypointense on T1-weighted sequences.

Received April 6, 2000, revision accepted December 4, 2000.
For reprint contact: Elvan Sayıt, M.D., 1826/3 Sokak, No: 3/9, 35530 Karşıyaka/Izmir, TURKEY.
E-mail: hatice.durak@deu.edu.tr

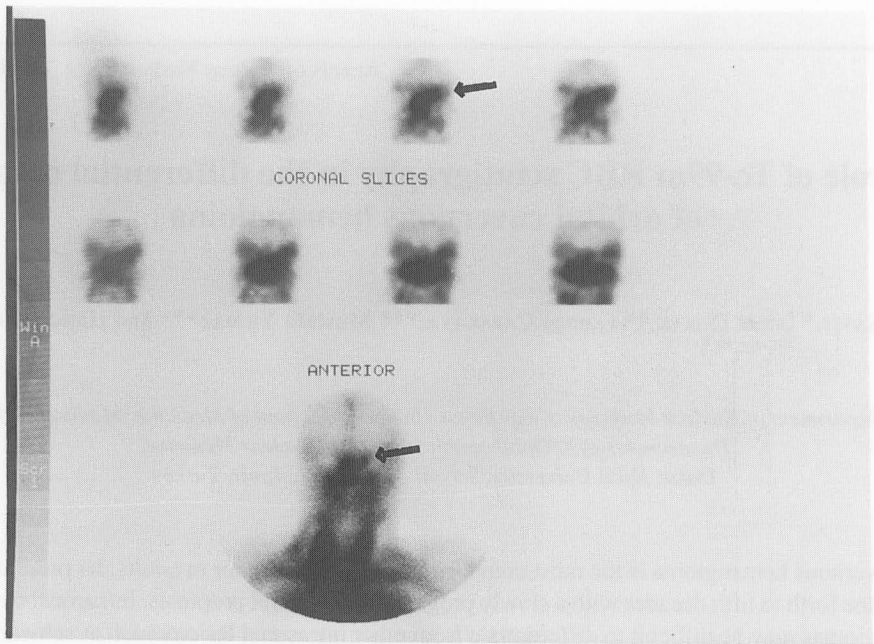

Fig. 1 In coronal slices and delayed blood pool anterior image of the head, Tc-99m RBC scintigraphy revealed increased uptake in the lesion (arrow).

The patient was referred for Thallium-201 (T1-201) imaging in order to evaluate the potential probability of malignancy of the orbital mass. Seventy-four MBq T1-201 was administered intravenously and early planar imaging was performed after 20 minutes and late planar imaging after 2 hours with a single head gamma camera (GE XC/T, St. Albans, UK). In the early image, slightly increased T1-201 uptake was noted in the medial part of the left orbita. In the late image, significant washout from this area was observed. These findings were in favor of a benign mass.

Radionuclide blood volume imaging was performed after the intravenous injection of 1110 MBq Tc-99m pertechnetate labeled RBCs with a RBC kit by an *ex vivo* labeling procedure (Ultra-tag RBC kit, Mallincrodt Medical Inc., St. Louis, MO). After the bolus injection of the tracer, dynamic perfusion images were acquired at a rate of 2 seconds per frame during 60 seconds. Subsequently, two static blood pool images were obtained at 5 minutes and 60 minutes after injection. For SPECT imaging, we obtained 64 images of 30 seconds each in a 64×64 matrix over 360°. Transaxial and coronal slices were generated with a Butterworth filter (cut off = 0.3, power factor = 10). The minimum size for the detection of the lesion is 10 mm. We did not observe any abnormal activity on dynamic perfusion or early blood pool images. Increased accumulation of RBCs in the mass was observed on SPECT images and a delayed blood pool image (Fig. 1). The findings of Tc-99m RBC scintigraphy were characteristic of a hemangiomatous lesion.

The patient is on regular follow-up once a year. USG and CT images did not demonstrate any progression after one year.

DISCUSSION

The cavernous hemangioma is the most common benign orbital tumor detected in the adult population.[1] Radiologic imaging techniques are useful in the evaluation of a suspected cavernous hemangioma including USG, CT and MRI. On the CT scans, cavernous hemangiomas appear as well-defined, smoothly marginated, homogeneous, rounded, ovoid or lobulated soft tissue lesions of increased density with various degrees of contrast enhancement.[2] The MRI features of these cavernous hemangiomas are indicative of a lesion with long T1 and T2 characteristics.[2] On MRIs, the lesion is usually isointense to muscle on T1-weighted sequences and hyperintense to muscle on T2-weighted sequences with marked contrast enhancement.[3–5] Occasionally intraconal cavernous hemangiomas may be difficult to differentiate from other intraconal lesions, such as meningiomas, hemangiopericytomas and schwannomas on the basis of radiologic examinations.[2,4,6]

Tc-99m labeled RBC is commonly used in the evaluation of hepatic hemangiomas[7–10] as well as in gastrointestinal bleeding imaging, cardiac-gated blood pool studies and radionuclide venograms. In the literature Tc-99m RBC scintigraphy was also reported to be useful in the evaluation of extrahepatic vascular lesions including head and neck hemangiomas,[11] soft tissue hemangiomas in children,[12] hemangiomas of the extremities,[13] splenic

hemangioma[14] and orbital hemangiomas.[15–17] The classic scan pattern ascribed to hemangioma was hypoperfusion during the flow study, with a progressive increase to a hyperperfused lesion on the later images.[18] Delay in the appearance of hyperperfusion results from the virtual absence of arterial flow and the slow mixing of the Tc-99m RBCs with the unlabeled RBC population already present in the confluent loculated spaces of the cavernous hemangioma. This pattern is the hallmark of both the nuclear medicine procedure and the dynamic bolus CT technique.[18] Tc-99m RBC scintigraphy is a useful method for the diagnosis of orbital cavernous hemangiomas and should be included in diagnostic methods used for this purpose.[17] The diagnosis of orbital cavernous hemangioma by means of Tc-99m RBC scintigraphy, in addition to clinical findings, USG, CT and MRI scans, should be used to confirm the diagnosis of hemangioma. In a previous study, the diagnosis of asymptomatic orbital cavernous hemangiomas was made with the clinical, USG, CT and/or MRI findings.[19] The follow-up period was an average of 37 months (range, 8 to 120 months). No clinical or radiological enlargement was demonstrated in any of the orbital cavernous hemangiomas. It was concluded that patients with orbital cavernous hemangiomas diagnosed clinically and radiologically can safely be followed using CT or MRI and clinical observation.[19] Ki WW et al. reported on two patients with orbital cavernous hemangioma diagnosed by Tc-99m RBC SPECT, in one of whom, MR and RBC SPECT findings were sufficient for the diagnosis of orbital cavernous hemangioma. This patient was under clinical observation without specific treatment. No change was demonstrated on MRI after 4 months.[16]

With Tl-201 scintigraphy, we first excluded the malignant potential of the orbital mass. As Doppler USG and dynamic CT findings were in favor of a vascular lesion, we performed Tc-99m RBC scintigraphy to verify the hemangiomatous nature of the mass. Increased accumulation of RBCs in the lesion in delayed blood pool images was strongly suggestive of an orbital cavernous hemangioma. We think that Tc-99m RBC scintigraphy is very useful in the diagnosis of orbital cavernous hemangioma. In orbital cavernous hemangiomas, especially asymptomatic orbital cavernous hemangiomas and patients with slowly progressive proptosis, clinical observation without specific treatment and follow-up MRI or CT can be alternatives to surgical excision. The diagnosis of orbital cavernous hemangioma by means of Tc-99m RBC scintigraphy, in addition to clinical findings, USG, CT and MRI scans, should be elected to confirm the diagnosis of hemangioma.

REFERENCES

1. Kanski JJ. Disorders of the Orbit. In *Clinical Ophthalmology*, Kanski JJ (ed), 4th ed, Oxford; Butterworth-Heinemann, 1999: 551–584.
2. Mafee MF. Imaging of the orbit. In *Imaging of the Head and Neck*, Valvassori GE (ed), New York; Thieme Medical Publishers, 1995: 193–199.
3. Fries PD, Char DH, Norman D. MR imaging of orbital cavernous hemangioma. *J Comput Assist Tomogr* 1987; 11: 418–421.
4. Mafee MF, Putterman A, Valvassori GE, Campos M, Capek V. Orbital space occupying lesions: role of CT and MRI, an analysis of 145 cases. *Radiol Clin North Am* 1987; 25: 529–559.
5. Wilms G, Ratt H, Dom R, Thywissen C, Demaerel P, Dralands G, et al. Orbital cavernous hemangioma: findings on sequential Gd-enhanced MRI. *J Comput Assist Tomogr* 1995; 19: 548–551.
6. Mafee MF. Eye and orbit. In *Head and Neck Imaging*, Som PM (ed), St. Louis; Mosby, 1996: 1109–1114.
7. Groshar D, Ben-Haim S, Gips S, Hardoff R, Jerushalmi J, Parmett S, et al. Spectrum of scintigraphic appearance of liver hemangiomas. *Clin Nucl Med* 1992; 17: 294–299.
8. Middleyon ML. Scintigraphic evaluation of hepatic mass lesions: emphasis on hemangioma detection. *Semin Nucl Med* 1996; 26: 4–15.
9. Rabowitz SA, McKusick KA, Strauss HW. Tc-99m Red Blood Cell Scintigraphy in Evaluating Focal Liver Lesions. *AJR* 1984; 143: 63–68.
10. Rubin RA, Lichtenstein GR. Scintigraphic evaluation of liver masses: cavernous hepatic hemangioma. *J Nucl Med* 1993; 34: 849–852.
11. Murata Y, Yamada 1, Umehara I, Ishii Y, Okada N. Perfusion and blood-pool scintigraphy in the evaluation of head and neck hemangiomas. *J Nucl Med* 1997; 38: 882–885.
12. Barton DJ, Miller JH, Allwright SJ, Sloan GM. Distinguishing soft-tissue hemangiomas from vascular malformations using technetium-labeled red blood cell scintigraphy. *Plast Reconstr Surg* 1992; 89: 46–52.
13. Murata Y, Yamada I, Umehara I, Shibuya H. The use of three-phase scintigraphy for diagnosing hemangiomas of the extremities. *Clin Nucl Med* 1997; 22: 372–375.
14. Phillpot J, Ali SA, Briscoe EG, Cesani F. Three-phase Tc-99m RBC scintigraphy of a splenic hemangioma. *Clin Nucl Med* 1997; 22: 158–160.
15. Deol AK, Terry JE, Seibert DA, Solanki HP, Chertow BS. Hemangioma of the apical orbit diagnosed by radionuclide imaging. *Optom Vis Sci* 1994; 71: 57–59.
16. Ki WW, Shin JW, Won KS, Ryu JS, Yang SO, Lee HK, et al. Diagnosis of orbital cavernous hemangioma with Tc-99m RBC SPECT. *Clin Nucl Med* 1997; 22: 546–549.
17. Gdal-On M, Gelfand YA, Israel O. Tc-99m labeled red blood cell scintigraphy (Tc-99m RBC scintigraphy) as a diagnostic method for orbital cavernous hemangioma. *Eur J Ophthalmol* 1999; 9: 125–129.
18. Wilson MA. Gastrointestinal Tract. In *Textbook of Nuclear Medicine*, Wilson MA (ed), Philadelphia; Lippincott-Raven Publishers, 1998: 57–88.
19. Orcutt JC, Wulc AE, Mills RP, Smith CH. Asymptomatic Orbital Cavernous Hemangiomas. *Ophthalmology* 1991; 98: 1257–1260.