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Characterization of Hyaluronic Acid-Based Injections Used on Rejuvenation Skin Treatments

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Abstract : This work provides a physicochemical and thermal characterization assessment of three different hyaluronic acid (HA)-based injections used for rejuvenation skin treatments. The three products analyzed are manufactured by the same manufacturer and commercialized for application on different skin levels. According to the manufacturer, all three HA-based injections are crosslinked and have a concentration of 23 mg/mL of HA, and 0.3% of lidocaine. Samples were characterized by Fourier-transformed infrared (FTIR), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and scanning electron microscope (SEM) techniques. FTIR analysis resulted in a similar spectrum when comparing the different products. DSC analysis demonstrated that the fusion points differ in each product, with a higher fusion temperature observed in specimen A, which is used for subcutaneous applications, when compared with B and C, which are used for the middle dermis and deep dermis, respectively. TGA data demonstrated a considerable mass loss at 100°C, which means that the product has more than 50% of water in its composition. TGA analysis also showed that Specimen A had a lower mass loss at 100°C when compared to Specimen C. A mass loss of around 220°C was observed on all samples, characterizing the presence of hyaluronic acid. SEM images displayed a similar structure on all samples analyzed, with a thicker layer for Specimen A when compared with B and C. This series of analyses demonstrated that, as expected, the physicochemical and thermal properties of the products differ according to their application. Furthermore, to better characterize the crosslinking degree of each product and their mechanical properties, a set of different techniques should be applied in parallel to correlate the results and, thereby, relate injection application with material properties.

Keywords : hyaluronic acid, characterization, soft-tissue fillers, injectable gels
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