Pediatric neck masses: Value of apparent diffusion coefficient in characterization.

Poster No.: C-0904
Congress: ECR 2014
Type: Scientific Exhibit
Authors: A. Youssef, A. Baiomy, Y. Mahfouz, T. Raafat, I. Gouda, A. Refaat, I. Zaky; Cairo/EG
Keywords: Head and neck, MR-Diffusion/Perfusion, Imaging sequences, Cancer
DOI: 10.1594/ecr2014/C-0904

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method ist strictly prohibited.
You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.
Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.
www.myESR.org
Aims and objectives

Head and neck masses in children represent a spectrum of malignant tumors and benign lesions that are sometimes difficult to differentiate by conventional imaging techniques. Our objective was to determine whether DWI and calculated apparent diffusion coefficient (ADC) value correlates with pathologic diagnosis of pediatric head and neck tumors and therefore allows more accurate tumor characterization.
Methods and materials

Patients:

We retrospectively reviewed the data for 100 pediatric patients (age range, 4 months - 17 years) who presented with head and neck mass to the Children's Cancer Hospital-Egypt (CCH-E) during the period from 1/2011 to 7/2012. The data were obtained from the radiology PACS database. For inclusion in our review, each patient had to have undergone conventional MRI and DWI. Patients who had received prior therapy were excluded from the study. All diagnoses were histologically confirmed by surgical excision or biopsy. As MRI and DWI are part of our routine imaging protocol, patient or institutional consent was not required. The average ADC obtained from each tumor was compared with the histological diagnosis benign, locally malignant or malignant.

MRI imaging:

All patients were evaluated by contrast-enhanced MRI using the Magnetom ESPREE 1.5 T (Siemens, Erlangen, Germany), a 1.5 Tesla super-conducting MR imager. All patients were examined in the supine position using the following sequences: Axial T1 FSE (TR = 450 ms, TE = 12 ms), Axial T2 SE (TR = 4540 ms, TE = 96 ms), Axial STIR (TR = 9000 / TE = 116 / TI = 2500 ms), and Sagittal T1 SE (TR = 430 ms, TE = 10 ms). A slice thickness of 5 mm and a gap and a matrix size of 256 x 256 mm were used. After intravenous administration of Gadolinium-DTPA (diethylene triamine pentaacetic acid, 0.3 mg/kg), contrast-enhanced T1WI in the axial, sagittal, and coronal planes were obtained.

DWIs were acquired with the following imaging parameters: TR = 3000, TE = 89, slice thickness = 5 mm, interslice gap = 1 mm, FOV = 230 x 180 x 130 mm, matrix = 112 x 70 mm, flip angle = 90 degrees and EPI factor = 51. The DWIs were acquired with b values of 0, 500, and 1000 s/mm², and calculated ADC maps were obtained. ADC was measured by manually placing ROIs of 50-100 mm² in tumor regions on the ADC map. We compared the ADC maps and other MR images carefully and placed ROIs in solid tumor components. We excluded necrotic and hemorrhagic tumor areas. We chose three otherwise random ROIs placed as centrally as possible within the tumor area and averaged the ADC values.

In patients with contrast-enhancing tumors, ROIs were placed at the site of enhancement. In patients with weakly enhancing or non-enhancing tumors, ROIs were chosen after identifying the solid part of the lesion. Necrotic components were differentiated on contrast-enhanced T1-weighted images as non-enhancing regions within enhancing tumors. Hemorrhagic lesions were differentiated on unenhanced T1-weighted MR images as areas of hyperintensity. In the pure cystic lesion, ROIs were placed in the center of the lesions.
Histopathologic Classification:

The final diagnoses were confirmed in most of malignant cases by guided biopsy however some cases were confirmed by open surgical biopsy. The diagnosed benign solid lesions were confirmed by biopsy as well, while diagnosis of benign inflammatory lesions and reactive lymph node were confirmed by correlation with clinical picture or radiological follow-up studies that revealed resolution or remarkable regression of the lesions after initiation of medical or anti-bacterial therapy.

Statistical Analysis

The statistical analysis of data was done by using Excel and the SPSS program (Statistical Package for Social Science version 15). The description of data was done in the form of mean and SD. The Kolmogorov-Smirnov (K-S) test was done for diagnosis normality of data distribution.

All data were revealed to be parametric with normal distribution. The analysis of data was done to test statistical significant difference. The Student's t test was used to compare between two groups. One way ANOVA was used to compare between more than two groups. The Receiver operating curve (ROC) was done to determine the cutoff point with highest accuracy and sensitivity. The p value was considered significant if #0.05 at the 95% confidence interval.
Results

One hundred pediatric patients with head and neck masses were studied (64 male and 36 female). Their ages range from 4 months to 17 years. On the basis of histological diagnoses, tumors were subdivided into benign (22 patients), locally malignant (7 patients) and malignant masses (71 patients). The rhabdomyosarcoma is the most common malignant pathological diagnosis (n=26) followed by nasopharyngeal carcinoma (n=14) and lymphoma (n=12). Table (1) shows the different pathological diagnosis of the malignant lesion. Locally malignant lesions (n=7), include chordoma (n=4), primitive myxoid mesenchymal tumor of infancy (n=2) and one case of giant cell tumor of bone as shown in table (2). The benign masses (n=22), the most common benign lesion were abscess (n=3) and neurofibroma (n=2). Table (1) shows the pathological diagnoses of the masses.

Regarding the location of the masses: the nasopharynx is the commonest location (n=19), followed by orbit (n=12) and masticator space (n=12). Table (4) shows the frequency of the location of the masses.

The mean ADC values of the malignant tumors, locally malignant masses and benign lesions were $(0.83\pm0.23) \times 10^{-3}$, $(1.43\pm0.17) \times 10^{-3}$ and $(1.65\pm0.58) \times 10^{-3}$ mm$^2$ s$^{-1}$, respectively. Fig.1 shows a box and plot of the ADC values of malignant, locally malignant and benign pediatric head and neck masses. ADC values of the malignant lesion are lower than those of the benign and the locally malignant lesions whereas there is overlap of the ADC values of the benign and the locally malignant lesions.

There were statistically significant differences in ADC values between the malignant tumors and benign lesions (p<0.001), with strong reverse correlation ($r$ value= -0.54). There were statistically significant differences in ADC values between the malignant tumors and locally malignant lesions (p<0.001). There were no statistically significant differences in ADC values between the benign tumors and locally malignant lesions (p 0.33).

Quantitative analysis revealed that the mean ADC value of malignant tumors was $(0.83 \pm 0.23) \times 10^{-3}$ mm$^2$ s$^{-1}$. The mean ADC value of rhabdomyosarcoma $(0.97 \pm 0.19) \times 10^{-3}$ mm$^2$ s$^{-1}$ (Fig. 2) is approximate to that of the nasopharyngeal carcinoma $(0.82 \pm 0.16) \times 10^{-3}$ mm$^2$ s$^{-1}$ (Fig. 3) where the lymphoma showed the least ADC value $(0.34\pm0.08) \times 10^{-3}$ mm$^2$ s$^{-1}$ (Fig. 4), the case of the aggressive malignant tumor, atypical teratoid rhabdoid tumor, had ADC value of $0.66 \times 10^{-3}$ mm$^2$ s$^{-1}$ (Fig. 5). Table (1) shows the mean ADC value of the malignant lesions.
The mean ADC value of locally malignant tumors was \((1.43 \pm 0.17) \times 10^{-3} \text{ mm}^2 \text{ s}^{-1}\). The mean ADC value was detected in patients with chordoma and primitive myxoid mesenchymal tumor of infancy (Fig.6) is \((1.2\pm0.17) \times 10^{-3} \text{ mm}^2 \text{ s}^{-1}\) and \((1.4 \pm 0.17) \times 10^{-3} \text{ mm}^2 \text{ s}^{-1}\) as shown in Table (2).

After exclusion of the abscesses, the mean ADC value of the benign lesions is \((1.65\pm0.58) \times 10^{-3} \text{ mm}^2 \text{ s}^{-1}\). We exclude the abscesses as they showed very low ADC value. The benign cystic lesions includes: cystic hygroma, thyroglossal cyst, coloboma, (Fig. 9a), and epidermoid cyst, the ADC value of these cyst range from 1.8 to 3.1 \(\times 10^{-3} \text{ mm}^2 \text{ s}^{-1}\). The solid lesions include fibromatosis, angiofibroma, hamartoma, teratoma, (Fig. 7), Warthin tumor, parotid adenoma, inflammatory myofibroblastic tumor (Fig. 8), and neurofibroma, the ADC value of these lesions range from 1.2 to 2.1 \(\times 10^{-3} \text{ mm}^2 \text{ s}^{-1}\).

DWI is useful in differentiation between pyogenic abscess and the necrotic malignant lesions as well as the benign cyst as the cystic component of the abscess contains vicious pus which form an obstacle in front of water mobility thus show restricted diffusion whereas the necrotic malignant lesions show facilitated diffusion (Fig.9, 10).

The receiver operating characteristic curve (ROC) (Fig. 11a) revealed that the threshold ADC value for differentiation between benign and malignant pediatric head and neck masses was \# 1.19\(\times10^{-3} \text{ mm}^2 \text{ s}^{-1}\) with a sensitivity of 97.3%, specificity of 80.0%, positive predictive value of 94.7% and negative predictive value of 88.9%. The ROC curve (Fig. 11b) showed the threshold ADC value for differentiation between malignant and locally malignant masses was \#1.19\(\times10^{-3} \text{ mm}^2 \text{ s}^{-1}\) with a sensitivity of 97.3%, specificity of 100.0%, positive predictive value of 100.0% and negative predictive value of 77.8%. The ADC value of the locally malignant tumor is overlap with that of the benign masses.

We found a significant negative correlation between average ADC and tumor histopathologic diagnosis \((P < 0.001, r = -0.54)\): The mean ADC values of the malignant tumors, locally malignant masses and benign lesions were \((0.83\pm0.23) \times 10^{-3}\), \((1.43\pm0.17) \times 10^{-3}\) and \((1.65\pm0.58)\times10^{-3} \text{ mm}^2 \text{ s}^{-1}\), respectively. Cut off value \# 1.19 \(\times10^{-3}\) \(\text{ mm}^2 \text{ s}^{-1}\) was used for differentiation between benign and malignant pediatric head and neck masses with a sensitivity of 97.3%, specificity of 80.0%, and positive predictive value of 94.7% and negative predictive value of 88.9%.
**Table 1:** Table (1):- The frequency and the mean ADC value of the malignant tumor.

© Radiology, Cairo university, national cancer institue - Cairo/EG

<table>
<thead>
<tr>
<th>Tumor Pathology</th>
<th>Frequency</th>
<th>ADC value Mean ± STD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhabdomyosarcoma</td>
<td>26</td>
<td>0.97 ± 0.19</td>
</tr>
<tr>
<td>Nasopharyngeal carcinoma</td>
<td>14</td>
<td>0.82 ± 0.16</td>
</tr>
<tr>
<td>Non-Hodgkin's Lymphoma</td>
<td>9</td>
<td>0.48 ± 0.10</td>
</tr>
<tr>
<td>metastatic lymph node</td>
<td>5</td>
<td>0.74 ± 0.17</td>
</tr>
<tr>
<td>Hodgkin Lymphoma</td>
<td>3</td>
<td>0.69 ± 0.03</td>
</tr>
<tr>
<td>Neuroblastoma (Netz)</td>
<td>3</td>
<td>0.89 ± 0.25</td>
</tr>
<tr>
<td>Leukemia</td>
<td>2</td>
<td>0.62 ± 0.01</td>
</tr>
<tr>
<td>ATRT</td>
<td>1</td>
<td>3.10</td>
</tr>
<tr>
<td>Epithelial carcinoma</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Fibrosarcoma</td>
<td>1</td>
<td>1.06</td>
</tr>
<tr>
<td>Langerhans cell histiocytosis</td>
<td>1</td>
<td>0.85</td>
</tr>
<tr>
<td>Mucopidermoid carcinoma</td>
<td>1</td>
<td>1.25</td>
</tr>
<tr>
<td>parotid gland undifferentiated Carcinoma</td>
<td>1</td>
<td>0.98</td>
</tr>
<tr>
<td>PNET</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>Retinoblastoma</td>
<td>1</td>
<td>0.88</td>
</tr>
<tr>
<td>undifferentiated carcinoma</td>
<td>1</td>
<td>1.10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>71</strong></td>
<td><strong>0.83 ± 0.23</strong></td>
</tr>
</tbody>
</table>
Table 2: Table (2) : the frequency and the mean ADC value of the locally malignant tumor

© Radiology, Cairo university, national cancer institute - Cairo/EG

<table>
<thead>
<tr>
<th>Tumor Pathology</th>
<th>Frequency</th>
<th>Mean ± STD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chordoma</td>
<td>4</td>
<td>1.43 ± 0.20</td>
</tr>
<tr>
<td>Primitive myxoid mesenchymal tumor of infancy (PMMTI)</td>
<td>2</td>
<td>1.50 ± 0.14</td>
</tr>
<tr>
<td>Giant cell tumor of bone</td>
<td>1</td>
<td>1.28</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>1.43 ± 0.17</td>
</tr>
</tbody>
</table>
Table 3: Table (3): The frequency and the mean ADC value of the benign lesions after exclusion of the 3 cases of abscesses.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Table 4: Table (4): The frequency of the location of the masses.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Fig. 1: Fig. 1 Box and whisker plot of pediatric head and neck masses. Malignant tumours show lower ADC values than benign masses.

© Radiology, Cairo university, national cancer institute - Cairo/EG
**Fig. 2:** 14 year old male with left cheek mass, MRI shows ill-defined enhanced left maxillary mass lesion shows diffusion restriction with low ADC value (0.95x 10^-3 mm²/sec), pathological diagnosis revealed: Rhabdomyosarcoma
Fig. 3: 10 years old male patient presented with right cervical mass lesion: MR shows large nasopharyngeal mass, iso to hypointense on T2wi with uniform enhancement, calculated ADC value (0.85 x 10^-3 mm^2/sec), associated enlarged right upper deep cervical lymph nodes (level V) show the same signal and enhancement pattern, calculated ADC value was (0.95 x 10^-3 mm^2/sec), pathological diagnosis revealed undifferentiated nasopharyngeal carcinoma.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Fig. 4: 16 years old female patient presented with chronic headache and left check fullness: MR shows left maxillary solid mass lesion, iso to hypointense on T2wi and T1wi with faint enhancement, calculated ADC value (0.34 x 10^-3 mm2/sec), pathological diagnosis revealed non Hodgkin Lymphoma.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Fig. 5: 10 months boy presented with large cervical mass lesion: MR shows large cervical mass lesion shows heterogeneous signal and enhancement, calculated ADC value (0.66 x 10^-3 mm^2/sec), pathological diagnosis revealed Atypical Teratoid rhabdoid tumor

© Radiology, Cairo university, national cancer institute - Cairo/EG
**Fig. 6:** 5 months girl presented with large cheek mass MR shows large facial mass lesion seen occupying the left maxillary sinus extending into the right orbit and through the optic canal to intracranial cavity, the lesion shows with heterogeneous enhancement, calculated ADC value ($1.66 \times 10^{-3} \text{ mm}^2/\text{sec}$), pathological diagnosis revealed Myxoid mesenchymal tumor of the infancy, a locally malignant rarely metastasing tumor.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Fig. 7: 13 year old female patient presented with chronic headache and left check fullness: MR shows left sided solid mass lesion seen occupying the left maxillary sinus extending into the nasopharynx, the lesion shows heterogeneous enhancement, calculated ADC value (1.06 x 10^-3 mm²/sec), pathological diagnosis revealed inflammatory myofibroblastic tumor.

© Radiology, Cairo university, national cancer institute - Cairo/EG
**Fig. 8:** 1.5 year old female patient presented with right cheek fullness: MR shows right parapharyngeal mass showing mixed fatty, calcific, solid and cystic components, calculated ADC value of the solid component (2.2 x 10^-3 mm^2/sec), pathological diagnosis revealed mature teratoma.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Fig. 9: 1 year old male patient presented with left sided proptosis: MR shows left sided retroocular cystic lesion has fluid like signal with small eye globe, no significant enhancement, calculated ADC value (2.6 x 10^-3 mm^2/sec), final diagnosis was coloboma.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Fig. 10: Fig (9b) : 7 year old male patient presented with left sided eye proptosis and pain : MR shows left sided retroocular cystic lesion has fluid like signal with significant wall enhancement associated ethmoidal and maxillary sinusitis , the lesion shows restricted diffusion ( light bulb in DWI ) the calculated ADC value ( 0.4 x 10^{-3} \text{ mm}^2/\text{sec} ), final diagnosis was abscess.

© Radiology, Cairo university, national cancer institute - Cairo/EG
**Fig. 11:** Fig (10a) : 5year old male patient presented with left submandibular lesion : MR shows left sided submandibular cystic lesion has fluid like signal with thick wall shows enhancement ,the wall show restricted diffusion whereas the internal cystic core shows facilitated diffusion, the calculated ADC value of the wall ( $1.2 \times 10^{-3}$ mm$^2$/sec), final diagnosis was necrotic metastatic lymph nodes.

© Radiology, Cairo university, national cancer institute - Cairo/EG
**Fig. 12:** Fig (10 b) : 11 year old female patient presented with right submandibular mass: MR shows right submandibular cystic lesion has fluid like signal with significant wall enhancement, the lesion shows restricted diffusion (light bulb in DWI) the calculated ADC value (0.36 x 10^-3 mm2/sec), final diagnosis was abscess.

© Radiology, Cairo university, national cancer institute - Cairo/EG
**Fig. 13:** Fig. (11a) Receiver operating characteristic (ROC) curve of the ADC value used for differentiating malignant tumors from benign lesions. Fig. (11b) Receiver operating characteristic (ROC) curve of the ADC value used for differentiating malignant tumors from locally malignant lesions.

© Radiology, Cairo university, national cancer institute - Cairo/EG
Conclusion

**Conclusion:**

Cystic and solid head and neck mass is a common finding in pediatric age group. It can present a diagnostic challenge on clinical and radiological levels. Differentiation of begin from malignant pediatric neck tumours is essential for treatment planning as well as for prognosis of malignant tumours [1].

Multiple imaging modalities can help in characterization of pediatric head and neck masses. Plain radiography has almost no role except for detection of associated bony affection. Ultrasound has important role in differentiation of cystic from the solid lesion; however it cannot determine the biological nature of solid masses either benign or malignant. CT is associated with radiation exposure. Different routine pulse sequences of MR imaging help in soft tissue characterization yet it cannot accurately differentiate benign from malignant tumors. Thus invasive procedures as biopsy is commonly used, but it may give false results[2].

Diffusion-weighted echo-planar MR imaging is a completely non-invasive technique for evaluation of the motion of microscopic water in tissues. The extent of translational diffusion of molecules measured in the human body is referred to as the apparent diffusion coefficient (ADC). [3].

In this work, after studying one hundred cases, the mean ADC value of malignant pediatric head and neck tumours was significantly lower than that of benign lesions. The mean ADC values in our study were as follows: - the malignant cases were found to be lower than that of the benign lesions and ADC value of the locally malignant was overlapped with that of the benign lesions. The mean ADC values of the malignant tumors, locally malignant masses and benign lesions were \( (0.83 \pm 0.23) \times 10^{-3} \), \( (1.43 \pm 0.17) \times 10^{-3} \) and \( (1.65 \pm 0.58) \times 10^{-3} \) \( \text{mm}^2 \text{s}^{-1} \), respectively. ADC value of 1.19 \( \times 10^{-3} \) mm2/sec is used as a threshold value for differentiation between malignant and benign lesions with a sensitivity of 97.3%, specificity of 80.0%, positive predictive value of 94.7% and negative predictive value of 88.9%.

These results are in the same track with results found by study of Junichiro Sakamoto a.et al 2009 that found that mean ADC value of malignant cases was 1.13 ± 0.43 \( \times 10^{-3} \) mm2/sec, mean ADC of benign solid tumors, (1.56 ± 0.51) \( \times 10^{-3} \) mm2/sec, that of benign cystic lesions, (2.05 ± 0.62) \( \times 10^{-3} \) mm2/sec. ADC value of 1.2 \( \times 10^{-3} \) mm2/sec was used as a threshold value for differentiation between malignant and benign lesions with accuracy of 86%, 84% sensitivity and 91% specificity [4].
Our results are in co-ordinance with that of Abdel Razek et al., 2009 who studied 78 neck masses (28 malignant and 50 benign lesions) and found that the mean ADC values of the malignant tumors, benign solid masses and cystic lesions were \( (0.93\pm0.18)\times10^{-3}\text{mm}^2\text{s}^{-1} \), \( (1.57\pm0.26)\times10^{-3}\text{mm}^2\text{s}^{-1} \) and \( (2.01\pm0.21)\times10^{-3}\text{mm}^2\text{s}^{-1} \), respectively. The threshold ADC value for differentiation between benign and malignant pediatric head and neck masses was \( 1.25\times10^{-3}\text{mm}^2\text{s}^{-1} \) with an accuracy of 92.8%, sensitivity of 94.4%, specificity of 91.2%, positive predictive value of 91% and negative predictive value of 94.2%.

The lower ADC value of the malignant lesions is explained by difference in histopathologic features of the benign and malignant tumours. Malignant tumours have enlarged nuclei, hyperchromatism and angulation of nuclear contour, and they show hypercellularity. These histological characteristics reduce the extracellular matrix and the diffusion space of water protons in the extracellular and intracellular dimensions with a resultant decrease in ADC [6].

The locally malignant tumors have ADC values overlapped with the benign solid lesions (Fig.1) instead of the aggressive appearance in the conventional MRI images, the DWI and calculated ADC value may help in diagnosis of lower biological behavior lesion. Our two cases of Primitive myxoid mesenchymal tumor of infancy (Fig.6) are good example for the usefulness of DWI in characterization of such lesions. Myxoid mesenchymal tumor of infancy is a recently recognized soft tissue tumor with only a few cases reported. To our knowledge, there were no previous reported studies, in the English literature, about the application of diffusion weighted MR imaging in characterization of such rare lesion.

The results of this study demonstrated that the cystic hygrma has the highest ADC value among the benign lesions \( (3.1\pm0.08)\times10^{-3}\text{mm}^2\text{s}^{-1} \). Wang et al. [7] reported that the mean ADC value of benign cystic lesion in adult head and neck is \( (2.05\pm0.62)\times10^{-3}\text{mm}^2\text{s}^{-1} \). They also reported that the difference in ADC values among cystic lesions may be due to varying protein concentration of the lesions.

The necrotic malignant cervical lymph nodes shows facilitated diffusion in contrast to the inflammatory pyogenic or granulomatous lymph nodes which show restricted diffusion due to thick pus in the pyogenis and caseous material in granulomatous nodes.( Fig. 10)

Among the solid benign solid tumor the parapharyngeal teratoma shows high ADC \( (2.3\pm0.01 \times10^3 \text{mm}^2\text{s}^{-1}) \) Fig. 8. The inflammatory myofibroblastic tumor (IMT), a rare
benign neoplasm of mesenchymal origin with unknown etiology, occurs primarily in soft tissue and in numerous anatomic locations. IMT has been reported mainly in the children and young adults. Because of IMT's rarity and because the lesions often mimic sarcoma, lymphoma, and metastasis, IMT can often be clinically misdiagnosed as a malignant tumor. We present a case of maxillary IMFT misdiagnosed as rhabdomyosarcoma depending on the conventional MRI criteria (Fig.7), the ADC value of such lesion was 1.06 x10^3 mm2 s^-1. This is another example, in addition to the primitive myxoid mesenchymal tumor of infancy, for the usefulness of DWI in prevent misdiagnosis of such lesions as malignant ones.

There are some limitations in this study. First, the group of patients was heterogeneous with different pathological entities and different age groups of infant and children. Second, the number of benign tumors was relatively small compared with the malignant lesions. Further studies are recommended to be performed on a larger scale to assess the full value of diffusion-weighted MR imaging in pediatric tumors. Third, the tumors in our study are spread all over the different compartments of the head and neck. Further studies are recommended to be performed on tumors of each compartment separately, i.e orbit, nasopharynx, parotid, cervical lymph nodes,….. etc.

In conclusion, diffusion MRI study is a significant, accurate, fast, non invasive and non enhanced technique that can be used for characterization of malignant lesions of the head and neck region and to differentiate it from benign lesions relying on calculated ACD value.
Personal information

Ayda Youssef, M.D.
Lecturer of Radiology
*National cancer institute, Cairo university.
*Children Cancer Hospital -Egypt 57357.

aydayoussefegypt@gmail.com
References


3. Thoeny H & Keyzer F. Extracranial applications of diffusion-weighted magnetic resonance imaging. Eur Radiol 2007; 17:1385-1393


6. Thoeny H & Keyzer F. Extracranial applications of diffusion-weighted magnetic resonance imaging. Eur Radiol 2007; 17:1385-139