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Computer and Magnetic Resonance Tomography Possibilities in Diagnosis Recurrent Juvenile Angiofibroma and Detection Possible Reasons of Failure due to Primary Surgical Interventions

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Abstract

The purpose is to assess the value of computed and magnetic resonance tomography in diagnosis of recurrent juvenile angiofibroma, to determine its cause and to make a decision about additional surgical intervention. Above-mentioned imaging methods allow to reveal recurrent juvenile angiofibroma growth in different places of maxilla-facial and skull base regions. These methods allow to determine a tentative cause of failure during primary surgical intervention due to lack of visual control or to significant dimensions of the tumor and its expansions, one of which can be torn off during neoplasm mobilization. The fragment of neoplasm can remain unnoticed during final control examination especially in the conditions of profuse bleeding. One more reason – radiologists mistake in evaluation of angiofibroma spreading. On the basis of computed and magnetic resonance tomography it's become possible to determine localization and dimensions of recurrent juvenile angiofibroma growth and to choose an optimal surgical approach for elimination of the process.

Keywords: juvenile angiofibroma, computed tomography, magnetic resonance tomography, surgical intervention, nasopharynx, auditory tube.

1. Introduction

Surgical treatment of juvenile angiofibroma (JAF) of cranial base is not always characterized by absolute reliability (Dolgushin et al. 2011), (Rzaev, 2005), (Speranskaya, Cheremisin, 2009), (Sennes, 2003). Sometimes recurrence of JAF is observed in different periods after the primary surgery. According to different authors, the recurrence rate is 8 %-63,4 % (Daikches et al. 2005), (Lopatin et al. 2009), (Tang et al. 2009), (Z et al. 2007) in surgically treated patients. We assure that choice of surgical intervention and methodology base of its performing should be support through CT and MRI examinations. Our tactic concerning spreading and choice of surgical approach for JAF was sufficient, but not absolutely reliable. We did a report about it early (Minenkov, Shalabaev, 2011).

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2. Materials and methods

Between 2001-2010 years in otorhinolaryngology-head and neck surgery department National Hospital of Kyrgyz Republic 85 patients were operated with pathomorphological verified JAF. All of them were males between 11 and 31 years old. Among them JAF was removed via natural routes in 7 patients, via endoscopic endonasal approach - in 5 patients, via Denker approach - in 3 patients, via lateral rhinotomy, including extended variants - in 61, via Laurs-Balon approach - in 4 patients and via combined approach (lateral rhinotomy and Laurs-Balon approach) - in 5 cases. At different post-operated time the signs of continued tumor growth developed in 11 patients (13 %). Clinical examination including CT and/or MRI findings, confirm recurrent JAF in all cases. The recurrent JAF was removed in 2 cases after natural routes and in 1 case after endoscopic endonasal approach (primary operations via lateral rhinotomy), in 7 cases after lateral rhinotomy (primary operations via natural routes in 2 cases, via endoscopic endonasal approach - in 2 cases and via lateral rhinotomy in 3 cases) and in 1 case - after Laurs-Balon approach (primary operation was via lateral rhinotomy). We can demonstrate it in the Table.

Patients with recurrent JAF were examined on CT scanners (1-slice Hitachi Pronto, Japan and 16-slice Neusoft, China) with 1-3 mm step in axial view with following reconstructions in coronary projections and on MRI scanner (Philips, Hyrosan-T5-NT, Japan) with 5 mm step in axial, coronal and sagittal views. During analyses CT and MRI examinations we focus our attention on tumor structure, boundaries, form, size and extensions, condition of bone and soft-tissues anatomical structures in consideration of anatomical changes resulting from primary surgical intervention.

Table 1. Comparison of different surgical approaches to JAF and rate of recurrence on the basis of CT, MRI examinations and intraoperational findings

Surgical approach	Number of primary operated patients		Number of recurrences	
	Abs.	%	Abs.	%
Natural routes	7	8	2	18
Endoscopic endonasal	5	6	1	9
Denker	3	3	-	-
Lateral rhinotomy, including extended variants	61	72	7	64
Laurs-Balon	4	5	1	9
Combined (lateral rhinotomy and Laurs-Balon)	5	6	-	-
Total:	85	100	11	100

3. Discussion

The patients complained of difficulty nasal breathing, earache due to secondary obstruction of auditory tube, occasional nasal bleedings and deformation of facial skull. Among them in 2 cases pink, high dense tissue with tuberous spots was noted on nasopharynx.

CT and MRI features for primary and recurrent JAF were very similar. On CT recurrent JAF was defined with non-homogeneous little spotted shadow with density +44,4+55,3 HU. It had the irregular form with slightly deformed hemisphere or ellipse-like contours at widespread tumors. Such formation of contours of a shadow during tumor growth depends on an anatomical constitution of region (a nasal cavity, sphenoid or another paranasal sinuses, pterygoid, pterygopalatine and infratemporal fossa, walls of orbit, optic canal, basocranial regions etc.). Deformation of bone formations from increasing pressure could be seen. That was manifested by their displacing and thinning, slowly increased to the defects. Sometimes it leads to the formation of «sclerosis» periphery rim. The post contrast CT scans reveal an enhancing mass. On MRI the mass of recurrent JAF is manifested by low-to-intermediate signal intensity and multiple areas of signal (flow) void representing the major tumor vessels.

In 8 cases the failure of primary surgical removal of JAF was due to large size and a lot of branches. Prior to the first surgery, the JAF shadow on CT and MRI in these patients corresponded to several anatomic formations. In addition, to nasopharynx and posterior part of the nose, its also overlapped on sphenoid and another sinuses, retromaxillary space and infratemporal fossa. In these cases, in addition to large size tumor extensions there also were smaller ones that after neoplasm preparation could be removed from the main part of JAF and missed during control examination.

In some cases was really hard to decide the place of continuous growth. In one case growing JAF partly (3 cases) or completely (1 case) filled an extensive defect that was formed after ordinary or extended lateral rhynotomy. With such CT results it is impossible to make a decision about the place where part of the tumor had not been removed. However, we could assume that primary surgery defect was located in retromaxillary space where JAF continued growth was not manifested by any symptoms in post-operative period (Fig. 1, 2). It was removed via lateral rhinotomy (3 cases) and via Laurs-Balon approach (1 case).

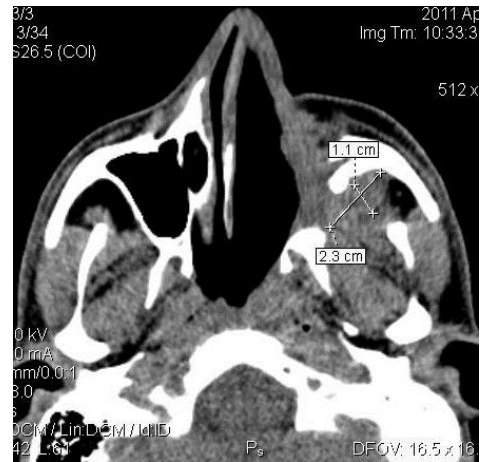
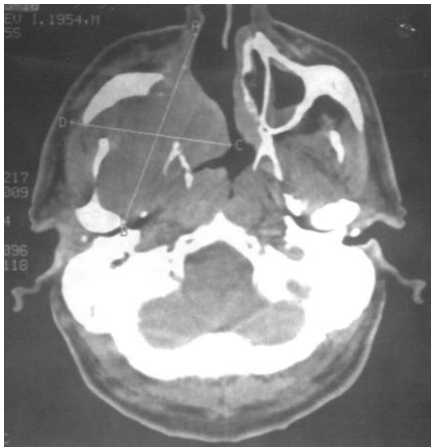


Fig. 1. Axial CT shows recurrent JAF completely filled the right retromaxillary space.

Fig. 2. Axial CT shows recurrent JAF partly filled the left retromaxillary space.

In another cases removing nasopharyngeal JAF via lateral rhynotomy there were signs of continued growth: unilateral difficulty with nasal breathing developed early, and tumor started to grow in the posterior part of this side of the nose (3 cases). MRI and CT studies performed because of these symptoms revealed tumor growth in the posterior part of the nose and nasopharyngeal posterior and lateral wall with compression of pharyngeal part of auditory tube from one side. Considering primary JAF area (nasal cavity, nasopharynx, main sinus, retromandibular space and growth into middle cranial fossa), a conclusion can be made that remaining part of tumor was located in posterior lateral nasal wall (Fig. 3, 4). They were removed via natural routes in 2 cases and via endoscopic endonasal approach- in 1 case.

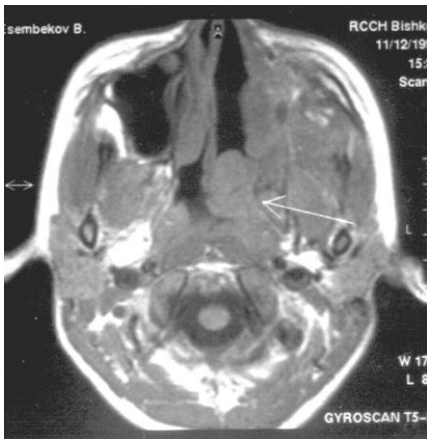


Fig. 3. Axial T1-weighted MRI shows recurrent JAF filled the left side posterior part on the nose.

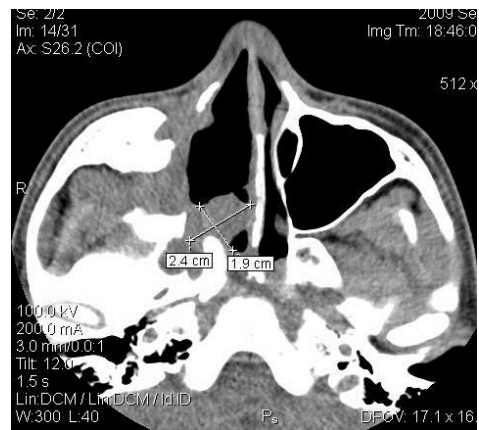


Fig. 4. Axial CT shows recurrent JAF filled the right side posterior part on the nose.

In the 1st case recurrent initial JAF was removed via Laurs-Balon. Five month later on the basis of CT it was found not only in sphenoid sinus, but inside optic canal too. It's very important that this fact was not reflected in protocol of CT and MRI examinations. It was confirmed during surgical intervention. In this case fragment of JAF additionally located in middle cranial fossa (Fig.5). Recurrent JAF was removed via lateral rhinotomy.

CT analysis allowed to conclude that patients with primary surgery performed via natural routes (2 cases) and via endoscopic endonasal approach (1 cases), the continued growth was due to exceeding the opportunities of these accesses. This was evident by the location of the recurrent tumor in pterygopalatine fossa and the primary CT analysis. It clearly showed the shadow of JAF which topically corresponded to the nasopharynx, posterior part of the nose and partly in pterygopalatine fossa. Even though the expansion of the tumor was not extensive, its complete removal without visual control could be difficult. That's why the recurrent tumor was found in pterygopalatine fossa only (2 cases) and in pterygopalatine fossa and posterior part of the nose (1 case), demonstrated on Fig. 6. The recurrent tumor was removed via lateral rhinotomy.

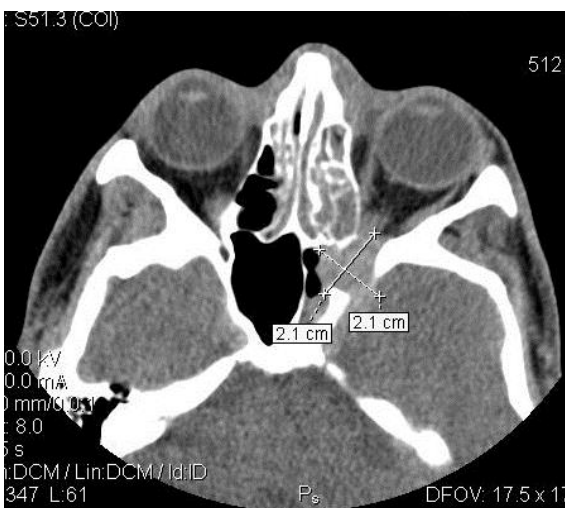


Fig. 5. Axial CT shows recurrent JAF inside optic canal, sphenoid sinus and middle cranial fossa from the left side. Demonstrated shading of both sides ethmoid cells.



Fig. 6. Axial CT shows recurrent JAF in pterygopalatine fossa and posterior part of the left nose.

4. Results

CT and MRI conclusions of recurrent JAF growth were performed in 11 patients in order to decide the surgical approach to tumor removal.

In one case after primary lateral rhinotomy tumor shadow was projected to nasopharynx and pterygopalatine fossa, retromandibular space and subtemporal area. Recurrent tumor was removed after Laurs-Balon approach.

In another 3 cases the tumor shadow occupied nasal cavity and the extensive defect formed due to primary surgical intervention; it was similar to anatomic features founding the first case. Such location of continued JAF growth could not be surgically corrected via natural routes. For this reason, lateral rhinotomy was resorted to as the approach for tumor removal in these cases.

In 3 cases, CT study allowed to reveal that continued tumor growth was restricted by posterior nasal cavity. Such location allowed to conclude that the tumor could be removal via natural routes (2 cases) and via endoscopic endonasal approach (1 case). This decision was made despite the fact that in primary surgery JAF was removed via lateral rhinotomy.

In 1 case recurrent JAF was found inside optic canal, sphenoid sinus and middle cranial fossa. Recurrent JAF was removed via lateral rhinotomy. It's important that in protocols of CT and MRI examinations there were not reflected the fragment of the tumor placed in optic canal.

In 2 cases primary JAF were removed via natural routes and in 1 case via endoscopic endonasal approach and recurrent growth was due to exceeding the opportunities of these accesses. This was evidence by the location of the recurrent tumor only in pterygopalatine fossa or in pterygopalatine fossa and posterior part of the nose. The recurrent tumor was removed via lateral rhinotomy.

This change in operational tactics proved no tumor recurrence in these patients during 5 and more years follow-up.

5. Conclusion

Thus, CT and MRI features for primary and recurrent JAF were very similar. These methods allow to reveal continued JAF growth and permit to determine a tentative cause of failure of the primary surgical intervention. It can be related to exceeding the access opportunities due to lack of visual control or to significant dimensions of the tumor and its expansions, one of which can be torn off during neoplasm mobilization which can remain unnoticed during final control examination often conducted in the conditions of profuse bleeding. Additional reason of primary surgical failure is an absence of correct CT or MRI conclusion with detailed description of all braches and dimensions of JAF. This fact leads to underestimation of real tumor size in pre-operation period. CT and MRI allow to determine real location and dimensions of recurrent JAF growth and to choose an optimal surgical approach. This makes CT and MRI studies absolutely necessary in the presence of clinical signs suggestive of recurrent tumor growth.

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