

## CLEAVAGE LINES IN THE ORAL MUCOSA AND ORAL SCARS

BY

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### ABSTRACT

Previously published data on the mucosal cleavage lines were compared with data on the formation of scar tissue after palatoplasty and it was found that, in the palate and surrounding tissues, scar formation is light when incisions are parallel to the long axis of the cleavage lines but severe when incisions are made at right angles to the cleavage lines. A few cases were also found where jaw movement was severely restricted because of the formation of hypertrophic scar between the upper and lower alveolar ridges. It is therefore desirable that surgical incisions in the palate and surrounding tissues be made parallel to the long axis of the mucosal cleavage lines.

### INTRODUCTION

It is said that incisions which follow the lines of cleavage of the skin result in much less postoperative scar tissue than incisions which do not<sup>1-5)</sup>. However, there are no reports on the relation between postoperative scar tissue and the orientation of incisions in the oral mucosa. We studied the relation between the cleavage lines in the oral mucosa and the formation of scar tissue in patients who underwent palatoplasty, and obtained some interesting results, which we report here.

### SUBJECTS OF OBSERVATION

In patients with cleft palate, we normally make the incision indicated by the dotted lines in Fig. 1 and perform the so-called "push-back operation". However, when the cleft is very wide and the mucosal flap cannot easily be moved, a tension-relieving in-

cision is sometimes made from the posterior edge of the upper alveolar ridge to the posterior edge of the lower alveolar ridge, as shown in Fig. 2. We investigated 48 cases where such an incision had been made, either by ourselves or by other doctors. As shown in Table 1, there were 3 cases in which less than one year had elapsed after the operation, 7 were in the second year after the operation, 7 in the third year, 13 in the fourth year, 9 in the fifth year, and 9 in the sixth year.

### METHOD OF OBSERVATION

We first examined the patients for the presence or absence of scar tissue along the incision, and where such tissue was present, we observed its condition. We next measured the maximal incisal opening between the edges of the deciduous incisors or the permanent incisors, as the case might be.

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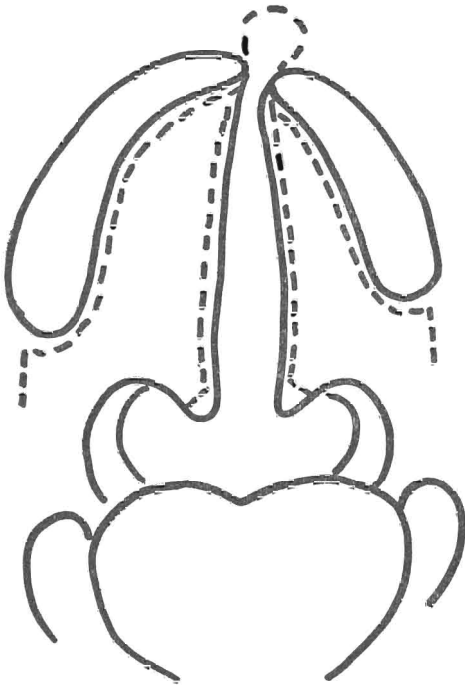


Fig. 1. Our routine palatoplasty operation.

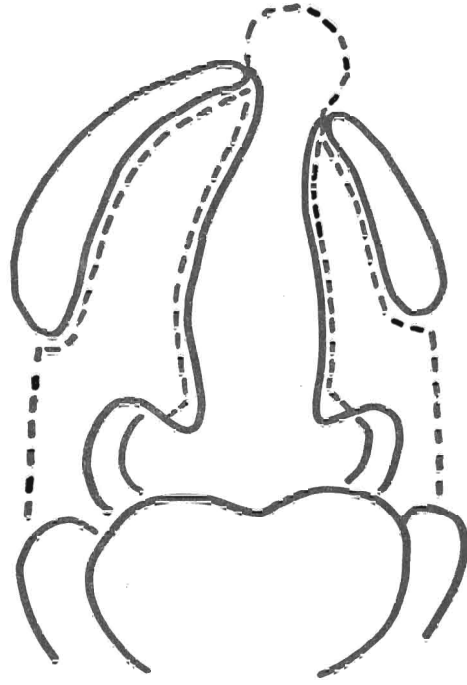


Fig. 2. Extension of the incisions between the alveolar ridges.

Table 1. Cases observed

Years after operation	-1	2	3	4	5	6	Total
Number of cases	3	7	7	13	9	9	48

#### RESULTS OF OBSERVATIONS

Along the central sutures of both the right and left mucosal flaps, both in the hard palate area and in the alveolar area, scar tissue was remarkably absent, the scar being a thin line or almost impossible to discern at all. However, as can be seen in Fig. 3, in the area of the soft palate, there could be seen in all cases poorly outlined smooth white scar tissue, about the same height as the surrounding mucosal tissue and occupying the approximate site of the original surgical incision. Again, between the posterior edges of the upper and lower alveolar ridges there could be seen at the

site of the original incision much hypertrophic scar tissue.

The incidence of hypertrophic scar tissue between the upper and lower alveolar ridges is shown in Table 2. In more than 90% of the cases, hypertrophic scar tissue was present in this area on both right and left sides. In all cases it was present on either the right or the left side. There were a few cases among those less than one year or more than five years after the operation which did not have funicular scar tissue on one side or the other, but such scar tissue was invariably present in all cases more than 2 or less than 5 years after the operation.

The width of the funicular scar tissue is

Table 2. Incidence of funicular scar tissue (%)

Years after operation	-1	2	3	4	5	6	Average
Left side	100	100	100	100	100	88	98
Right side	66	100	100	100	77	100	94
Either right or left side	100	100	100	100	100	100	100

Table 3. Width of funicular scar tissue (mm)

Years after operation	2	3	4	5	6
Left side	3.4±0.9	3.4±0.5	3.8±1.0	3.7±1.3	3.1±1.6
Right side	3.4±0.9	4.2±1.2	3.4±1.1	3.3±2.4	3.4±0.7

Table 4. Average extent of maximal incisal opening (mm)

Years after operation	-1	2	3	4	5	6
Width of maximal incisal opening	26.3±10.1	34.4±3.3	32.3±4.8	33.8±3.9	36.2±7.1	39.1±3.0

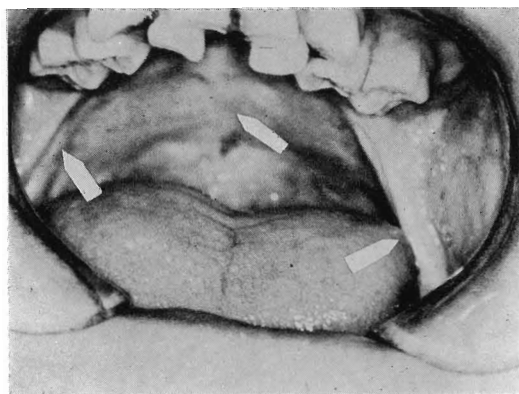


Fig. 3. Flat scar tissue in the sutures along the center line of the soft palate in the right and left mucosal flaps, and hypertrophic funicular scar tissues between the upper and lower alveolar ridges.

shown in Table 3. The maximum width was 6 mm, with an average of 3.5 mm, regardless of the time elapsed since the operation. There was no difference between right and left sides.

The maximal incisal opening of the patients, excepting those of advanced age, is shown in Table 4. These data are presented as a graph in Fig. 4. There was no

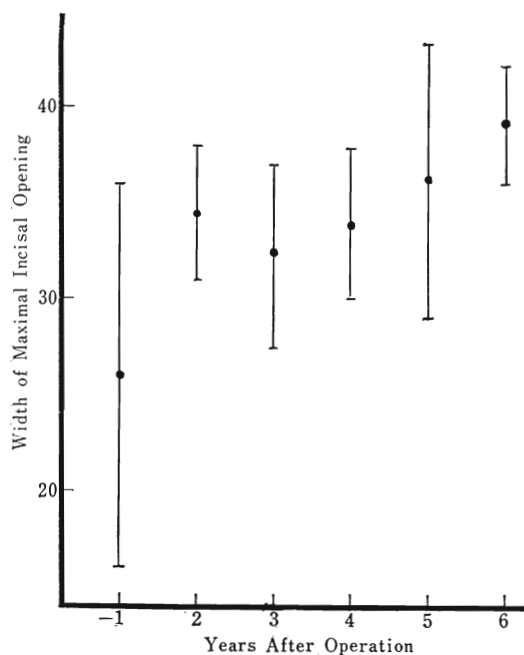


Fig. 4. Extent of maximal incisal opening.

significant difference among the various groups, but in the group less than 1 year after operation, maximal incisal opening averaged 26.3 mm; the value increased to 34.4 mm in the 2-year group, dropped to

32.3 mm in the 3-year group, and then gradually increased with time to a maximum average of 39.1 mm in the 6-year group.

#### DISCUSSION

Fig. 5 shows the cleavage lines of the mucosa of the palate and surrounding areas in a normal healthy person<sup>6)</sup>. In the center of the anterior portion of the hard palate, the tendency toward cleavage is weak, and only small round holes or angled lines appear. Sometimes cleavage lines appear in this area, whose long axis is in a sagittal direction. In the center of the central and posterior portions of the hard palate, there is a strong tendency to form cleavage lines whose long axis is in a sagittal direction. However, when proceeding from the center of the hard palate towards the sides, the long axes of the cleavage lines form an U inverted pattern, and become again sagittal along the alveolar ridges. In the soft palate, the tendency toward the formation of cleavage lines is much stronger than in the hard palate. The cleavage lines are mostly sagittal near the center of the anterior portion, but transverse in the central and

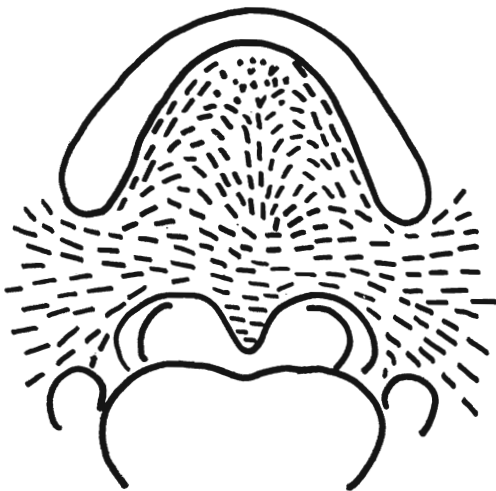


Fig. 5. Mucosal cleavage lines in the palate and surrounding areas.

posterior portions. In the soft palate and the mucosa between the upper and lower alveolar ridges, the cleavage lines are almost all transverse. On the uvula the cleavage lines are transverse.

Fig. 6 shows the palate at the end of the operation outlines in Fig. 2, and Fig. 7 shows the resulting postoperative scar tissue. After palatoplasty, movements of the palate and surrounding tissue of patients with cleft palate become nearly the same as in healthy persons, and therefore the cleavage lines of the palatine mucosa become aligned the same as in a healthy person. When Figs. 5 and 6 are compared, it can be seen that the incision along the alveolar ridges, as well as the sutures of the right and left mucosal flaps of the hard palate, are parallel to the cleavage lines, while the sutures of the right and left mucosal flaps of the soft palate and the incisions between

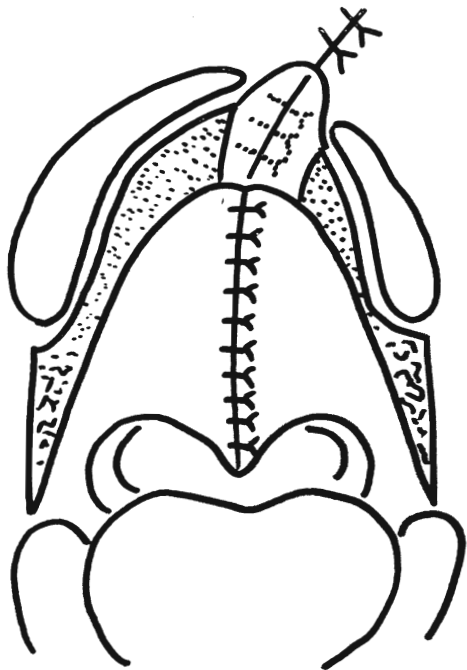


Fig. 6. Completed palatoplasty operation after making the incisions shown in Fig. 2.

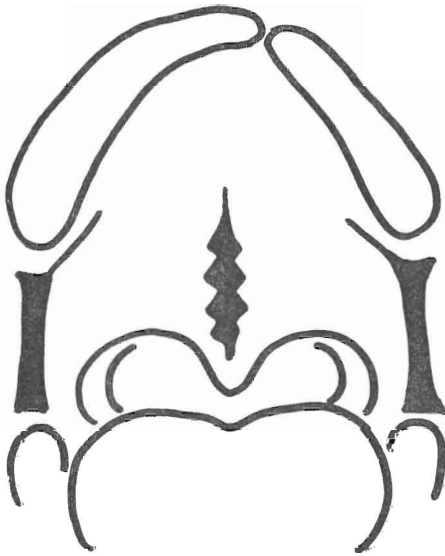


Fig. 7. Location of scar tissue after palatoplasty.

the upper and lower alveolar ridges are at right angles to the lines of cleavage. Next, when postoperative scarring is observed by comparing Figs. 6 and 7, it can be seen that, in spite of the fact that the incision along the alveolar ridges was not sutured, and primary healing was not undertaken, there is remarkably little scar tissue. There is also very little scar tissue formation in the sutures of the hard palate. On the other hand, in the sutures of the soft palate and in the incisions between the upper and lower alveolar ridges, scarring is severe. In other words, it can be concluded from this information that scarring is remarkably light when incisions are made parallel to the mucosal lines of cleavage, but severe when incisions are made at right angles to the lines of cleavage.

There are no data on the amount of maximal incisal opening of the jaws of Japanese children under 10, but according

to Sugimori<sup>7)</sup>, the forced maximal incisal opening of children from 1 to 9 years of age is  $39.7 \pm 5.9$  mm for males and  $39.3 \pm 4.3$  mm for females, and the maximal incisal opening should be 5–7 mm less than this, that is, between 32 and 37 mm for both sexes. When the data in Table 4 are examined in this light, it will be seen that in patients less than one year after operation, the extent of maximal incisal opening is  $26.3 \pm 10.1$  mm, which is less than normal, but it increases with time, so that it does not seem to be affected by the operation. However, this can be said only of the average value for, among the patients were some whose jaw movement was severely restricted, to whom normal jaw movement could be restored only by an operation for removing the scar tissue<sup>8)</sup>.

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