Observation of Blood Flow on Palatal Mucosa using an Improved Probe

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Introduction

In order to evaluate oral health and the function of prostheses, it is important to clarify the movement of blood flow on the palatal mucosa and in the cervical region around abutment teeth. In the past, we have observed blood flow on the palatal mucosa;[1),2)] ,however, the probe used to measuring blood flow has a number of limitations and restrictions. In the present study we make use of a newly-developed and more advanced miniature probe which can take more detailed measurements, and we present measurements of blood-flow volume in the palate and near the cervical region of the teeth areas in which we had difficulty in measuring in the past.

Materials and Methods

The improved probe, which was used for blood-flow-volume measurement,is about 1/10 the diameter of the previous model, and it is more flexible. (Fig1)

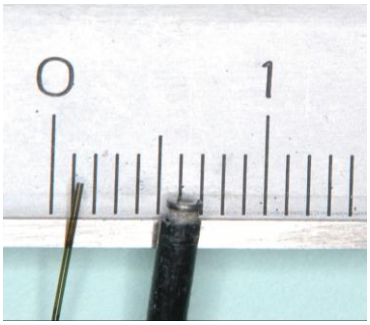

Fig1: Comparison of improved model(ϕ 0.17mm) with previous model(ϕ 1.8mm)

By comparing measurements of the same part of a palate using both models, we determined that there was no difference in the measurement accuracy.

Experiment①:　To clarify blood flow volume of in the cervical region of teeth.
Subject: 8persons(3 men, 5 women) average age is 28.9 years old(±3.3y)
Points of Measurement: Three points separated by 1mm intervals, in the cervical region of the first molar 1mm (Fig 2)

Experiment②:　To measure the blood-flow under a denture base at the time of load.
We created a model of a denture which covers occlusal surface of the maxillary molars and palate. (Fig3)

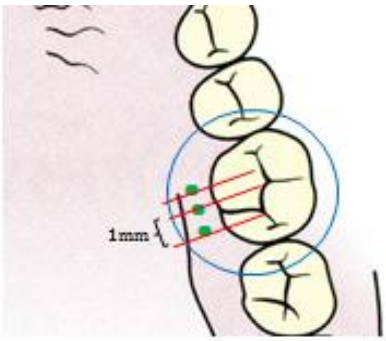

Fig 2: Points of Measurement

Fig 3: Model of a denture

Blood flow volume was measured at the time of load. The maximum occlusal pressure measurement was performed simultaneously.
・The right-and-left first molar and second molar section of the model was occluded.
・The thickness of the model was about 1.5mm
・The point of measurement was the mesial point, which was separated from the cervical region of right-and-left first molars by 1 mm.
・Load was measured in terms of continuous load and intermittent load.
Continuous load involved a maximum occlusal pressure of about 400N, on average, Whereas intermittent load involved tapping at the rate of three times per second.
・On the right side, the denture model and mucosa became stuck, and on the left side, the denture model and mucosa had about 1mm of relief. (Fig4)

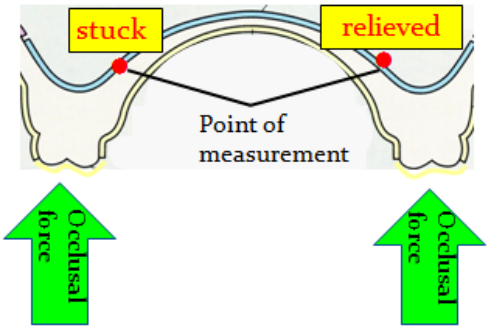

Fig 4: The difference in how to give occlusal force

Results

In experiment①,a significant difference in the blood flow volume among the three measuring points was not seen. (Fig 5)

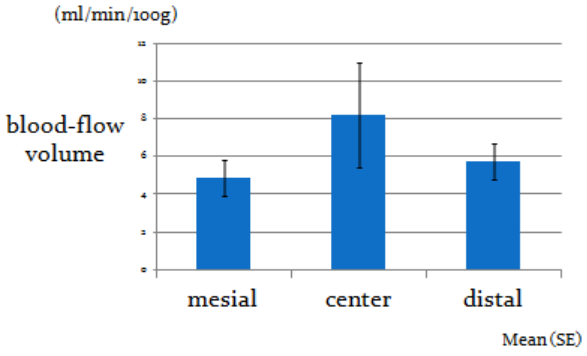

Fig 5: Blood flow volume among the three measuring points

In experiment②, in the case of relieved, rate with decreasing a blood flow volume becomes
small clearly rather than in case of stuck. (Fig6)

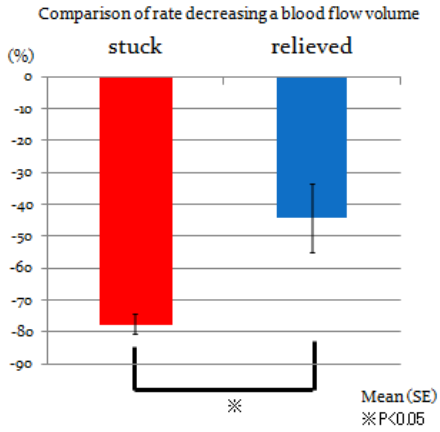

Fig 6: Comparison of rate with decreasing a blood flow volume(continuous load)

In case of relieved, rate with increasing a blood flow volume becomes small clearly rather than in case of stuck. (Fig7)

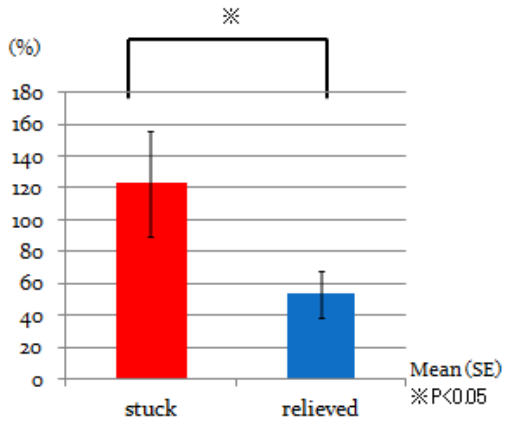

Fig 7: Comparison of rate increasing a blood flow volume(intermittent load)

Discussion

In experiment①,a clear difference in three measured regions was not seen, and the mesial point of measurement was the most stable. The mesial point of measurement Was considered to be the optimal measurement point in the cervical region of the teeth. Therfore, the mesial point of measurement was applied in the second experiment.

In experiment②, the aspect of blood-flow-volume change in the case of intermittent load and continuous load which were measured under the conditions of occlusal pressure, showed the same tendency as the result of the past experiments under pressure. Moreover, blood-flow-volume change in the case of intermittent load and continuous load under the conditions with relief were clearly smaller than those under the conditions of being stuck.This was the same result seen in past experiments under similar pressure conditions.

Conclusion

The measurement of blood-flow-volume change under the conditions of occlusal Pressure, which were difficult to perform until now, have become possible due to the use of the improved probe. Under various conditions, our results were similar to those

seen in past experiments[1)-4)] under similar conditions of pressure.
Based on our findings, we believed that the improved probe is sufficiently reliable for use under clinical conditions. We intend to conduct further investigations into detailed blood-flow-volume measurements under clinical conditions.

References

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