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SPECTROPHOTOMETRIC DIAGNOSIS OF DERMATOSCOPIC IMAGES OF PIGMENTED SKIN TUMORS

SPECTROPHOTOMETRIC DIAGNOSIS OF DERMATOSCOPIC IMAGES OF PIGMENTED SKIN TUMORS – The method of diagnosis of pigmented skin tumors using spectrophotometric analysis (SPM) of dermatoscopic images was analyzed in the article. The obtained results indicate the possibility of using SPM as an addition to the standard methods of dermatoscopic diagnostics to make the correct diagnosis that is confirmed by clinical examples and are histologically proven.

СПЕКТРОФОТОМЕТРИЧНА ДІАГНОСТИКА ДЕРМАТОСКОПІЧНИХ ЗОБРАЖЕНЬ ПІГМЕНТНИХ ПУХЛИН ШКІРИ – У статті розглядається метод діагностики пігментних пухлин шкіри з використанням спектрофотометричного аналізу (СФМ) дерматоскопічних зображень. Отримані результати свідчать про можливість застосування СФМ як доповнення до стандартних методів дерматоскопічної діагностики для встановлення правильного діагнозу, що підтверджено клінічними прикладами та результатами гістологічного дослідження.

СПЕКТРОФОТОМЕТРИЧЕСКАЯ ДИАГНОСТИКА ДЕРМАТОСКОПИЧЕСКИХ ИЗОБРАЖЕНИЙ ПИГМЕНТНЫХ ОПУХОЛЕЙ КОЖИ – В статье рассматривается метод диагностики пигментных опухолей кожи с использованием спектрофотометрического анализа (СФМ) дерматоскопических изображений. Полученные результаты свидетельствуют о возможности применения СФМ как дополнение к стандартным методам дерматоскопической диагностики для установления правильного диагноза, что подтверждено клиническими примерами и результатами гистологического исследования.

Key words: skin melanoma, nevi, diagnosis, spectrophotometry, dermatoscopy.

Ключові слова: меланома шкіри, невуси, діагностика, спектрофотометрія, дерматоскопія.

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INTRODUCTION Differential diagnosis of the most atypical melanocytic lesions is extremely complex. There is a large range of non-melanoma tumors that are similar in color with melanoma – venous hemangioma, pigmented basalioma and dyskeratosis. There was noted the fact that superficial melanomas arise on the background of premelanoma nevi and it is important to establish the differences between these lesions. Often neither clinical nor dermatoscopic signs give a clear differential diagnosis. Despite the use of a general diagnostic index (GDI) dermatoscopic diagnosis is subjective and its accuracy in the diagnosis of melanoma is 75–84 % [2–5]. This requires the additional criteria for dermatoscopic diagnosis of pigmented skin lesions. The aim of the study was to develop spectrophotometric criteria of differential diagnosis of pigmented skin lesions based on the analysis of digital dermatoscopic images.

MATERIALS AND METHODS A spectrophotometric analysis of 62 dermatoscopic images of pigmented skin tumors in patients aged 18–63 years (39 women and 21 men) was made. In all cases of pigmented skin lesions such diagnostic and treatment algorithm was used: clinical examination + digital image of tumors; dermatoscopy with digital image; ultrasound diagnostics: thickness measurement, horizontal size and volume of pigmented formation ("Siemens G60S", L10–5, 7,5–10,0 MHz); spectrophotometry of digital clinical and dermatoscopic images of pigmented skin lesions using computer programs; preoperative cytological diagnosis of pigmented cells after superficial scarification biopsy; postoperative histological diagnosis of the removed skin tumors.

Dermatoscopic images were analyzed by the rule of ABCD with GDI determination. Spectrophotometric analysis (SPM) of digital dermatoscopic images was used to improve diagnostics, that was performed by a computer program Image-J, where histograms of red (R), green (G) and blue (B) colors were received. Then, RGB-spectrophotograms were created in gray scale in Microsoft Excel program. Curves of R-G-B color charts were evaluated regarding the horizontal axis (in units of gray scale) and the vertical axis (amplitude height in %) – these criteria were taken as a basis of the differential diagnosis of pigmented skin tumors of different genesis [1]. Sighting study was done by photobiopsy of "zone of interest" in digital dermatoscopic images of pigmented lesions. Based on the comparison of preoperative specrtophotometric diagnosis with postoperative pathomorphologic data the validity of the proposed method was determined.

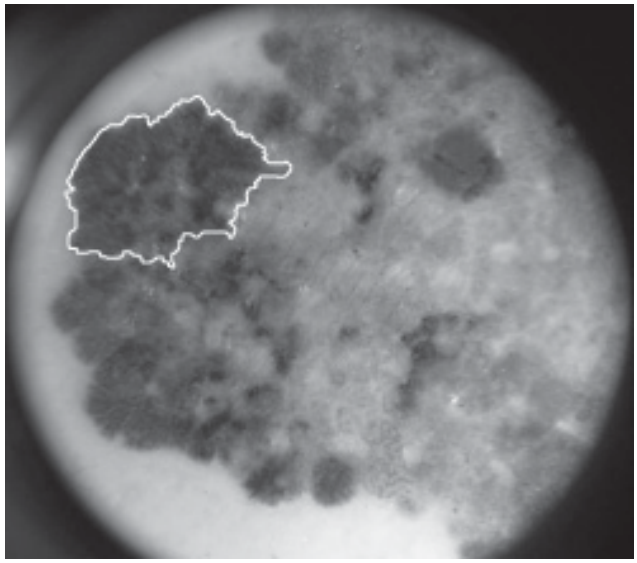

Fig. 1. Dermatoscopic image of superficial spreading melanoma, ×10 (Episcope Welch Allyn, USA); "zone of interest" is contoured.

RESULTS AND DISCUSSION 62 dermatoscopic images of pigmented skin tumors were characterized by the rule of ABCD which included assessment of symmetry, contours, colors, and tumor diameter with GDI determination. In 43 (69 %) cases tumor asymmetry was observed, polychromy – in 39 cases (63 %), edge irregularity of the lesion – in 32 cases (52 %), tumor diameter more than 6 mm was in 56 (90 %) patients. GDI from 1.0 to 4.7 points was found in 51 (82 %) cases,

that is a characteristic of benign process. Potentially malignant lesions were diagnosed in 8 (13 %) cases where GDI was from 4.8 to 5.5. Three lesions were evaluated at 5.1 points, which is typical for a malignant tumor.

The main indications for pigmented lesions removal were: in 45 % of cases – medical history of increasing tumor size, in 31 % – the presence of clinical and dermatoscopic signs for biopsy, 24 % – the subjective sensations and regular lesions trauma.

According to the results of morphological studies pigmented nevi were observed in 43 cases (included 12 dysplastic nevi), skin melanoma – 8, arterial hemangioma – 6, venous hemangioma – in 5 patients.

Characteristics of RGB spectral graphs of dermatoscopic images of pigmented skin tumors are shown in Figure 2-5.

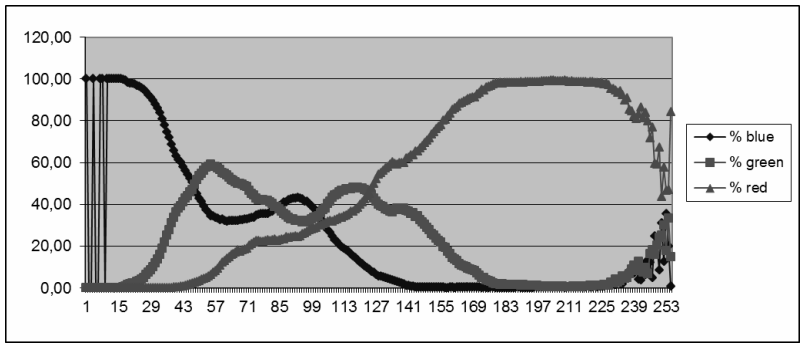

Fig. 2. RGB spectral graphs of melanoma image of the entire dermatoscopic field of view.

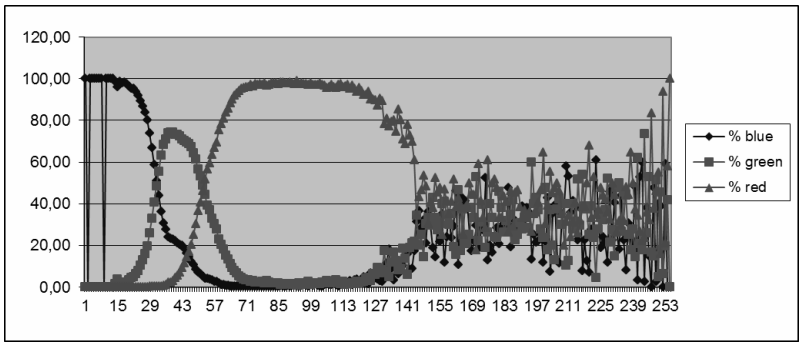

Fig. 3. RGB spectral graphs of "zone of interest" – photobiopsy of dermatoscopic melanoma image.

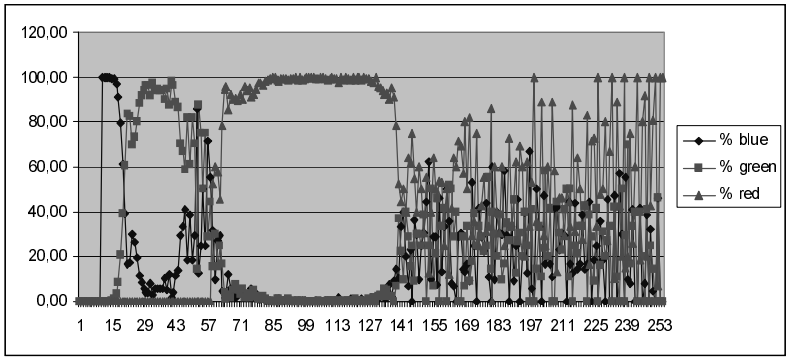

Fig. 4. RGB spectral graphs of dermatoscopic image of pigmented nevus.

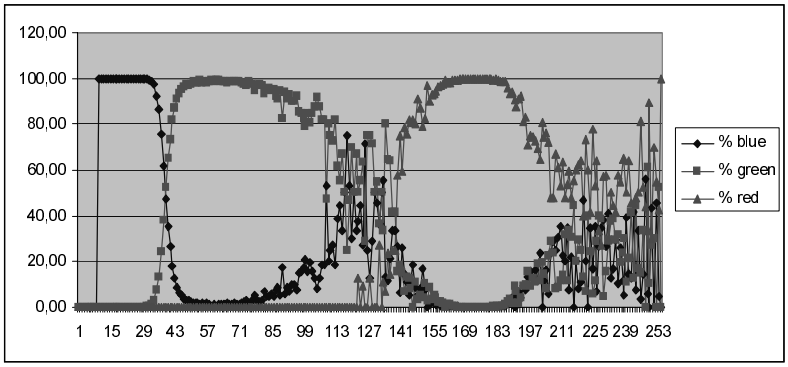

Fig. 5. RGB spectral graphs of dermatoscopic image of arterial hemangioma.

Spectrophotometric analysis of melanoma dermatoscopic image is characterized by increasing of red graphic to the amplitude of 100.0 % on the vertical axis in the range of gray scale of 40–50 units. Photobiopsy of melanoma dermatoscopic image was made in the darkest area of the melanoma. It was characterized by the early rising of red graph.

Pigmented nevi have specific red graphics with a heavy increase in the amplitude. The additional criteria in the diagnosis are graphs of blue and green color, which rise up to 100.0 % mark on the vertical axis.

Arterial hemangiomas (tumors saturated with oxyhemoglobin) have the main red graph with 80.0 – 95.0 % of amplitude on the vertical axis on the right half of gray scale (120–240 units.). Graphs of green and blue color "interweaved" on the left side of gray scale.

CONCLUSIONS 1. Specrtophotometry of digital dermatoscopic images of pigmented skin tumors can be used as an additional criterion in establishing the preliminary diagnosis in patients with suspected skin melanoma at the stage of initial dermatological examination.

2. The use of spectrophotometric analysis of selected areas ("photobiopsy") of digital dermatoscopic image provides new diagnostic parameters from different parts of superficial skin melanoma.

3. Further studies will be related to the development of differential spectrophotometric criteria of dermatoscopic images diagnostics for telemedicine consultations.

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