AJNR

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AJNR Am J Neuroradiol 1981, 2 (5) 472-474
http://www.ajnr.org/content/2/5/472.citation

Thyroid Ophthalmopathy: Bony Erosion on CT and Increased Vascularity on Angiography

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A patient with biopsy-proven Graves ophthalmopathy is described, with the unusual and previously unreported CT finding of erosion of the bony roof of the orbit. Internal carotid arteriography revealed diffuse increased vascularity throughout the orbit. We were unable to find any previous description of the angiographic findings in thyroid ophthalmopathy.

Case Report

A 21-year-old man had gradually increasing unilateral proptosis of the right eye. His history was remarkable in that he had had a subtotal thyroidectomy several years earlier for Graves disease. He remained euthyroid on no thyroid medication and was, on admission, euthyroid with normal T3 and T4. His vision had recently deteriorated from 20/20 to 20/50 OD, but had returned to normal when he was placed on steroid therapy. Physical examination was entirely normal, except for marked proptosis and marked conjunctival injection of the right eye.

Plain films of the orbits were unremarkable. Optic canal tomograms were normal. Axial (fig. 1A) and coronal (figs. 1B and 1C) CT scans revealed a slightly enhancing mass in the superior apex of the right orbit with evidence of smoothly marginated bone erosion on the posterior and superior wall of that orbit. There was obvious exophthalmus and thinning of the right orbital roof. The superior orbital mass appeared bilobed. The possibility of enlarged superior rectus and superior oblique muscles was entertained. Both medial recti muscles appeared slightly prominent on the axial scans, but looked less enlarged on the coronal scans. Right external carotid arteriography revealed no abnormalities. Right internal carotid arteriography (fig. 2) revealed stretching of the ophthalmic artery and its branches by a mass. A diffuse homogenous vascular stain, most prominent in the apex, was noted in the capillary phase along with many small irregular vessels. The increased vascularity and puddling persisted somewhat into the venous phase. The left internal carotid angiogram was normal.

Because of the possibility of a solid tumor, a right frontal craniotomy with extensive right orbital decompression was performed. The bony orbital roof was markedly thinned. The superior oblique and superior rectus muscles were hypertrophied to 8–10 times normal size. No tumor was found. A specimen was submitted for pathologic study.

Pathological samples exhibited a variegated admixture of lymphocytic infiltrates and degenerative changes within skeletal muscle; the spectrum was quite characteristic of the ophthalmopathy associated with Graves disease. Small, well differentiated lymphocytes were the most conspicuous inflammatory component, with additional scattered plasma cells and eosinophils. A reactive vascular background was particularly striking, with numerous dilated capillaries, arterioles, and venules (fig. 3A). In some areas the inflammatory cells surrounded groups of skeletal muscle fibers, suggestive of a myositis.

Parts of extraocular muscle exhibited a variable increase in fiber diameter and zones of basophilic or mucinous degeneration within the sarcoplasm. The fibers were widely separated by layers of loose collagen with increase in mucopolysaccharide ground substance (fig. 3B).

Discussion

The usual spectrum of findings of thyroid ophthalmopathy in cranial computed tomography has been well described [1–5]. Bilateral extraocular muscle enlargement, either symmetric or asymmetric (30%), has been reported in the vast majority of patients with thyroid ophthalmopathy. None of the 116 patients in the largest reported series exhibited abnormal orbital soft tissues other than enlarged muscles. While superior rectus involvement was seen in 50% of the patients, superior oblique muscle involvement was distinctly unusual [1]. In another study by Wing et al. [2], using direct sagittal CT scanning, involvement of the superior rectus was seen in 17 of 24 patients.

Bony thinning and erosion can be seen in orbital masses. If the bony changes are of a permeative destructive type, either direct extension from adjacent malignant processes from the paranasal sinuses or from distant sites (especially lung, breast, and prostate) are often the cause. Benign lesions such as hemangiomas, dermoids, or venous malformations can produce well marginated erosions. Lloyd [15] states that generalized enlargement of the bony orbit is usually the result of longstanding space-occupying lesions

Received January 14, 1981; accepted March 17, 1981.

The opinions or assertions expressed herein are those of the authors and are not to be construed as official or as reflecting the views of the Department of the Navy or the Naval Service at large.

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AJNR 2:472–474, September/October 1981 0195-6108/81/0205-472 $00.00

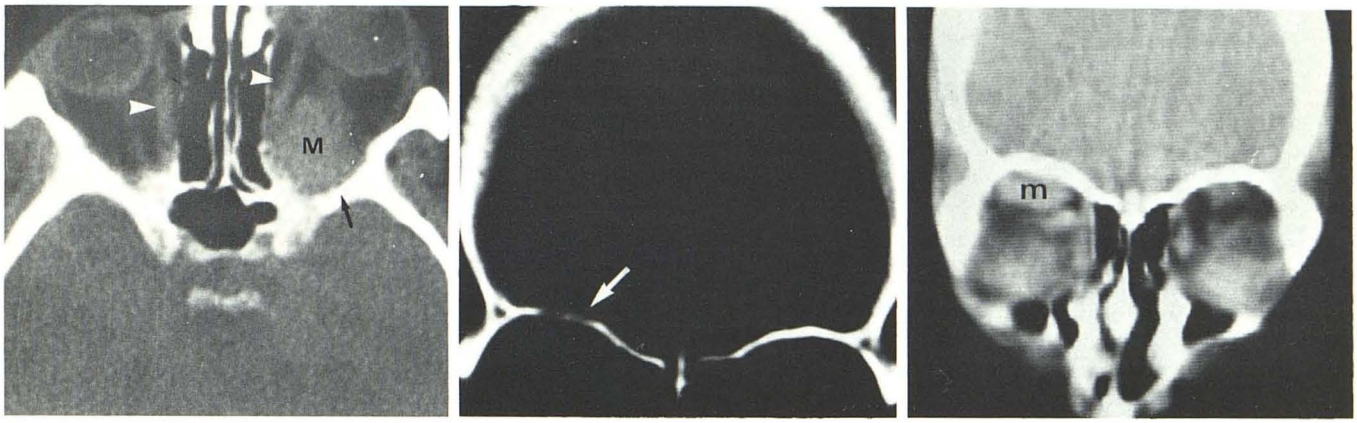

Fig. 1.—**A**, Axial CT scan with contrast. Slightly enhancing mass (M) in superoposterior right orbit. Moderate enlargement of both medial recti (*arrowheads*). Remodeling of posterior bony wall of right orbit (*arrow*). Obvious right exophthalmus. **B**, Coronal scan (level 189 EMI units, window 400 EMI units). Thinning (*arrow*) of bony roof of right orbit. **C**, Coronal conventional scan (level 0, window 200 EMI units). Large superior right orbital mass (M).

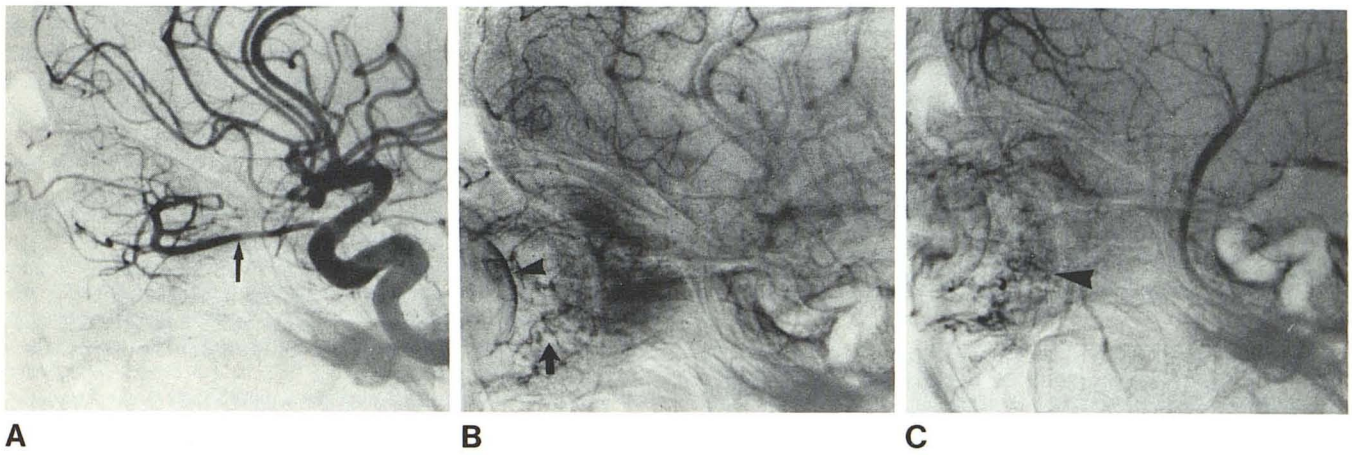

Fig. 2.—**A**, Arterial phase, selective internal carotid injection. Marked stretching (*arrow*) of ophthalmic artery. **B**, Orbital capillary phase. Multiple irregular small vessels (*arrow*) and diffuse stain predominating at orbital apex. Slight flattening of choroid crescent by mass effect (*arrowhead*). **C**, Venous phase. Persistent abnormal vascularity and puddling of contrast (*arrowhead*).

causing raised intraorbital pressure and that orbital enlargement is important in differentiating a space-occupying lesion from unilateral exophthalmus of endocrine origin.

In the orbit, there are two ways in which carotid angiography may reveal an abnormality; either by the displacement of vessels or by demonstration of pathologic circulation. Thus, examination may be of help in revealing both the site and the nature of the lesion [15]. However, we have been unable to find a description in the literature of the arteriographic findings in thyroid ophthalmopathy [6–16]. Hanafee and Dayton [12] describe "irregular arteries in the late arterial phase and a distinct tumor-like staining caused by contrast-laden capillaries in the capillary phase" on an arteriogram done on a patient with unilateral exophthalmus caused by pseudotumor of the orbit. They ascribe the "tumor stain" to areas of cellular inflammation consistent with pseudotumor. Another vascular method of investigation, orbital venography, shows only nonspecific findings in patients with endocrine exophthalmus. Orbital myositis is often noted in these patients and the orbital veins may be dilated, especially adjacent to the involved eye muscles. However, Doyon et al. [16] found that orbital venography was of little help in differentiating malignant exophthalamus of endocrine cause from other lesions of the orbit. The flow in the superior ophthalmic vein may be blocked as intraorbital pressure increases, but this was a nonspecific finding also seen in many mass lesions.

We believe that the bone erosion and expansion demonstrated in our case was the result of direct pressure erosion by the huge superior rectus and superior oblique muscles. Thinning and resorption of bone may have also resulted from the diffuse hyperemia in the orbit. The numerous dilated capillaries, arterioles, and venules noted in the pathologic specimen forms the basis for the angiographic findings of increased vascularity and dilated small vessels in the late arterial, capillary, and venous stages.

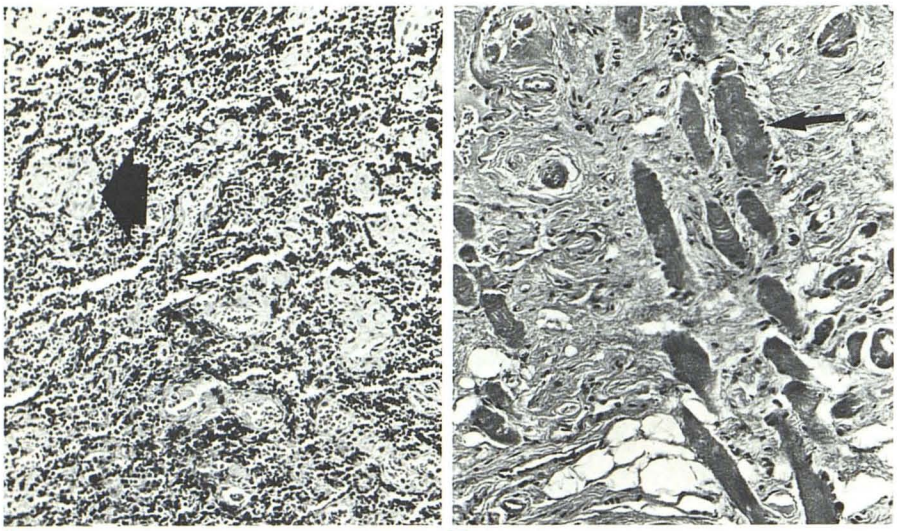

Fig. 3.—Muscle biopsy ×125. **A**, Lymphocytes infiltrate with rich vascular background composed of dilated capillaries, arterioles, and venules (*arrow*). **B**, Enlarged extraocular muscle fibers (*arrow*) with degenerative changes, separated by loose, edematous collagen.

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