Validation of non-uniform illumination correction techniques in microscopic digital TB images using image sharpness measures

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Background: Tuberculosis (TB) is a communicable disease for which an early diagnosis is essential to control the disease. The microscopy-based TB screening is the conventional method employed for TB identification in sputum smears. Fluorescence microscopy-based diagnosis provides improved sensitivity and benefits large number of TB burdened communities across the globe. Microscopic images are often corrupted by intensity variations because of inherent imperfections of the image formation process. This may result in false positives which is the potential shortcoming of fluorescence microscopy.

Methods & Materials: The fluorescence-stained slides were prepared at South African National Health Laboratory Services, Groote Schuur Hospital in Cape Town. The images (N=100) were captured using a camera in monochrome binning mode attached to a 20x objective fluorescence microscope of 0.5 numerical aperture. The camera (AxioCam HR) has a resolution of 4164 x 3120 with a pixel size 6.45 μm (h) x 6.45 μm (v).

The illumination correction methods adopted in this work include surface fitting method, multiple regression method and bidirectional empirical mode decomposition. The results of illumination correction are validated using the image sharpness measures. This includes derivative-based, statistical, histogram-based and transform-based parameters.

Results: It is observed from the results that surface polynomial fit-based correction performs better among the illumination correction techniques. The intensity profile of the corrected image reveals the performance of the method. Also, the most significant sharpness parameters-based on derivative, statistical, image histogram and transform showed the effectiveness of the method which could be suitable for the non-uniform illumination correction of these images. Results demonstrate that the seven most significant (p < 0.0001) sharpness parameters present distinct variation with the implementation of surface fitting illumination correction method. This proves the suitability and efficiency of the method for these images.

Conclusion: Although illumination correction is a long standing research topic and many algorithms have been proposed, the selection of the optimal algorithm for specific experimental microscopy applications remains ad hoc. The application of the surface fitting method is especially useful in pre-processing of digital sputum smear images, and could be used for reliable identification and classification of TB objects (bacilli and non-bacilli).

Paradoxical reaction (PR) in HIV negative patients with tuberculosis: Case series

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Background: PR, an entity with an incidence of 10-15%, is an exuberant inflammatory reaction resulting in clinical or radiological worsening after initiation of appropriate ATT in the absence of disease relapse, drug resistance or presence of another diagnosis. This is well described in the HIV infected as IRIS but with scarce data in the non-immunocompromised individuals. This is a case control study which elaborates on the incidence, risk factors and clinical