On the effects of the characteristics of the titanium oxide to the osteoblast cell culture.

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Statement of problem. Confusion about the relationship of surface characteristics of implant to osteoblast cell attachment.

Purpose. This study attempted to bone cell attachment to the implant surface which was modified by heat.

Material and methods. Commercially pure titanium grade 2, 4 × 4mm sheet 40 pieces were treated for 10 minutes with ultrasonic cleaner with methylethyl ketone, ethanol, deionized distilled water, and half of the specimen 20 pieces were heat treated in 980°C for 15 minutes. All 40 specimens were autoclaves.

Total 6 dishes were prepared, 3 dishes were for control group, and the other 3 dishes were for heat treatment. In fourth day, cell account was done.

Conculsion. The change of surface characterization by heat treatment could affect the cell attachment in the early stage however, the change of surface characterization would not be prolonged.

The are no guideline of selecting the surface pattern of titanium intraosseous implant.

Also there is no study of any surface factors which could affects the bone formation. There are some study about relationship osteoblast cell culture and surface roughness, however they did not point out any things about cell attachment[1,2].

It is our hypothesis that if osteoblastic cell could recognize the difference of surface topography, then bone matrix formation by attaching cell will be changed by surface morphology.

The MG-63 cells were cultured on heat treated experimental specimens and controls whether heat treatment can affect the ceel attachment.

MATERIAL AND METHODS

40 commercially pure titanium grade 2 specimens (4 × 4mm) were treated for 10 minutes in ultrasonic cleaner with methylethyl ketone, ethanol, deionized distilled water. Then 20 specimens were heat treated in 980°C for 15 minutes.

All 40 specimens were autoclaved.

Total 6 dishes were prepared, 3 dishes were for control group, and the other 3 dishes were for

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heat-treated

In second day, Media of all 6 dishes contained the titanium was changed.

In fourth day, cell account was done as follows;

1. The titanium was transfer to the falcontube with pincett.
2. Washing with PBS 3ml,then aspiration.
3. Trypsin/EDTA 3ml was put into the tube for 10 minutes.
4. Vortex was used to help dropping the cell.
5. Titanium was take out with pincett and add DMEM 6ml to titanium.
6. Total 9ml volume falcontube was put into centrifuge.(RPM 1000/5minutes)
7. 8ml was aspirated sothat 1ml was remained
8. 1ml was pipetting.
9. Cell count in hemocytometer.

RESULTS

Table 1. MG-63 Cell attachment per titanium plate.

	Titanium	heat treament titanium
3days	1×10^4	2×10^4
4days	2×10^4	2×10^4

DISCUSSION

From this experiment we could get the information of cell response of heat treatment effects. Heat treated surface would be beneficial to the bone cell attachment. Heat treatment may increase the oxide thickness[3], perhaps the thickened oxide may play be some roles for cell attachment, however it is difficult to maintain the heat treatment effects because at 4th day, the account was not changed, however at untreatment control speciemen,the cell account was increased by 2 fold.

Castellani reported that the effect of surface rougness on the proliferation, differentiation and calcification of rat bone marrow cell[4].

He compared Ra=0.38 and Ra=0.8, however did not find any diffenence of cell proliferation.

Surface roughness would not be related with cell culture, rather than it would be related with thickness it self, perhaps.

MG-63 cell is a cancer cell, so it would be necessary try to use another cell type.

CONCULSION

The change of surface characterization by heat could affect the cell attachment in the early stage of implant installation, however the change of surface characterization would not be prolonged.

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