Semi quantitative evaluation of skin burn wound healing: ATR-FTIR study

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The role of skin wound healing the biochemical mechanisms are still not fully understood and spectroscopy may shine some light on this information. The Fourier Transform Infrared spectroscopy coupled with Attenuated Total Reflectance (ATR-FTIR) has been demonstrated potential to monitor the biomolecule activity upon biological samples. This work aims to evaluate the feasibility of using ATR-FTIR to discriminate burned skin throughout wound stages. Water vapor at 90°C was applied to the dorsum of Wistar rats resulting in standardized third-degree burns. Tissue samples were collected after 3°, 7°, 14° and 21 days post burn injury. For the acquisition of the spectra, 150 scans were averaged with a resolution of 4 cm^{-1} and wavenumbers ranging from 4000 to 400 cm^{-1}. Analysis of the spectra was calculated using MATLAB®R2015a (MathWorks, Natick, MA) software. Fingerprint region (900 - 1800 cm^{-1}) and high wavenumber (2800 - 3000 cm^{-1}) of spectra were offset-corrected and vector normalized. Area under the curve (AUC) of collagen (1236 cm^{-1}), amide II (1540 cm^{-1}), amide I (1632 cm^{-1}) and lipid (2852 cm^{-1}) of each group were performed by integration method. The FTIR results exhibit the high biochemical activity of the tissue in the 14^o post burn injury when it is compared with control group which correspond to the stage when the new tissue formation is still ongoing. The lipid content decrease in the 21 day, which suggest that the metabolic activity and structural reorganization decrease as the wound healing progress. For future works, micro-FTIR imaging will be used spatially discriminate the bands. This study was supported by CEPID/FAPESP 05/51689- 2, CAPES/PROCAD 88881.068505/2014-01, CNPq/INCT 465763/2014-6, 141946/2018-0 and PQ 309902/2017-7.