Effects of in vitro experiment conditions on the RFA results

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Resonance frequency analysis(RFA) offers clinical, noninvasive measures of stability and presumed osseointergration of implants. Clinically, RF values are considered to correlate with changes in implant stability during healing and after osseointegration. However, resonance frequency analysis measuring implant stability needs to be tested at in vitro conditions to interpret the in vivo manifestations. The aim of this study was to investigate the effects of changes of in vitro temperatures and wet conditions on the resonance frequency measurements.

Each 12 fixtures were installed into the two types of bovine rib bones with 2-mm thick superior cortical bone and no superior cortical bone. After installation, RF measurements were done after 0, 15, 30, 45 and 60 minutes in the 4℃ wet, 23℃wet and 37℃ wet conditions. Measurements were also made in the 23℃ air to simulate the dryness of the bone during 24 hours.

On the basis of the results of the above experiments, a total of other 120 fixtures with different lengths were installed into the prepared bovine rib bone with 2-mm thick superior cortical bone and no superior cortical bone varying the effective implant length(EIL) and RF values were acquired. Repeated measure analysis of variance and post-hoc Scheffe's test were performed at the 95% significant level.

The results were as follows:

1. In the cortical bone group, there were significant differences between the ISQ values at 4℃ and the ISQ values at 37℃ of the wet condition ($P<0.05$), but there were no significant differences between the ISQ values of the other temperature conditions ($P>0.05$).
2. In the cancellous bone group, there were no significant differences between the values at any temperature conditions ($P>0.05$).
3. In both groups, there were no significant differences between the values at 23℃ of dry condition until 24 hours ($P>0.05$).
4. In both groups, there were significant differences according to the variations of the effective implant lengths ($P<0.05$)