Ultrasonographic presence of microcalcifications, peripheral vascularity and cystic necrosis in lymph nodes - sign of recurrence of Thyroid Cancer

Poster No.: C-1477
Congress: ECR 2015
Type: Scientific Exhibit
Authors: M. R. M. Machado, M. C. Chammas, M. R. Tavares, G. G. Cerri; São Paulo/BR
Keywords: Metastases, Image verification, Cancer, Statistics, Screening, Diagnostic procedure, Ultrasound-Colour Doppler, Ultrasound, Thyroid / Parathyroids, Lymph nodes, Head and neck
DOI: 10.1594/ecr2015/C-1477

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 is 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

Cervical ultrasound is the method of choice for the identification of lymph node metastases. Ultrasound can detect lesions as small as 4mm, and increased 50% in detecting recurrences smaller than 1cm\(^1,2\). Also proves to be useful in the evaluation of the cervical internal architecture and can even be combined with fine needle aspiration biopsy, allowing a single examination, the primary tumor and cervical metastases be evaluated.\(^3,4,5,6\)

Differentiated malignant thyroid tumors have good prognosis, unlike medullary and anaplastic carcinomas. However, 5 - 40 % of patients have persistent or recurrent disease, most often in the lymph nodes on the central compartment ipsilateral side but also in the remaining thyroid tissue or contralateral lymph nodes.\(^4,7,8\)

Papillary thyroid carcinoma has a high propensity for invasion of cervical lymph nodes, the incidence ranges from 30 to 90%, being higher in systematic surgery with excision of the cervical lymph nodes. Medullary carcinoma (50%) and anaplastic carcinoma (40%) also have a high tendency to invade lymph nodes, while the less common follicular carcinomas (10%).\(^9,10\)

Normal cervical nodes, usually show hilar vascularity or appear apparently avascular. Metastatic lymph nodes are usually round in shape, without an echogenic hilus. The majority of metastatic nodes appear hypoechoic. Cystic necrosis is common in metastatic nodes from squamous cell carcinomas, and papillary carcinoma, and papillary carcinoma of the thyroid. Intranodal calcification is a characteristic feature in metastases from papillary carcinoma of thyroid. On ultrasound, intranodal calcification appears as an echogenic focus with or without acoustic shadowing. Although metastases cause enlargement of lymph nodes, nodal size is not an accurate criterion in identifying metastatic nodes because micro-metastases may be found in small lymph nodes, and inflammation may cause nodal enlargement.\(^9,11\)

Therefore, precise diagnosis for the presence of lymph nodes metastases (LNM) is important. Imaging of lymph nodes plays an important role in determining surgical procedures because physical examination is less accurate for detecting cervical lymph nodes.\(^15,16,17,18,19,20\). High-resolution cervical lymph nodes ultrasonography has emerged as an important tool in evaluating locoregional recurrence. The sensitivity for lymph nodes sonogram in detecting cervical disease ranges from 70 a 100%.\(^21\)

Images for this section:
Fig. 1: Schematic of characteristics cervical lymph node
Fig. 2: Gray-scale sonography showing a metastatic lymph node from medullary carcinoma of the thyroid, which is enlarged, hypoechoic, with rare microcalcifications.

![Gray-scale sonography showing a metastatic lymph node from medullary carcinoma of the thyroid, which is enlarged, hypoechoic, with rare microcalcifications](image)

Fig. 3: Gray-scale sonography image showing intranodal microcalcifications from a papillary thyroid cancer.
Methods and materials

A prospective study was conducted and we investigated 94 patients of postoperative thyroid cancer, determining ultrasonography characteristics of malignant lymph nodes, from February 2012 to September 2013 in the University State of São Paulo (USP). Institutional review board approval was obtained for this study. Ultrasound was held at E9 equipment - GE or Phillips iU22, equipped with a multifrequency linear probe 7-12 MHz, with the use of trapezoidal image. Ultrasonography of neck lymph nodes research of each of the patients included in this study was performed in the following sequence: U.S B-mode and US Doppler amplitude.

The performance of the test was standardized as follows: patient supine with a roll under the shoulders and neck in hyperextension of approximately 45°. The devices were pre-adjusted for thyroid ultrasound. The transducer unit was lightly resting on the skin without pressuring her to not interfere in the evaluation of the vascularity of the parenchyma due to compression of the vessels. The images were documented by digital means and recorded on compact disk (CD) or memory storage device in USB flash drive format Joint Photographic Experts Group (.Jpeg) JPEG.

The number of lymph nodes present, node size and malignancy status were recorded by ultrasound in 94 patients post operative thyroid cancer. We had 80 of these lymph nodes showed some characteristic among microcalcifications, hemorrhagic necrosis and Doppler ultrasound peripheral and irregular vascularization. From these 80 patients with suspicious lymph nodes we had 22 patients with histologic confirmed recurrence.

We analyzed the association between suspicious lymph nodes ultrasonographic characteristics and the confirmation of presence of malignancy.

Our study focused on determining sensitivity and specificity of the presence of microcalcifications, peripheral vascularity and cystic necrosis in cervical lymph nodes to detect cervical lymph nodes recurrence.

Results

Microcalcifications, cortical vascularity and cystic degeneration were associated with regional lymph node recurrence in univariate analyses (p<0.05). The sensibility and specificity of microcalcifications were 47.3% and 85.7%, of peripheral vascularity were 69.1% and 83.3%, of cystic necrosis were 27.3% and 100%, respectively.
We had 80 patients’ suspicious cervical lymph nodes, with some ultrasonographic characteristic of lymph node recurrence thyroid cancer. From these 80 patients with suspicious lymph nodes we had 22 patients with histologic confirmed recurrence.

Twenty two patients with thyroid cancer recurrence were identified: 14 women (63.6%) and 8 men (36.4%). The mean age in this study among the recurrent patients was 46.8 years.

Among these patients (22 necks with recurrence), 17 patients had Papillary Cancer (77.3%), 4 patients Medullary Cancer (19%) and 1 patient Follicular Cancer (4.5%).

The rate of recurrence in cervical lymph nodes after thyroidectomy for thyroid cancer was 23.4%. The most significant features on ultrasonography gray-scale on metastatic diseases were microcalcifications, cystic necrosis and in Doppler ultrasound aspect was peripheral and irregular vascularization.

Compared to a similar study\textsuperscript{22}, in our assessment we get the same sensitivity in the detection of microcalcifications. We observe that microcalcifications not always present posterior acoustic shadowing and may be sparse, or grouped. In the presence of cystic necrosis sensitivity of our study was 27.3%, slightly higher compared to that study with a sensitivity of 11%. Both showed a specificity of 100% for malignancy in the presence of cystic necrosis in the cervical lymph nodes.\textsuperscript{22}

Summary of data acquired for 22 patients operated for lymph node recurrence of thyroid cancer and lymph nodes characteristics

<table>
<thead>
<tr>
<th>Patient</th>
<th>Sex</th>
<th>Age</th>
<th>hist</th>
<th>US</th>
<th>FNAB</th>
<th>TG</th>
<th>RC</th>
<th>n#</th>
<th>L+</th>
<th>microc</th>
<th>vasc</th>
<th>necr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>44</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.9</td>
<td>+</td>
<td>57</td>
<td>8</td>
<td>pos</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>42</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>324</td>
<td>+</td>
<td>36</td>
<td>8</td>
<td>pos</td>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>33</td>
<td>3</td>
<td>+</td>
<td>+</td>
<td>0.9</td>
<td>+</td>
<td>52</td>
<td>5</td>
<td>neg</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>38</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.1</td>
<td>+</td>
<td>9</td>
<td>7</td>
<td>neg</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>65</td>
<td>3</td>
<td>+</td>
<td>+</td>
<td>0.3</td>
<td>+</td>
<td>10</td>
<td>2</td>
<td>neg</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>63</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>85.1</td>
<td>+</td>
<td>2</td>
<td>1</td>
<td>neg</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>35</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.1</td>
<td>+</td>
<td>1</td>
<td>1</td>
<td>neg</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>31</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.9</td>
<td>+</td>
<td>61</td>
<td>9</td>
<td>neg</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>30</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.4</td>
<td>+</td>
<td>17</td>
<td>2</td>
<td>pos</td>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>64</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>211.6</td>
<td>+</td>
<td>38</td>
<td>5</td>
<td>pos</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>61</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>13.5</td>
<td>+</td>
<td>20</td>
<td>1</td>
<td>neg</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>62</td>
<td>2</td>
<td>+</td>
<td>+</td>
<td>1.0</td>
<td>+</td>
<td>3</td>
<td>1</td>
<td>neg</td>
<td>neg</td>
<td>pos</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>26</td>
<td>3</td>
<td>+</td>
<td>+</td>
<td>211.0</td>
<td>+</td>
<td>34</td>
<td>5</td>
<td>pos</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>39</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>17.6</td>
<td>+</td>
<td>34</td>
<td>10</td>
<td>pos</td>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>71</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.1</td>
<td>+</td>
<td>20</td>
<td>4</td>
<td>pos</td>
<td>pos</td>
<td>neg</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>44</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.1</td>
<td>+</td>
<td>57</td>
<td>7</td>
<td>pos</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>24</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.2</td>
<td>+</td>
<td>167</td>
<td>23</td>
<td>neg</td>
<td>neg</td>
<td>neg</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>63</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.1</td>
<td>+</td>
<td>31</td>
<td>1</td>
<td>neg</td>
<td>neg</td>
<td>pos</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>65</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>6777</td>
<td>+</td>
<td>4</td>
<td>4</td>
<td>neg</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>25</td>
<td>3</td>
<td>+</td>
<td>+</td>
<td>1.0</td>
<td>+</td>
<td>15</td>
<td>8</td>
<td>pos</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>70</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>25.0</td>
<td>+</td>
<td>36</td>
<td>1</td>
<td>neg</td>
<td>pos</td>
<td>pos</td>
</tr>
<tr>
<td>22</td>
<td>2</td>
<td>35</td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>0.1</td>
<td>+</td>
<td>57</td>
<td>1</td>
<td>neg</td>
<td>neg</td>
<td>neg</td>
</tr>
</tbody>
</table>


TG: Serum Thyroglobulin; US +: ultrasound with suspected lymph nodes

FNAB: positivity at cytology; RC: recurrence confirmed;

n# LYM: number of cervical lymph nodes evaluated at histological examination

L+: number of cervical lymph nodes metastases in each patient

+: positive data

Micro: presence (pos) or absent (neg) of microcalcifications

Vasc: presence (pos) or absent (neg) of peripheral vascularity

Necr: presence (pos) or absent (neg) of necrosis

Images for this section:
**Fig. 7:** Color Doppler image shows irregular intranodal vascularization and cystic necrosis in a patient with metastatic papillary thyroid carcinoma.
Fig. 5: Gray-scale sonography showing a metastatic cervical lymph node with intranodal cystic necrosis.
Fig. 4: Gray-scale sonography showing a metastatic lymph node from papillary carcinoma of the thyroid which is enlarged, hypoechoic, without an echogenic hilus, with microcalcifications.
Fig. 6: Color Doppler sonogram showing a metastatic cervical lymph node with irregular and peripheral vascularity
Conclusion

The presence of microcalcifications, peripheral vascularity and cystic necrosis in lymph nodes by ultrasonography have a high specificity to detect recurrence cervical lymph nodes metastasis.

Personal information

MRM MACHADO, Department of Radiology, University of São Paulo mrmmachado@uol.com.br; MC CHAMMAS, doctor of Hospital das Clínicas da Faculdade de Medicina da Universidade of São Paulo (USP), Medical director of Service of Ultrasound (USP); MR TAVARES, doctor and professor of Department of Head and Neck Surgery, University of São Paulo; GG CERRI, Chairman of Department of Radiology and Oncology of Faculdade de Medicina da University of São Paulo.

References


