MIRIAN GETSADZE

STUDY OF NEOPLASMS OF THE EYE AND ORBIT BY COMPUTED TOMOGRAPHY METHOD

D. Agmashenebeli University of Georgia, Tbilisi, Georgia

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მირიან გეწაძე

თვალისა და ორბიტის ახალწარმონაქმნების კვლევა კომპიუტერული ტომოგრაფიული მეთოდით

საქართველოს დავით აღმაშენებლის სახელობის უნივერსიტეტი, თბილისი, საქართველო

რეზიუმე

ორბიტის ნეოპლაზმები ხშირად იწვევს მხედველობის ფუნქციის დაკარგვას და პაციენტის ინვალიდობას. ამიტომ, ორბიტისა და თვალის კაკლის სიმსივნეების დროს ადრეული დიაგნოსტიკისა და დროული მკურნალობის ღონისძიებებს სამედიცინო და სოციალური მნიშვნელობა ენიჭებათ. მრავალშრიანი კომპიუტერული ტომოგრაფების გამოყენება საშუალებას იძლევა ჩავატაროთ უწყვეტი მოცულობითი სკანირება და მოვახდინოთ მინიმალური პათოლოგიური კერის (სიმსივნეები, მეტასტაზები და ა.შ.) მკაფიო იდენტიფიცირება.

შედარებითი მრავალშრიანი კომპიუტერული ტომოგრაფიული გამოკვლევა ჩაუტარდა ორბიტისა და თვალის კაკლის პირველადი წარმონაქმნის მქონე 38 პაციენტს. ორბიტისა და თვალის კაკლის პირველადი სიმსივნეების CT სემიოტიკის ანალიზის შედეგად გამოვლინდა მათი საერთო ნიშნები.

Introduction. In the practice of ophthalmology, the differential diagnosis of orbital tumors, as well as intraocular neoplasms, is still among the important and difficult diagnostic dilemmas. Regardless of the nature of the pathological process, neoplasms of the orbit often cause loss of visual function and disability of the patient. Loss of visual function in benign tumors and the threat to the patient's life in case of malignant neoplasms of the orbit and eyeballs determine the medical and social significance of early diagnosis and timely therapeutic measures [1]. Multislice CT scanners allow continuous volume scanning within 30-40 cm of the anatomical space with breath-holding, which ensures clear differentiation of minimal pathological foci (tumors, metastases, etc.) [2].

Methods. The studies were conducted on the **SIEMENS Somatom Perspective 128 type** CT scanner, which is an ultra-modern, 128-slice model. The use of Somatom Perspective is relatively safe for patients and staff, as it is equipped with SAFIRE technology and reduces the patient's radiation exposure by 60% [3,4].

CT of the orbits was carried out by scanning in automatic mode using a special program embedded in the computer program of the tomograph. The program allows image reconstruction in sagittal, coronal, and axial planes. In the first stage of the study, the image is obtained in the axial projection (with the patient in a supine position) at the angle of inclination corresponding to the roof line of the orbit of the X-ray tube. The examination area was marked from the lower edge of the maxillary sinus to the upper edge of the frontal sinuses; 1 mm thick incisions were made in this area to evaluate the tumor location, size, shape, structure, density (fat (-120 - -30 units H), liquid (0 - +29 units H), soft tissue (+30 - + 70 units H)), tissue (+ more than 70 units H)), spreading to surrounding structures, destruction of orbital bone walls, infiltration of extraocular muscles, orbital tissue and optic nerve [5].

Study results and their discussion. A comparative multislice computed tomography examination was performed in 38 patients with a primary neolplasm of the orbit and eyeball. While conducting the study, we evaluated the following parameters:

- Localization of the neoplasm

- Dimensions of the pathological focus
- The shape of the tumor
- Structure of neoplasia
- Connection of tumor and orbital structures.

As a result of the analysis of CT semiotics of primary tumors of the orbit and eyeball, their common features were revealed (Table 1).

Table 1. Computed tomographic signs of primary neoplasms of the orbit and eyeball

Computed tomographic signs		Primary neoplasms (n – 38)	
		აბს.	%
Architectonics	Solitary	36	94,7
	Multi-node	2	5,3
Shape	Oval	26	68,4
	Irregular	12	31,6
Structure	Heterogeneous	11	28,9
	Homogeneous	27	71,1
Inclusions	High-density	2	5,3
	Low-density	7	18,4
	Combination	-	-
	No inclusions	20	52,6
Surface	Smooth	30	78,9
	Irregular, nodular	8	21,1
Accumulation of contrast	High	23	60,5
	Medium	8	21,1
	Low	7	18,4

When analyzing the computed tomographic image of the primary neoplasms of the orbit and eyeball, depending on the morphological variant of the tumor, the following features were revealed.

All melanomas were localized in the eyeball, had a smooth surface (90.9%) and a uniform structure. In some studies, small retinal detachments were visualized. No changes were observed in the ocular motor muscles or retroorbital tissue.

Here is an example of a clinical study: Patient A., 71 years old, came with complaints of ptosis of the lower eyelid of the right eye, pain, and decreased visual acuity of the right eye. During spiral computed tomography (Fig. 1.) in the right eyeball along the medial contour, a mass of soft tissue density, slightly hyperdense (30-34 HU), moderately heterogeneous structure, located near the inner wall of the eyeball was visualized.

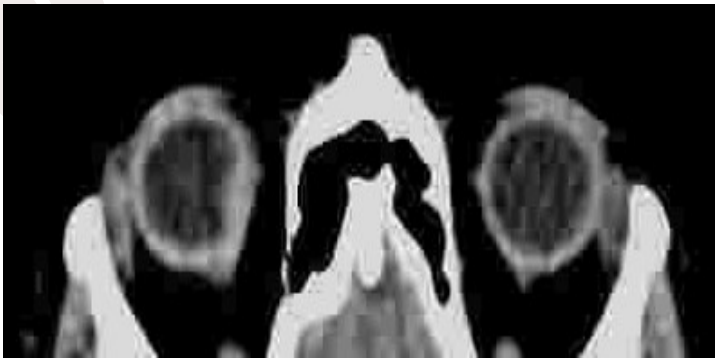

Fig. 1. Computed tomography fragment of Patient A., 71 years old

In the lateral parts of the right eyeball, the neoplasm of a heterogeneous structure with a dimension of 11x3 mm is visualized.

The dimensions of the pathological focus were 11x3 mm. The neoplasm had an irregular shape and partially unsharp contours. The spread of the tumor beyond the eyeball was not detected, the contours of the eye muscles were clear. The patient was diagnosed with choroidal melanoma of the right eyeball.

Cavernous hemangioma was single in most cases - 92.3% of cases. The shape of the cavernous hemangioma was irregular in all cases, contours were not sharp in 53.8%. The internal structure of cavernous hemangioma was mostly equally heterogeneous - 84.6%, in 30.8% of neoplasms, calcified inclusions were determined, and in 15.4% - the inclusions of a mixed nature were visualized.

Here is an example of a clinical study: Patient M, 65 years old, when referring to the hospital, the main complaint for was the left eye proptosis. Computed tomography (Fig. 2.) in the left orbit, between the left optic nerve and the external rectus muscle, shows an irregular, clearly contoured tissue formation, which is isodense with the surrounding muscles and contrasts relatively homogeneously on post-contrast slices. The formation causes a mass effect on the optic nerve, causing its deviation medially and the II degree proptosis. No bone invasion or hyperostosis is observed. The patient was diagnosed with cavernous hemangioma of the left orbit.

Fig. 2. Computed tomography fragment of Patient A., 65 years old. A tissue formation with a clear contour is visualized in the left orbit

For cancer arising from pleomorphic adenoma of the lacrimal gland, the characteristic localization of the tumor is observed - in the upper outer parts of the orbit, which corresponds to the projection of the lacrimal gland.

The shape of the tumor was irregular, with incorrect contours in 85.7% of cases. In 71.4% of cases, the heterogeneity of the structure was detected due to the presence of cystic inclusions.

Here is an example of a clinical study: Patient B., 51 years old, came with complaints of double vision, left-sided proptosis, and decreased vision in the left eye. Ophthalmological examination revealed conjunctival chemosis, restriction of lateral movement of the eyeball, and narrowing of the palpebral fissure above and to the left. Visual acuity on the affected side is 0.6, and on the healthy side - 1.0. Fundus is with signs of optic disc congestion. The boundaries of the visual fields are not changed.

During the spiral computed tomography (Fig. 3.), a formation of the left eye socket with the presence of both a cystic and a solid component was detected. The epicenter of the formation was located on the projection of the left lacrimal gland. There is left-sided proptosis with medial dislocation of the optic nerve and extraocular muscles. Adjacent bone remodeling is also detected, without osteolytic lesions, CT scan of intracranial spread without signs.

Fig. 3. Computed tomography fragment of Patient A., 51 years old. The neoplasm of a heterogeneous structure is visualized in the lateral parts of the left eyeball

The neoplasm had a irregular, unclear contour, a sharply inhomogeneous structure, with the presence of cystic and solid (contrast) elements therein. Adenocarcinoma of the left lacrimal gland was morphologically confirmed.

In B-cell lymphoma of the soft tissues of the orbit, the oval shape of the formation predominated, with clear contours in 80% of cases. The tumor was most often localized in the posterolateral parts of the orbit.

Characteristic is the heterogeneity of the structure (80%). Densitometric inclusions of low and high density were found in an equal percentage ratio.

Contrast agent accumulation by tumor tissue was high in 60% of cases, moderate contrast accumulation was observed in the remaining 40%.

Here is an example of a clinical study: Patient K, 74 years old, came to the clinic with complaints of proptosis of the left eye and restriction of movements on the corresponding side. During the ophthalmological examination, there was limited movement of the left eyeball laterally and downwards, difficulty in repositioning the eye, exophthalmos on the left side within 2.1 mm, visual acuity 1.0, the borders of the visual fields did not change. The tomograms obtained as a result of spiral computed tomography (Fig. 4.) show a homogeneous, soft-tissue formation of the left eyeball with irregular, unclear contours, which is isodense to the extraocular muscles and causes left-sided proptosis and medial deviation of the eyeball and optic nerve. In order to clarify the diagnosis, a study using contrast material was conducted.

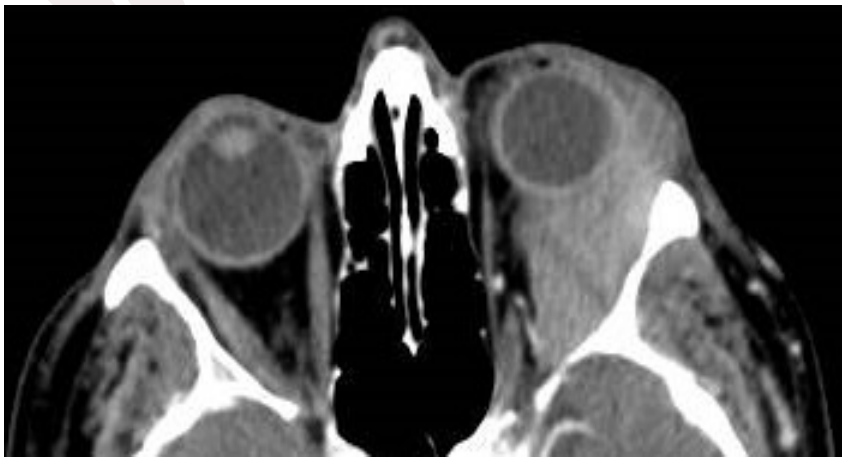

Fig. 4. Postcontrast computed tomography fragment of Patient K, 74 years old.

The patient was diagnosed with B-cell non-Hodgkin lymphoma, the so-called MALT associated diagnosis.

In retinoblastoma, the irregular shape of the neoplasm prevailed, with unclear contours in 70% of cases. The tumor was most often localized in the eyeball and the lower quadrant of the orbit. Retinoblastoma is characterized by heterogeneity of structure (85%).

Ophthalmological examination revealed restriction of lateral and downward movement of the eyeball. The boundaries of the visual fields are not changed.

Here is an example of a clinical study: Patient L, a 33-month-old boy, changes were observed in the fundus examination (fundoscopy). Spiral computed tomography was carried out (Fig. 5.). A non-contrast tomogram shows an irregular, opaque contoured soft tissue mass in the left eyeball. Given the age of the patient and the presence of hyperdense inclusions within the neoplasm, retinoblastoma is practically an uncontested diagnosis.

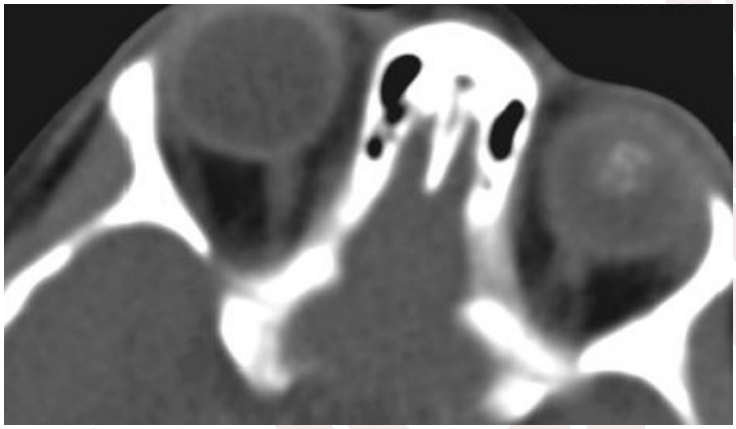

Fig. 5. Non-contrast computed tomography fragment of Patient L, 33 months

In the case of basal cell carcinoma, the neolpasm was mostly misshapen, with unclear contours in 80% of cases. The tumor was most often localized in the eyeball and lower quadrant. Characteristic is the heterogeneity of the structure (80%).

Here is an example of a clinical study: Patient E., 88 years old, came with complaints of pain in the lower eyelid of the right eye and decreased visual acuity in the right eye. Computed tomography (Fig. 6.) visualized a mass of soft tissue density (25-35 HU), heterogeneous structure, closely related to the lower eyelid, covering the inner corner and extending into the socket, along the medial contour of the right eye socket.

Fig.6. Computed tomography fragment of Patient E., 88 years old. In the right eye socket, in close connection with the lower eyelid, a heterogeneous neoplasm with an irregular contour is visualized

The dimensions of the pathological focus were 15x12 mm. The neolpasm had irregular, patchy, indistinct contours. The spread of the tumor beyond the eyeball was not detected, the contours of the eye muscles were clear. The patient was diagnosed with basal cell carcinoma of the lower eyelid.

Conclusion. The analysis of the obtained data revealed that the sensitivity of the method of computed tomographic study in the diagnosis of primary tumors of the orbit and eye socket was 95%, specificity - 91.4%, and accuracy - 93.1%. Finally, we can conclude that the method of computed tomographic study provides a high probability of differentiating eye and orbit neoplasms and can be successfully used in modern medicine.

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D. Agmashenebeli University of Georgia, Tbilisi, Georgia

SUMMARY

Neoplasms of the orbit often cause loss of visual function and disability of the patient. Therefore, early diagnosis and timely therapeutic measures for orbital and eyeball tumors are of medical and social importance. The use of multislice CT scanners allows us to carry out continuous volumetric scanning and to clearly identify the smallest pathological focus (tumors, metastases, etc.). A comparative multislice computed tomography study was carried out in 38 patients with primary neoplasm of the orbit and eyeball. The analysis of CT semiotics of primary and secondary tumors of the orbit and eyeball revealed their common features.

Keywords: neoplasms; computed tomography; melanoma; cavernous hemangioma; pleomorphic adenoma; lymphoma; retinoblastoma; basal cell carcinoma