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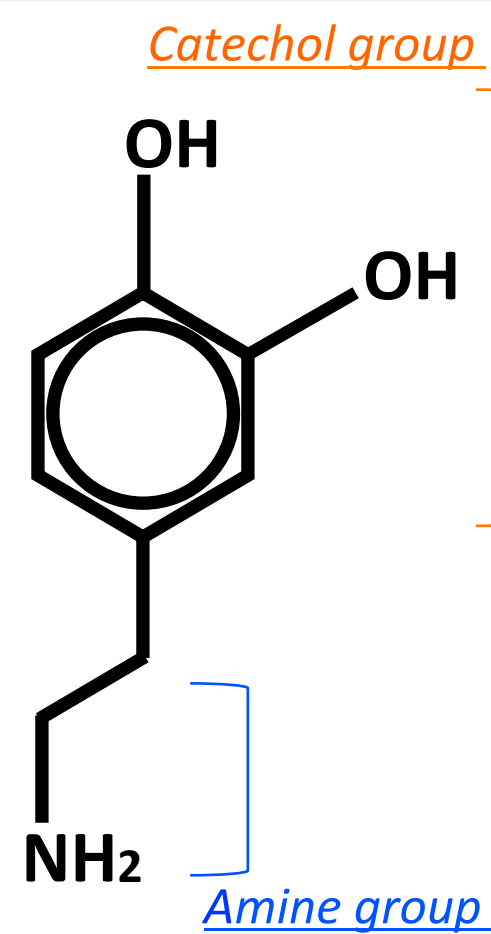
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BASIC RESEARCH

## Objective

The peri-implant healing is an essential consideration in order to achieve long-term success following the placement of the dental implant. The purpose of the present study is to investigate the effect of 3,4-dihydroxy-L-phenylalanine (Dopamine) on a titanium abutment surface in terms of wettability evaluations as well as cellular response calculations by means of human gingiva fibroblast (HGF).



## Dopamine

The present study is inspired by the adhesive characteristic of mussels attached to the bottom of a ship. The mussels contain a not so well known adhesive protein which can attach to all sort inorganic and organic materials. The adhesive protein consists of 3,4-dihydroxy-L-phenylalanine (L-dopamine).

## Materials and Methods

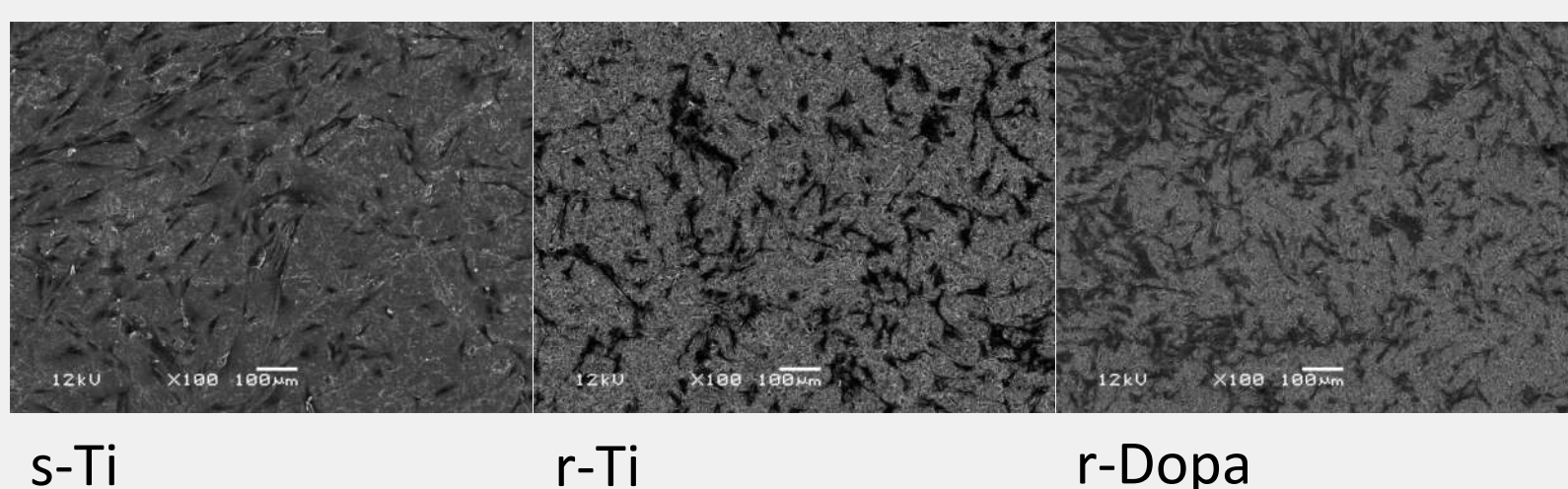
### Experimental titanium classification

|        | Sandblasting | Dopamine-dip-coating |
|--------|--------------|----------------------|
| s-Ti   | -            | -                    |
| r-Ti   | +            | -                    |
| r-Dopa | +            | +(24 hours)          |

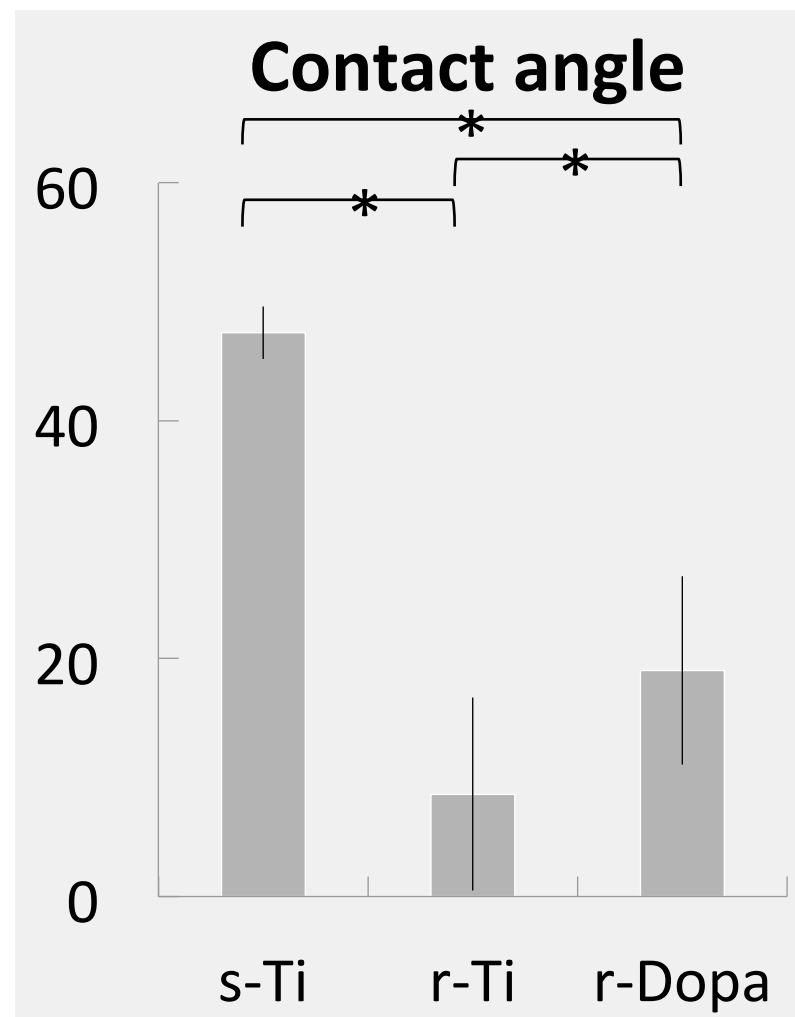
A total 27 titanium plates were divided into three groups (n=8) to imitate an abutment surface following the dental implant placement. Each titanium plate was 1cm\*1cm square shaped either with (r-Ti) or without (s-Ti) sandblast. r-Dopa titanium plate was simply soaked in an aqueous of L-Dopamine for 24 hours, immediately after the sandblasting.

The amount of HGF was calculated with the range for  $628.6\mu\text{m} * 471.4\mu\text{m}$  of each group via implementing of a scanning electron microscope (SEM) (n=6). With regards to the wettability evaluation, distilled water was used for the contact angle calculation on the surface of each group (n=8). All dates were analyzed by analysis of variance (ANOVA) followed by Fisher's LSD test.

## Results

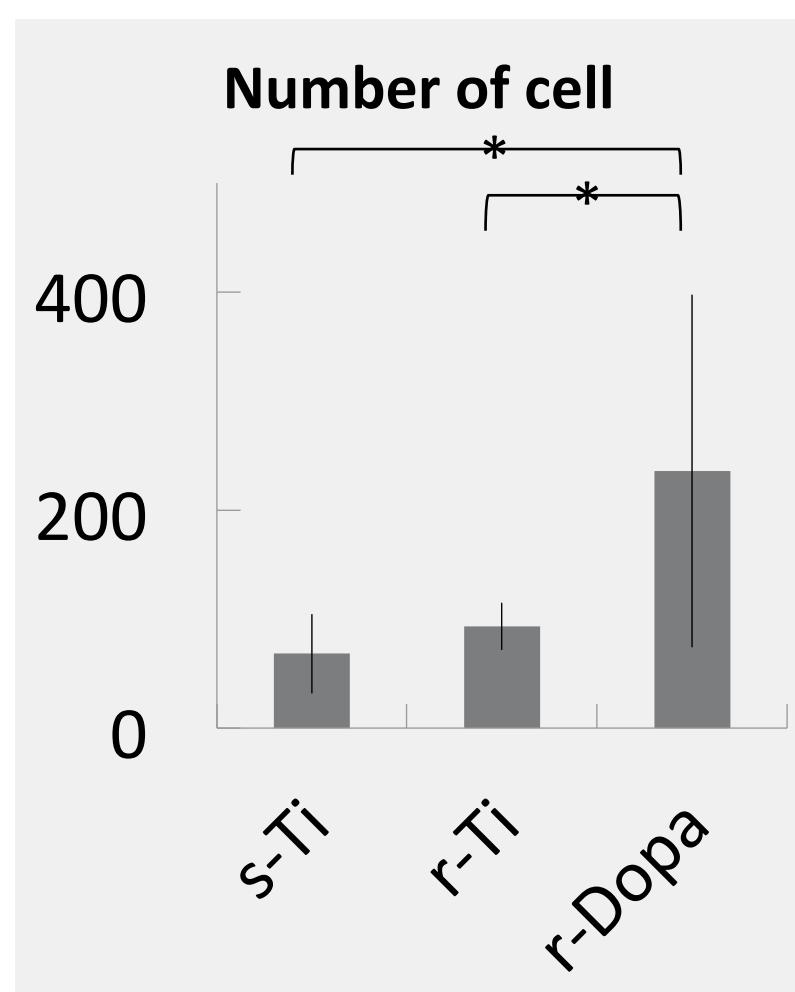


While both r-Ti and r-Dopa showed microporous titanium consisting of steep-sided pores or sharp triangular peaks, there was intact titanium surface in s-Ti. In terms of cell morphological outcomes, there was no distinctive difference among the groups. Tense HGF proliferation was present in the surface of r-Dopa.



### Hydrophilic assessment

The present figure illustrates the hydrophilicity, which was calculated on the titanium plates on respective conditions (Table). The highest contact angle reveals in s-Ti ( $47.4 \pm 8.1^\circ$ ), while the minimum angles assessed in r-Ti ( $19.0 \pm 7.9^\circ$ ). There were statistically significant differences among the test groups. The angles of r-Dopa amount to  $19.0 \pm 7.9^\circ$ .



### Cellular number of HGF

The graph describes cellular numbers of HGF, which were observed implementing SEM following HGF cultural operation. r-Dopa featured significantly greater number of cells ( $235.8 \pm 161.6$ ) than s-Ti ( $93.5 \pm 36.4$ ) and r-Ti ( $68.2 \pm 21.8$ ). However, there is no significant difference between s-Ti and r-Ti.

## Discussions

The results of HGF proliferation show that L-Dopamine, which possesses both catechol and amine functional groups, cause intense proliferation as well as cell adhesion on Titanium surface.

The mechanically treated Titanium with Dopamine coating features lower hydrophilicity than without coated titanium. Interestingly, the result gives that hydrophilicity of dopamine coated titanium possess significantly less hydrophilicity, than purity titanium which is endowed with ultra hydrophilicity, chemically.

## Conclusions

The present in-vitro investigation is concluded that 3,4-dihydroxy-L-phenylalanine affect on titanium biomechanical properties, in terms of hydrophilicity as well as cellular reaction of human gingiva fibroblast.



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