Immunohistochemical expression of endocan, as a marker of assessment of angiogenic potential in benign vascular lesions (hemangioma, lymphangioma and lobular capillary hemangioma) of head and neck region

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ABSTRACT

BACKGROUND: The biological behavior of vascular tumors ranging from a hamartomatous growth to frank malignant. The pathophysiology of vascular malformation, hemangioma and lymphangioma is interrelated, blood vessels known to be the site of origin of venous malformations, hamartomas and some neoplasms as benign, tumor-like growth of vessels (hemangiomas). Angiogenesis is the process of formation of new blood vessels from an existing structure.

Aims of study: Assessment of angiogenic potential in benign vascular lesions (hemangioma, lymphangioma and lobular capillary hemangioma) of head and neck region.

Materials and Methods: Twenty formalin-fixed paraffin-embedded tissue blocks of lymphangioma, thirty of lobular capillary hemangioma and another twenty-two of hemangioma/vascular malformation to be stained with endothelial cell-Specific Molecule-1 (ESM-1) monoclonal antibody.

Results: Microvessel density expressed by Endothelial cell-Specific Molecule-1 (ESM-1) immunomarker was found in all cases with mean density of (25.02±13.89) for hemangioma and (37.44±23.16) for lobular capillary hemangioma and (6.34±3.52) for lymphangioma. Along with post hoc test ESM-1 marker expression showed a high significant difference between (lymphangioma and hemangioma = 0.001), (lymphangioma, pyogenic granuloma = 0.000), and it was significantly different between (hemangioma, pyogenic granuloma = 0.011)

Conclusions: The obvious capillary growth in lobular capillary hemangioma revealed that lobular capillary hemangioma showed the highest activity of angiogenic potential in comparison to hemangioma and lymphangioma.

Keywords: Endocan, vascular tumor, angiogenic potential.

INTRODUCTION: Vascular system is a highly heterogeneous and non-identical organ system, hence to make a judgment whether the entire lesion is composed of only venous component or whether there is a lymphatic channels cannot be easy(1).

To increase the flow of blood to ischemic tissue the human body grows new blood vessels from an existing structure, the process of formation of new blood vessels termed angiogenesis (2).

Vascular development starts by the gathering of a vessel plexus from single cell precursors, adjustment then undergoes to this plexus by sprouting growth and remodeling (angiogenesis), followed by recruitment of vessels into target tissues, finally according to the specific needs of the tissue, new vessels differentiate. (3)

Endocan also named as Endothelial cell-Specific Molecule-1 (ESM-1) has acted since its detection as a dermatan sulfate proteoglycan, with unique functional and structural properties. Endothelial cells naturally expresses ESM-1, a highly controlled in existence of proinflammatory and proangiogenic molecules, binds to growth factors, matrix proteins, integrin and cells, and considered as an precise marker of endothelial activation (4).

MATERIALS AND METHODS

The sample is consisted of twenty formalin fixed paraffin embedded tissue blocks of lymphangioma, thirty of lobular capillary hemangioma and another twenty-two of hemangioma/vascular malformation. The samples gained from the archives of Al-Shaheed Ghazi Hospital/ Medical City / Baghdad and the department of Oral & Maxillofacial Pathology/ College of Dentistry/ University of Baghdad & dated from (1979 till 2015).

After histopathological reexamination of haematoxylin and eosin stained sections for all blocks, an immunohisto-chemical staining was achieved using endocan, assessment MVD based on the criteria of weidner (5).

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RESULTS
ESM-1 Expression
The immunostaining procedure of ESM-1 was applied to hemangioma, pyogenic granuloma and lymphangioma, where the endothelial cells of blood vessel were stained with brown coloration as seen in (Figures 1, 2, 3, 4 and 5).

In (Table 1), the mean±Sd of MVD assessed by ESM-1 immunomarker expression, in relation to ANOVA test imploded between samples groups. There was a high statistical significant difference in the mean of expression of ESM-1 in pyogenic granuloma in comparison to lymphangioma and hemangioma (p=0.000).

<table>
<thead>
<tr>
<th>ESM-1</th>
<th>N</th>
<th>SD</th>
<th>mean</th>
<th>Max.</th>
<th>Min.</th>
<th>F</th>
<th>SIG.</th>
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<tbody>
<tr>
<td>hemangioma</td>
<td>22</td>
<td>13.89</td>
<td>25.01</td>
<td>62.60</td>
<td>10.00</td>
<td>20.17</td>
<td>0.000</td>
</tr>
<tr>
<td>lymphangioma</td>
<td>20</td>
<td>3.51</td>
<td>6.34</td>
<td>15.60</td>
<td>2.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyogenic granuloma</td>
<td>30</td>
<td>23.16</td>
<td>37.44</td>
<td>95.30</td>
<td>8.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>72</td>
<td>21.04</td>
<td>25.01</td>
<td>95.30</td>
<td>2.30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Numerous comparisons were made between lymphangioma, hemangioma and pyogenic granuloma with endocan marker as stated by post hoc test, a highly significant difference was establish between ESM-1 expression in lymphangioma and hemangioma=0.001), (lymphangioma and pyogenic granuloma=0.000) and it was significantly different between pyogenic granuloma and hemangioma (0.011).(Table 2).

<table>
<thead>
<tr>
<th>ESM-1</th>
<th>Dependent variable</th>
<th>Std. Error</th>
<th>Mean differe nce</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>hemangioma</td>
<td>Lymphangioma</td>
<td>5.24</td>
<td>18.67</td>
<td>.001**</td>
</tr>
<tr>
<td></td>
<td>Pyogenic</td>
<td>4.76</td>
<td>-12.42</td>
<td>.011*</td>
</tr>
<tr>
<td>Lymphangioma</td>
<td>Pyogenic</td>
<td>4.89</td>
<td>-31.10</td>
<td>.000**</td>
</tr>
</tbody>
</table>

Figure (1) A: Photomicrograph in lymphangioma showing ESM-1 immunostaining - negative stain lymphatic vessels and positive blood vessels X100) B: Positive blood vessels X400) (thin arrow for lymphatic while, thick arrow for blood vessels
DISCUSSION

This study exhibited the highest positive expression of endocan in lobular capillary hemangioma that is in agreement with previous studies, which determined ESM-1 as critical proangiogenic molecule (7), also it agrees with Chen LY et al., (8) whom found in vitro that ESM-1 being over-expressed in the course of angiogenesis. This can be clarified by understanding the pathogenesis of lobular capillary hemangioma at the molecular level that considered as the imbalance between angiogenesis inhibitors and enhancers, that is overexpression of VEGF and bFGF and decreased quantity of angioatin direct to the development of pyogenic granuloma (9).

In this study, endocan was positively expressed in lymphangiomia and that agrees with Shin JW et al., (10) whom clarified that endocan was a potential target for the inhibition of VEGF-A or VEGF-C induced pathologic lymphatic vessel growth and activation and considered it as a novel mediator of lymphangiogenesis. In lobular capillary hemangioma the obvious capillary growth (hyperplastic granulation tissue) suggests that there should be a strong activity of angiogenic potential (9). This agree with the findings of the present study, which found that ESM-1 expression being higher in lobular capillary hemangioma, which explains the proliferative nature of this lesion.

REFERENCES:


المستخلص

الخلفية: إن مصطلح الأورام الوعائية يستخدم عادة لشرح مجموعة متنوعة من أورام الأوعية الدموية والتشوهات الخلقية. الأورام الوعائية والأورام اللمفية هي أورام مرتبطة فسيولوجياً تعتبر الأوعية الدموية هي المصدر الرئيسي للمولد للأورام الوعائية. الأهداف: تهدف هذه الدراسة لتقييم القابلية لتكوين الاوعية الجديده في الأورام الوعائية والأورام اللمفية في منطقة الرأس والرقبة. المواد وطرائق العمل: في هذه الدراسة تم استخدام itemName في هذه الدراسة و 30 عينة أورام الوعائية الشعرية المفصصه و 20 عينة أخرى أورام الوعائية الشعرية المفصصه. الاختلافات: نسبة الاوعية الدموية المتضمنة في الأورام الوعائية الشعرية المفصصه (37.44±23.16) نسبة الاوعية الدموية المتضمنة في الأورام الوعائية الشعرية المفصصه (25.02±13.89) نسبة الاوعية الدموية المتضمنة في الأورام الوعائية الشعرية المفصصه (6.34±3.52). النتائج: كثافة الأوعية الدموية المتضمنة في الإنجاب الشعري (1.64±3.15) للأورام الوعائية الشعرية المفصصه (25.02±13.89) للأورام الوعائية الشعرية المفصصه. الاستنتاجات: التطور الوعائي الواضح للأورام الوعائية الشعرية المفصصه تظهر نسبة عالية من الاوعية الدموية بالمقارنة مع الأورام الوعائية والأورام اللمفية.