II. Clinical difference between SLA surface finishing and UV irradiated implant

In the last issue, it was confirmed that biologic aging phenomenon that the height of bone and implant occurs due to organic matrix such as hydrocarbon in the air even for the Sandblasted with large grit and acid etched (SLA) surface finishing, which is evaluated as the most stable and outstanding surface processing technique until now. As a solution, UV irradiation of the implant surface can remove the organic matrix from the implant surface and convert the hydrosphoric surface into superhydrophilic surface, thereby inducing direct osseointegration by inducing high level of bio-friendliness in the initial interactions between the implant and the bone generation factors such as protein and cells. In addition, UV irradiation accelerates osseointegration process and enhances the extent of osseointegration. In this issue, the usefulness of UV irradiated implant will be reviewed through comparison of the effects of the SLA surface and UV irradiated implant on osseointegration in actual cellular experiment, animal experiment and in clinical settings to verify the theoretical considerations presented in the previous issue.

II. Clinical difference between SLA surface finishing and UV irradiated implant

[In Vitro Test] Cell proliferation experiment prior to and after UV irradiation (Dental College of Kyungpook University)

Titanium disk with diameter of 10mm was used as a control group after having subjected it to SLA surface finishing. Same titanium disk with SLA surface treatment was further subjected to irradiation with UV wavelength for 3 hours after having subjected it to SLA surface finishing. Cell proliferation experiment was then conducted by embedding the MC3T3-E1 cell line into osteoblast cells applied to these disks.

As illustrated in Fig. 1, there was rapid increase in cell proliferation for the disk with UV irradiation in comparison to the control group without UV irradiation since the 3rd day of the commencement of experiment. Based on the results of increase in the quantity of proliferated osteoblast cells, which is an osteogenesis factor, for disk with UV irradiation in comparison to the disk without UV irradiation, it can be presumed that UV irradiation has substantial effect on proliferation of osteoblast cells.

Therefore, it is deemed possible to prevent failure in the implant embedding by stimulating the bone generation factors such as protein and cells in the very early stage by inducing secondary stability at earlier stage by irradiating UV to SLA processed surface.

[In Vivo Test] BIC experiment prior to and after UV irradiation (Dental College of Kyungpook University)

The following are the results of animal experiment on the bone to implant contact (BIC) rate of the SLA surface processed implant and UV irradiated (10 minutes) implant (Fig. 3-4). Experiment was executed by embedding 2 each of the SLA implants and UV irradiated implants into the left and right side of 3 white rabbits, BIC observations were made at the 3rd and the 4th week of the experiment and there was no death of rabbit during the experiment. As illustrated in Fig. 4, BIC of the UV irradiated implant was measured to be higher than that of the SLA surface processed implant. In particular, BIC for the UV irradiated implant was at a substantially higher level at 30% in comparison to 20% for the SLA surface processed implants at the time of measurement in the 4th week.

Although there is no difference in BIC between the values prior to and after UV irradiation of SLA surface processed implant but more than 2 folds as in the case of the value measured in the experimental rat model of professor Ogasawara of UCLA, USA (BIC of 84.2% for UV irradiated implant and BIC of 53% for non-UV irradiated control group at the 4th week of experiment), these values were not considered as substantial increase for the UV irradiated implant in comparison to the SLA surface processed implant prior to UV irradiation in this experiment. Therefore, it was possible to confirm that the acceleration of the osteogenesis process and enhancement of the extent of osseointegration are possible by minimal exposure between the bone and implant more advantageously in the latter stage of healing through UV irradiation.

Although there was no difference in Vickers hardness between the values prior to and after UV irradiation of SLA surface processed implant by more than 2 folds as in the case of the value measured in the experimental rat model of professor Ogasawara of UCLA, USA (BIC of 84.2% for UV irradiated implant and BIC of 53% for non-UV irradiated control group at the 4th week of experiment), these values were not considered as substantial increase for the UV irradiated implant in comparison to the SLA surface processed implant prior to UV irradiation in this experiment. Therefore, it was possible to confirm that the acceleration of the osteogenesis process and enhancement of the extent of osseointegration are possible by minimal exposure between the bone and implant more advantageously in the latter stage of healing through UV irradiation.

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