SEMI-AUTOMATIC AND AUTOMATIC KI-67 INDEX EXAMINATION IN WHOLE SLIDE IMAGES OF MENINGIOMAS

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Introduction

Histopathological examination of tissue subjects by immunohistochemical staining is the basic method of recognizing types of cancer and it provides valuable indicators concerning choice of optimal therapy or defining the prognosis. One of a most important markers is the mitotic receptor Ki-67, among others, in central nervous system tumours. According to examination guidelines, ROI's (Region of interest) whose fields correspond with the high positive receptors' reaction should be selected. The digital pathology offers possibilities for automatic procedure performed on the whole slide images(WSI). In this paper, the authors present the comparison of Ki-67 index examination in meningima specimens performed in two ways: with selection of hot-spot regions by the experts, and with automatic selection of hot-spots. Using both ways we have analyzed variability of results between two experts and between the exprets and the automatic procedure, also in respect of Ki-67 level.

Materials

The fifty cases of meningiomas were stained with the ready-to-use FLEX Ki-67 antigen (Dako, code IR626) in Dako Autostainer Link. Acquisition of images was carried out by the 3DHistech Pannoramic II Flash scanner under the 20x magnification of lens.

Methods
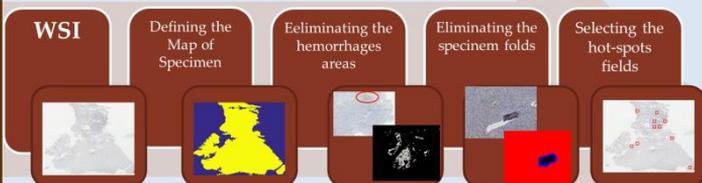
The selection of hot-spots was done manually by two experts and automatically with the proposed method of automatic hot-spot detection.
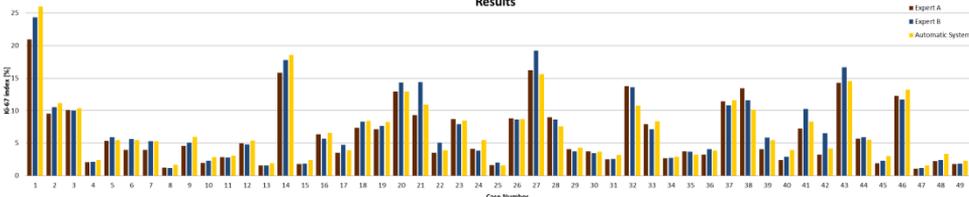
Results

The obtained results were analyzed by means of determination statistic and Bland-Altman plot. The mean difference between the results of Expert A and Expert B was -0.6065% (SD ±1.27%). Comparison between the results of Automatic system and Expert A gives mean difference 0.5207% (SD 1.18%) whereas in relation to the Exert B, it was -0.0858% (SD 1.21%). No significant skewness was observed in any of Bland-Altman plots. The determination analysis gives R^2 equals 0.947 (Expert A to Expert B, p<0.000001), 0.947 (System to Expert A, p<0.000001), and 0.944 (System to Expert B, p<0.000001).
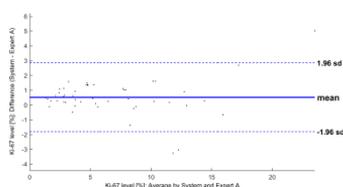
Bland-Altman plot

Conclusions

The automatic procedure for the hot-spot detection in meningioma WSI gives the high concordance of results with the expert's examinations. The differences between the automatic and both experts' results are included in the range of variability of experts' results. No significant positive or negative trend was observed, in relation to Ki-67 level. The presented results confirm that the proposed automatic procedure can be introduced to the multicenter verification process for practical applicability in histopathological diagnosis in the near future.