

Novel use of a Dektak 150 profiler unmasks differences in the morphology of resorption pits between control and Charcot patient osteoclasts

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Background and aims: Recently we have demonstrated the utility of a Dektak surface profiler to measure the erosion profile of resorbed bone discs. We hypothesised that there is a difference in the morphology of pits resorbed by osteoclasts generated from Charcot patients and controls. The aim of the study was to compare types and size of pits on bone slices between Charcot patients and controls. **Research Design and Methods:** Peripheral blood monocytes were isolated from 8 Charcot patients and 9 healthy controls and cultured in vitro on bovine disks in duplicate for 21 days with macrophage-colony stimulating factor (M-CSF) and receptor activator of nuclear factor- κ B ligand (RANKL). Erosion pit profiles were measured by a Dektak 150 Surface Profiler. A total of 1233 pits (average of 52 and 96 pits per Charcot patient and control subject respectively) were evaluated. According to their shape, pits were defined as uni-dented (erosion with a single dent under the unresorbed surface), bi-dented (erosion with two clearly defined dents) and multi-dented (erosion with three or more dents). Each pit type was characterised by the following parameters: width at the surface (μ m), maximum depth (μ m) and Full-Width Half-Maximum (FWHM), where the width was measured at the half of the maximum depth. **Results:** There was a significant difference in the pit parameters in the two groups. The median pit width, median FWHM and median depth were significantly greater in Charcot patients compared with controls for the uni-dented ($p=0.02$, $p=0.002$ and $p=0.002$) and multi-dented pits ($p=0.008$, $p=0.01$, $p=0.013$) respectively. Bi-dented pits were also wider in Charcot patients compared with controls at the surface ($p=0.03$) and at the FWHM ($p=0.056$), although there was no difference in their median depth ($p=0.223$). There was a different distribution of the pits in the two groups. The most common pit type in the control group was the uni-dented (60%), whereas in the Charcot group these represented only 38% ($p=0.004$) of the total pits. Although there was no difference in the percentage of bi-dented pits in the Charcot patients compared with controls (24% versus 21% respectively, $p=0.124$), there was a two-fold increase in the percentage of multi-dented pits in the Charcot patients compared with controls (38% versus 19%, $p=0.001$). **Conclusions:** Novel use of Dektak surface profiler revealed differences in the morphology of resorption pits which in Charcot patients were deeper and wider compared with controls and more frequently presented as multi-dented pits.