CT-Osteoabsorptiometry (CT-OAM) - a new investigation technique in the field of mummy research

Anna Christina Hirsch, Gerhard Hotz, Wilfried Rosendahl, Valentin Zumstein, Frank J Rühli & Magdalena Müller-Gerbl

ABSTRACT
The scientific study of mummies provides an insight into the life of past populations. Using CT-Osteoabsorptiometry (CT-OAM), a noninvasive technique based on conventional CT-data sets, it is possible to visualize the mineral density distribution in the subchondral bone plate, representing the long-term loading conditions of the articulation surface. The objective of the current study was to investigate the applicability of CT-OAM on mummies for the load analysis of joints as a new investigation technique in the field of mummy research. In order to clarify if apparent malpositions of the spinal column have existed during lifetime or occurred post-mortem, we evaluated the long-term loading patterns within the thoracic and lumbar endplates of 8 mummies. The implementation of CT-OAM on mummies for load analysis of joints was feasible. The mineral density distribution within the endplates was not homogenous but followed distinct distribution patterns. In all of the endplates investigated the marginal zones were higher and the central areas lower mineralized, whereby the areas of greatest density were found in the peripheral marginal zones. The vertebra columns without malposition showed within the thoracic endplates an almost even circular allocation of the density maxima, whereas within the lumbar endplates an increased localization of the density maxima dorsomedial, dorsolateral and ventral was observed. The thoracic endplates of the spines with kyphosis did not show an even circular allocation anymore but a concentration of the density maxima in the ventral area and the endplates of the spines with scoliosis exhibited a predominant localization of the density maxima on the concave side. The examined endplates showed characteristic reproducible density patterns consistent with the long-term loading conditions. With help of CT-OAM pathological load distributions can be visualized before macroscopical changes appear and the information obtained can be useful to solve paleopathological and paleoarchaeological questions.

type: journal paper/review (English)
date of publishing: 04-04-2017
journal title: Anthropol Anz (74/1)
ISSN print: 0003-5548