Comparison of gold standards with common histopathologic evaluations in diagnosis of oral neurofibromas in pathology department of Shiraz Dental School

Ali Dehghani Nazhvani (DDS)¹, Zohreh Jafari Ashkavandi (DDS)², Nafiseh Shamloo (DDS)³, Zeinab Moniri (DDS)⁴ 

¹. Assistant professor, Bio-Material Research Center, Department of Oral & Maxillofacial Pathology, School of Dentistry, Shiraz University of Medical Sciences, Shiraz- Iran.
². Associate professor, Department of Oral & Maxillofacial Pathology, School of Dentistry, Shiraz University of Medical Sciences, Shiraz-Iran.
³. Assistant professor, Department of Oral & Maxillofacial Pathology, Dental School, Shahid Beheshti University of Medical Sciences, Tehran-Iran.
⁴. General Dentist, School of Dentistry, Shiraz University of Medical Sciences, Shiraz- Iran.

Corresponding Author: Zeinab Moniri, School of Dentistry, Shiraz University of Medical Sciences , Shiraz- Iran.
Email: zmoniri66@gmail.com Tel: +989171809479

Received: 27 Jan 2014 Accepted: 15 Jul 2014

Abstract

Introduction: Diagnosis of neurofibroma usually is based on the specific morphology and arrangement of mesenchymal cells in routine Hematoxylin and Eosin (H&E) sections, and detection of mast cells supports the diagnosis. Sometimes definite diagnosis from other mesenchymal lesions may be difficult. The aim of the present study was to compare S100 expression and mast cells count (as Gold Standard) with routine histopathologic diagnosis.

Methods: In this cross-sectional analytical study, all cases of neurofibroma and compatible/consistent with neurofibroma, that had been diagnosed in department of oral & maxillofacial pathology, school of dentistry, Shiraz, from 1986 to 2013, were enrolled. Immunohistochemistry was performed using S100 antibody and slides were stained by Giemsa. S100 labeling index, intensity and distribution as well as mast cells count were evaluated using light microscope.

Results: Mast cells were present in 97% of cases that 56.4 % showed 1-200 cells/10HPF. 82 % of cases were positive for S100 that 40.7% showed 2-30% labeling index and 70.4% had moderate intensity for S100 staining.

Conclusions: The comparison of routine histopathologic examination with gold standard method in Oral Pathology Department of Shiraz Dental School confirmed the routine histopathologic diagnosis in all cases, therefore no more evaluation may be required if a pathologist considers all routine diagnostic criteria.

Keywords: Neurofibroma, S-100 protein, Giemsa stain, Mast cells

مقایسه استاندارد طلایی شناسایی نوروفيبرومای دهانی با روش تشخیص هیستوپاتولوژیک رایج در بخش پاتولوژی دانشکده دندانپزشکی شیراز

چکیده
تشخیص نوروفيبروما به صورت مهم بر پایه رنگ آمیزی همانوتوصیلی و توانی (H&E) و مشاهده شده‌ی مورفولوژی و آرایش خاص سلول‌های مراقب‌نامه‌ای درک‌بری بررسی وجود مسکنگی سلها صورت می‌پذیرد. گفته‌گاه با توجه به اشتباهات نمایشی نوروفيبروما در شاخص‌های مختلف به شکل اختلاس نوروفيبروما را نتایج نکته این مطالعه مقایسه سل سلار S100 و بررسی سطح مسکنگی سلها به عنوان استاندارد طلایی تشخیص با روای رایج تشخیص بوید است.

مواد و روش‌ها: در این مطالعه موردی-محوری، یک جفت با میزان رونده‌های موجود در بخش پاتولوژی دهان و فک و سومت دانشکده دندانپزشکی شیراز که تشخیص هیستوپاتولوژیک آنها در سال‌های 1357 تا 1375 این است که رنگ آمیزی H&E نوروفيبروما و با مطلوبیت نوروفيبروما بوده است. از آنجایی که بهتر استخراج گردید سپس آنها را با رنگ آمیزی گیمسب و اینتونوستولونیمی S100 رنگشانند. با استفاده از میکروسکوپ نوری، شمارش سطح سلها و بنامی، شدت و توزیع رنگ‌پذیری مورد بررسی قرار گرفت.

یافته‌ها: در صورت موفقیت در تشخیص صورت، به رنگ آمیزی این روش استفاده شده است. روایی S100 مورد ارزیابی قرار گرفت.

نتایج گریه: رنگ آمیزی استاندارد طلایی و مقایسه ی دو روش درک‌بری پاتولوژی دهان دانشکده دندانپزشکی شیراز مورد به‌هم‌آوری سل میانهایی با H&E و استاندارد طلایی در تمامی مراجعه‌ها به این می‌رسد در صورتی که یک پاتولوژیست تمامی می‌شود تشخیص رایج را نظر نگیرد. احتمالاً دیگر نیاز به صرف هزینه و زمان بیشتر برای تشخیص وجود ندارد.

واژگان کلیدی: نوروفيبروما، پاتولوژی، رنگ آمیزی، کم و مصرفی

Introduction
Diagnosis is the most important phase of a patient’s treatment. It is made by combination of mental and practical actions through which the disease is determined and evaluated. [1] One of the common benign neoplasm of peripheral nervous system is neurofibroma. [2] It may appear as a solitary lesion or multiple as a part of neurofibromatosis type 1 syndrome. [3] Its histopathologic feature consists of interlacing fascicles of spindle-shaped cells with fusiform or wavy nuclei. [4,5] In most cases, presence of mast cells helps the diagnosis. These cells can definitely be diagnosed using Giemsa and toluidine blue staining methods. [2-5] S100 protein is normally expressed in the nuclei and cytoplasm of cells derived from the neural crest (Schwann and Gelial cells and Melanocytes) [4,6,7], fat cells, Myoepithelial cells, macrophages, Langerhans cells, dendritic cells, nevus cells and keratinocytes [4,6,7], chondrocytes [4,8], satellite cells of adrenal medulla [9], adenosynthesis [10], reticular cells of lymph nodes, interstitial cells of pineal gland [11] and tumors derived from these cells. [6,7,12,13] S100 involves many intra and extra cellular biologic functions [4], but this protein is usually employed for definitive diagnosis of peripheral nerve sheath and melanocytic tumors. [4] Immunohistochemistry...
can show S100 protein in the most cases of neurofibroma which confirms the diagnosis.[2,3]

In Karvonen et al. study (2000), S100 was used as the gold standard for identification of new tumors in patients with neurofibromatosis type I.[14] Karamchandani et al. used S100 for detection of cells with nervous system origin in soft tissue neoplasms.[15] Diagnosis of neurofibroma usually is based on the specific morphology and arrangement of mesenchymal cells in routine H&E sections, and detection of mast cells supports the diagnosis. Sometimes definite diagnosis from other mesenchymal lesions may be difficult because of similarity in histopathologic features and the mast cells may not be detected.

Furthermore, the researchers found no research on comparison between the common H&E method and S100 and Giemsa staining to evaluate the accuracy level of neurofibroma diagnosis. Therefore, the aim of the present study was to compare S100 positivity and mast cells detection as gold standards with routine histopathologic diagnosis.

Methods

In this cross-sectional analytical study, all cases of neurofibroma and those compatible/consistent with neurofibroma that had been diagnosed in department of oral & maxillofacial pathology School of Dentistry of Shiraz, between 1986 to 2013 were enrolled.

The diagnosis was confirmed by pathologists according to routine histopathologic features. All cases had enough tissue for evaluation. For S100 and mast cell, staining two sections with 4-µm thickness was provided. For Giemsa staining, the sections were deparaffinized and were placed in 5% Giemsa solution for one hour, then washed with acid acetic and water. Finally the sections were mounted and evaluated using light microscope.[16]

Mast cell count was evaluated in 10 microscopic fields, at 400 magnification and reported as negative (0), +positive (1-200), ++positives (between 200-1000) and +++positives (>1000). S100 expression was evaluated by immunohistochemistry.[16] The sections were deparaffinized and rehydrated.

Endogenous peroxidase activity was inhibited by 3% H2O2. Then, the sections were incubated with S100, Polyclonal Rabbit antibody (Ready to use, code iR504-DakoLTD) for 30 minutes. 3, 3_di_aminobenzidine (DAB-Code K8004-DAKO LTD) solution was used as chromogen. A section of schwannoma was used as positive control.

Primary antibody was replaced by TBS Buffer in negative control sections.[17] S100 expression was classified in 4 groups: negative (<2%), +positive(2-30%), ++positives(30-80%), +++positives>80%). Regarding to intensity of expression, the results were categorized in 3 grades: 1: low, 2: moderate, 3: intense.[18] Data were analyzed using SPSS software version 11.

Results

33 cases of neurofibroma were evaluated. They were 16-74 years, with mean age of 50 years. 18 cases (54.5%) were male and 15 (45.5%) were female. Regarding to the location, neurofibroma was reported in gingival (42.4%), buccal mucosa (24.2%) and other areas such as retromolar pad, mandibular body, hard palate, tongue and floor of the mouth (33.4%). Giemsa staining demonstrated the mast cells as round, oval or polygonal cells with purple granules (figures 1&2).

Mast cells were found in 97% of the cases, the mast cell count in 56.4% (18 patients) of the cases was found one positive (+), 21.8% (7 patients) two positive (++) and 21.8% (7 patients) three positive (+++). In S100 positive immunoreactions, mesenchymal cells were found with brown nucleus and cytoplasm (figure 3). S100 expression is shown in table 1. The diagnosis was confirmed in the cases that were positive for Giemsa, S100 or both of them (table 2).

Figure1. Bundles of fusiform mesenchymal cells with elongated and wavy nuclei in a neurofibroma lesion beside the presence of mast cells (Asterisk) (H&E magnification, 400X)
Discussion

Histopathologic features of all neurofibromas and the similar lesions in this study were interfacing fascicles of spindle-shaped cells with fusiform or wavy nuclei based on H&E sections (figure1) beside many mast cells scattered among them. [2] According to the study of Leclere et al. Giemsa staining for detection and confirmation of mast cells is considered more appropriate because it had manifested less expense and more convenient application among the other four staining methods. [5]

In this study, 97% of mast cells were stained by Giemsa and proved their existence in H&E slides (figure2). Their count also showed vast spectrum of their presence in neurofibroma lesions from less than 200 cells/10HPF to more than 1000 cells/10HPF; 56.4% of the cases were under 200 cell/10HPF, half of the remaining cases were from 200 to 1000 and half of the other had more than 1000 cells/10HPF. S100 normally exists in nucleus and cytoplasm of cells derived from neural crest (schwann and gelial cells and melanocytes) and tumors derived from them. [6,7,12,13] In the present study, the neural origin of the majority of the cases was confirmed by IHC staining for S100 (82% of patients) (figure 3). In a study, 49 patients with peripheral nervous system tumors showed S100 positivity in all neurofibroma cases [18], while in another study, S100 was positive in 95% of the cases. [13]

Other study also showed S100 staining in about half of the skin tumors of 9 patients suffered from neurofibromatosis type1. [14] The labeling index of S100 in this study was 1 positive in 40.7% (11 patients), 2

<table>
<thead>
<tr>
<th>Positive cases</th>
<th>S100 staining</th>
<th>S100 staining intensity</th>
<th>Pattern of S100 staining</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td>1+</td>
<td>2+</td>
<td>3+</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>40.7%</td>
<td>33.4%</td>
<td>25.9%</td>
<td>14.8%</td>
</tr>
<tr>
<td>70.4%</td>
<td>44.5%</td>
<td>55.5%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total cases</th>
<th>H&amp;E diagnosis confirmation with Giemsa</th>
<th>H&amp;E diagnosis confirmation with S100</th>
<th>H&amp;E diagnosis confirmation with both gold standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>32</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>97%</td>
<td>82%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
positives in 33.4% (9 patients) and 3 positives in 25.9% (7 patients) which suggests diversity in the quantity of S100 expression. As a result, it may not help in differential diagnosis of neural tumors although the confirmation of this issue needs more research. In the present study, the intensity of S100 staining was also reported the same as previous immunohistochemistry studies.

Nevertheless, considering the fact that the staining intensity is a subjective matter and quantitative parameters are more significant in data analysis. The intensity was gradually eliminated from these studies and its report can only show staining errors. The evaluation of the S100 staining pattern can be helpful in the differential diagnosis of neural tumors too, as in the present study focal staining was observed in 44.5% of the patients and diffuse distribution in 55.5%. Ghilusi et al. stated that the focal pattern of S100 in all cases. Weiss and et al. reported S100 staining only in a group of cells because neurofibroma had different cellular population.

Therefore, S100 staining is distributed in these lesions in various patterns. Karamchandani et al. also have compared S100 staining pattern in a number of soft tissue neoplasms except neurofibroma. Therefore, it is suggested to evaluate and compare staining patterns in studies with higher number of cases and in particular in those associated with neurofibroma and/or neural tumors. Taking into account the confirmation of mast cells in almost all H&E samples, and the positive results for S100 expression in 82% of the cases, this study proved the harmony between the current histopathologic diagnosis (H&E) and gold standards. In this study, 18% of the cases (6 patients) were reported negative for S100, considering re-staining of negative cases beside positive controls throughout the procedure, so it is possible to associate this phenomenon to the absence of S100 expression in some neural tumors.

Yet, expression of other neural markers is probable in these lesions. So for these cases, diagnosis of neurofibroma is confirmed to consider the morphology of cells and also the presence of mast cells in them, too.

Conclusions

Neurofibroma is a benign tumor with neural origin, its common diagnosis of which is based on H&E staining and the pathologists report this tumor when they detect interlacing fascicles of spindle-shaped cells with fusiform nuclei and also the presence of mast cells. Gold standard staining and the comparison between the two methods in the present study showed that the current diagnosis was totally confirmed in Oral Pathology Department of Shiraz Dental School, therefore no more evaluation may be required for future cases if a pathologist considers all routine diagnostic criteria.

Acknowledgments

The Authors thank the Vice-Chancellor of Shiraz University of Medical Sciences for supporting this research. The authors also thank Dr. Golkari for editing of the article and Dr. Hamedani for improving the use of English in the manuscript.

Funding: This study was a part of thesis and research project (Grant No:5448) which was supported and funded by Shiraz University of Medical Sciences.

Conflict of interest: There was no conflict of interest.

References