

evaluated under linear finite element analysis. Mechanical properties<sup>7-10</sup> used for the analysis are listed in Table 1. The border of the bone was fixed. The establishment of the finite element models and their analysis were based on the finite element analysis system, COSMOS/M Version 2.0 (Structure Research and Analysis Co. Ltd., USA.).

The loading point was set on the buccal portion over the occlusal surface of the occlusion rim. The loading force was 1 kgf/cm<sup>2</sup> vertically. The stress and strain in horizontal and vertical directions of the mucosa elements, m1 to m9, were evaluated. The frictions of the gap elements were designed as 0.5, 0.05, and 0.005, and displacement of the nodes on the occlusal table (Fig. 4) was applied for assessing appropriate friction of the gap elements.

**RESULTS**

**Stress Distribution on the Mucosa**

The principal stress in the horizontal and vertical

**Table 1. Mechanical Properties Used for the Finite Element Analysis**

Material	Modulus of elasticity (kgf/mm <sup>2</sup> )	Poisson's ratio
Denture	250	0.3
Mucosa	0.1	0.3
Cortical bone	2000	0.3
Cancellous bone	150	0.3
Truss element	1 × 10 <sup>-7</sup>	

directions on the mucosa elements (m1-m9) was shown in Fig. 5. Differences were found between the Connected model and the Separated model. In the horizontal direction, the value of the principal stress on the Separated model decreased. Furthermore, on the Connected model, the m9 element on the lingual side showed the lingualward stress, while the m5 element on the Separated model showed the lingualward stress. No stress was noted at elements m1 or m9 in the Separated model. All of the mucosa elements showed buccalward stress, except for m1, m5, and m9.

In the vertical direction, the highest stress value

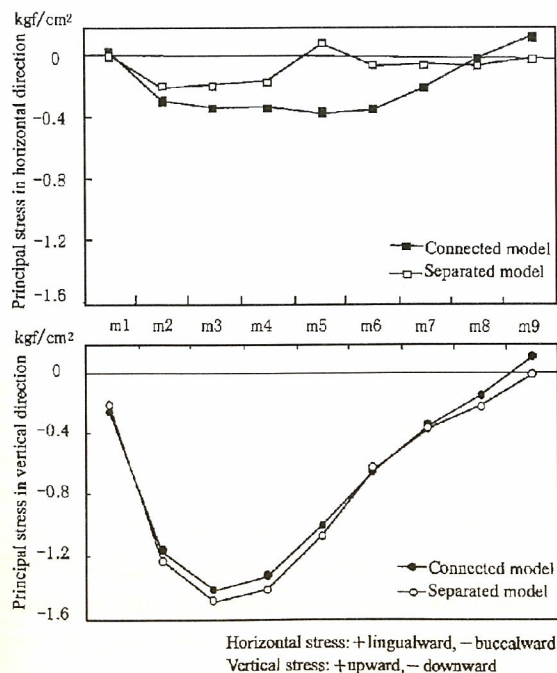


Fig. 5. Results of principal stress in horizontal and vertical directions for elements (m1 - m9, from buccal to lingual) of mucosa in the Connected model and the Separated model.

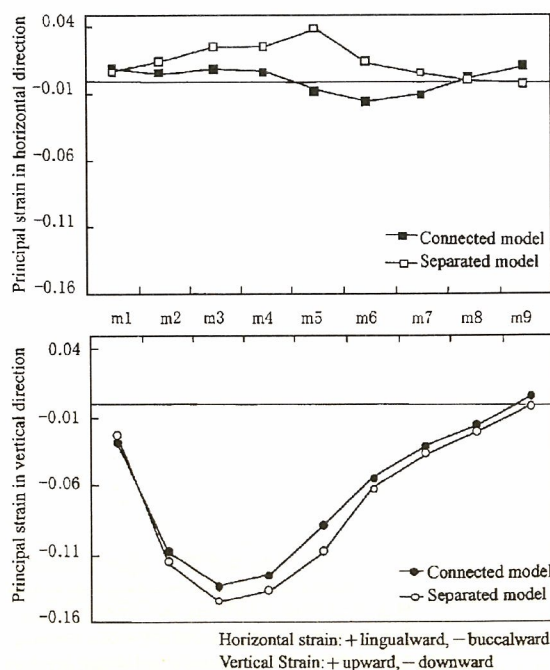


Fig. 6. Results of principal strain in horizontal and vertical directions for elements (m1 - m9, from buccal to lingual) of mucosa in the Connected model and the Separated model.