IR-microscopic analysis of skin biopsies for identification of implant materials as used in aesthetic surgery

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Different implant materials are currently applied for correction of inborn and acquired aesthetic deficiencies of the skin with the main focus on the human face. Several different materials are in use as dermal fillers for such aesthetic facial surgery, i.e. products containing bovine collagen and cross-linked substances, others with hyaluronic acic derivatives, both also in combination with polymethylmethacrylate (PMMA) or co-polymerisates of methacrylate derivatives, or recently also gels containing polylactate components. Another category has been dimethylpolysiloxane, which is an inert and medical grade silicone. Infrared spectra of several commercially available products are presented after dry film preparation. Individual product component identification can be supported by analysing inhomogeneous dry samples by infrared microscopy.

Infrared attenuated total reflection (ATR) spectroscopy has often been used for bio-medical studies.[1] Infrared microscopy is also able to identify previously applied dermal filler products in excised tissue. Whereas transmission spectroscopy needs the microtoming of thin tissue slices of micrometer thickness after embedding the sample in a matrix material such as paraffin or an epoxy or polyester resin without any staining, the use of the micro-attenuated total reflection technique[2] allows a much simpler sample preparation after tissue drying, because optically thick samples can be analysed and no difference spectroscopy is necessary for removing contaminating matrix bands. A line mapping technique was used for investigating the existence of implanted foreign matter. Several tissue spots guided by inspecting the different colour grades were found with increased single compound concentrations, as made plausible by the dominating spectral features and supported by difference spectroscopy. The chemistry within dermal biopsies after material implantation can be uniquely investigated based on their infrared spectra.

References:

[1] H.M. Heise, in H.-U. Gremlich and B. Yan (Eds.), *Infrared and Raman Spectroscopy of Biological Materials*, Marcel Dekker, New York, 2001, pp. 259-322.
[2] L. Küpper, H.M. Heise, F. Bechara, M. Stücker, J. Mol. Structure ***565/566***, 497-504 (2001).