

# Pressure Pain Threshold of Mucosa After Tooth Extraction Under Removable Denture Bases

Y. Suzuki\*, M. Katoh\*, J. Sato\*, M. Morokuma\*, M.A. Hosoi\* and C. Ohkubo\*

**Abstract** - This study explored the pressure pain threshold (PPT) of the mucosa after tooth extraction. The PPTs of the wounded mucosa of eight volunteer subjects were observed at 7, 30, and 90 days after tooth extraction. The PPTs at 30 days and 90 days were approximately two and three times higher, respectively, than those at 7 days. As time passed, the values for the PPTs after tooth extraction increased in all regions. At 90 days after tooth extraction, the PPTs are about 97% recovered compared to the PPTs of the contralateral points.

KEY WORDS: Removable denture, pressure pain threshold, tooth extraction, mucosa

## INTRODUCTION

Edentulous and partially edentulous patients with removable dentures often complain of pain areas in the mouth due to occlusal errors or overfunction<sup>1,2</sup>. Patients particularly complain of pain in the wound under the denture base after tooth extraction. So far, the diagnoses of wounds resulting from tooth extraction have been performed only by inspection and palpation; a literature review revealed no method to measure the wound condition quantitatively. This study explored the pressure pain threshold (PPT) of the mucosa after tooth extraction using a pressure pain threshold meter<sup>3</sup>.

## MATERIALS AND METHODS

To quantitatively evaluate the pressure pain threshold of soft tissue areas, a measurement device was developed using a small load cell (LM-5KAM306-T Kyowa, 6 mm diam., Japan) and a modified strain amplifier (MEDICAL ACCESS, Japan) (Fig. 1). The pressure pain threshold of the mucosa was measured on eight volunteer partially edentulous subjects (1 man and 7 women, mean age of 75.0 years) after tooth extraction without any complications (Table 1). The subjects were instructed to inform the operator when they felt pain by pressing an electrical switch in their hand. Five maxillary points (lateral incisor: 1; canine: 1; first premolar: 1; second molar: 2) and five mandibular points (incisor: 1; first premolar: 3; second premolar: 1) were measured using the pressure pain threshold measurement system. The contralateral points of the measurement points were also measured as a control. These points had undergone tooth extraction more than three years previously. The PPTs of the wound after tooth extraction were measured after 7, 30 and 90 days.

Normality of the data distribution and homogeneity of variances in the groups were first verified using the Mauchly sphericity test. Then repeated measure ANOVA

was applied to verify if the group differences were statistically significant. The Dunnett test was applied for post-hoc comparison. In all tests, the level of significance was set  $p < 0.05$ .

## RESULTS

The PPTs of the wounds up to 90 days after tooth extraction are presented in Fig. 2 and Table 2. The PPTs at 7 days after extraction were the lowest and ranged from 230 to 640 gf in the maxilla, and 240 to 430 gf in the mandible. The PPTs at 7, 30, and 90 days after extraction were 358.5gf, 662.5gf and 978.1gf respectively. As time passed, the values for the PPTs increased in all regions. The PPTs at 30 days and 90 days were approximately two and three times greater, respectively, than those at 7 days ( $p < 0.05$ ). The percentages of the PPTs of the wound up to 90 days after tooth extraction compared to the contralateral points are shown in Fig. 3 and Table 2. The PPTs at 7, 30, and 90 days after extraction were 35.8%, 66.6%, and 97.1% lower, respectively, compared to the contralateral points. The percentage PPTs of tooth extraction per contralateral point at 30 days and 90 days were approximately two and three times greater, respectively, than those at 7 days ( $p < 0.05$ ).

## DISCUSSION

Information about the relationship between the PPTs and the length of time after tooth extraction could contribute to the effectiveness of denture adjustment. The healing of an extraction socket is characterized by internal changes that lead to the formation of bone within the socket and by external changes that cause the loss of width and height of the alveolar ridge<sup>4</sup>. When a tooth is removed, there is hemorrhage, followed by the formation of a blood clot that fills the entire socket<sup>5</sup>. The socket would be completely covered by the epithelization by 6 weeks post-extraction<sup>6</sup>. Further replacement of the bone takes place with maximum radiographic density at around 100 days<sup>6</sup>.

A number of factors may affect the healing of sockets. The size of the socket, periodontal disease, and possible

\* DMD, PhD

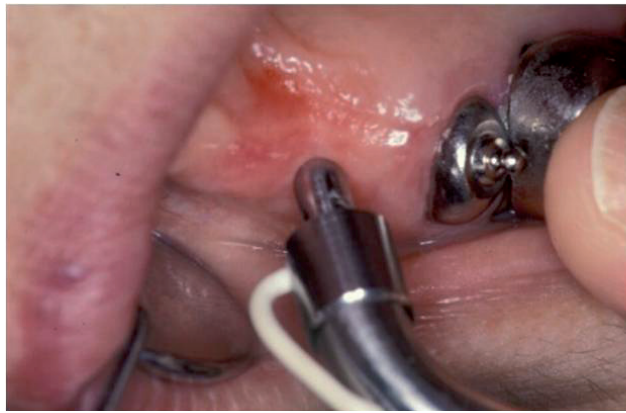


Figure 1. Measurement of pressure pain threshold

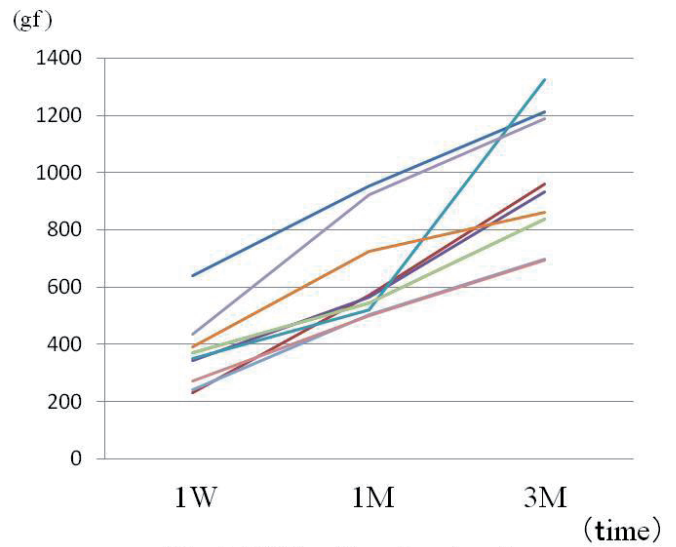


Figure 2. PPTs of tooth extraction

Table 1. Subjects situations

subject	gender	age	extraction tooth	Missing tooth
1	F	86	5	7~2   2~7
2	F	74	4	7~4   4~7
3	F	82	4	7~4   4~7
4	M	55	4	7~4   4~7
5	F	81	1	2~2
6	F	84	4	7~3   5~7
7	F	69	3	7~2   2~7
8	F	69	2	7~2   2~7
9	F	69	7	7~2   2~7
10	F	79	7	76   67

Table 2. Mean(SD) PPTS and the percentage PPTs per contralateral point

	PPTs(gf)	The percentage PPTs per contralateral point %
	Mean (SD)	Mean (SD)
7 days	358.5 (118.7)	35.8 (10.2)
30 days	662.5 (178.1)	66.6 (14.9)
90 days	978.1 (217.1)	97.1 (12.9)
P value group effect	<.001*	<.001*

\* Post-hoc test. All paired comparisons` P values are <0.05

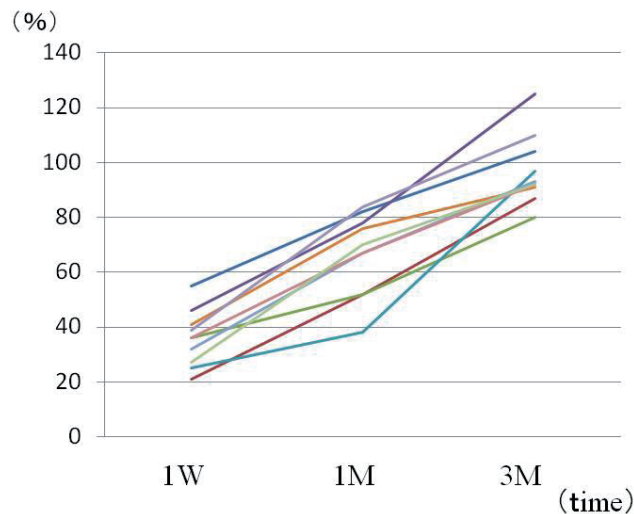


Figure 3. Percentage PPTs of tooth extraction per contralateral point

invasive surgery may influence the healing process. In this study, conventional tooth extraction without heavy invasive surgery was performed due to the presence of caries. Thus, normal healing was expected in all sockets. The PPTs at 7 days after extraction were very low compared to 30 and 90 days. Thus, denture refitting on the wound should be avoided to reduce mucosal pain until 7 days after tooth extraction. At 30 days after tooth extraction, PPTs have recovered by about 67% compared to the contralateral points. It is therefore suggested that denture adjustment using temporary soft lining materials can be performed effectively. At 90 days after tooth extraction, the PPTs are about 97% recovered compared to the PPTs of the contralateral points. Therefore, it is suggested that it would be appropriate to use hard lining materials to fit the denture base to the healed mucosa. The denture can be remade because the form of the residual ridge may also be recovered.

## CONCLUSION

As time passed, the values for the PPTs after tooth extraction increased in all regions. At 90 days after tooth extraction, the PPTs are about 97% recovered compared to the PPTs of the contralateral points.

## ADDRESS FOR CORRESPONDENCE

Dr. Yasunori Suzuki, Division of Oral and Maxillofacial Implantology, Tsurumi University School of Dental Medicine, 2-1-3 Tsurumi, Tsurumi-ku, Yokohama 230-8501, Japan.  
E-mail:suzuki-ys@tsurumi-u.ac.jp

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