POSTOPERATIVE SCARS AND CLEAVAGE LINES

BY

Katsutoshi Motegi*1,2 Yuichi Azumi*2 and Tadashi Ueno*2

ABSTRACT

We elucidated the pattern of skin cleavage lines of the neck of Japanese cadavers and studied the scarring in 42 cases of radical neck dissection for the removal of metastatic nodules from the malignant tumors of the oral region, in the operation of which one incision was made parallel to, and another perpendicular to, the cleavage lines. From this study we came to the following conclusions:

1) The cleavage lines run parallel in ring-form around the neck, with the exception of the back and the lowermost part of the base of the neck. Seen from the side, the lines run horizontally across the neck.

2) Raised and widened scars were few at the site of the incision parallel to the cleavage lines but there were often at the site of the perpendicular incision.

3) There were no raised postoperative scars in the patients who had received radiotherapy prior to the time of observation.

INTRODUCTION

Since Langer’s paper1) on the cleavage lines of the skin was published in 1861, it has been reported that the formation of the scar tissue is significantly reduced when the surgical incisions are made parallel to these lines2–13). In recent years, however, there have been many reports from the field of plastic surgery stating that this is not necessarily the case14–20). These conflicting reports motivated us to study the cleavage lines of the facial skin, in which we have obtained results which differ from those reported in the existing literature27,28).

We chose the neck region to begin this study, for there the pattern of the cleavage lines is uncomplicated and is relatively uncontroversed in the literature.

MATERIALS AND METHODS

We used two cadavers, a Japanese male of age 83 and a Japanese female of age 70. These cadavers were preserved in the Department of Anatomy, Tokyo Medical and Dental University, and showed no abnormalities in the skin of the neck region. With a sharp, conical awl we punctured the skin of the neck (with the exception of the back of the neck) repeatedly and randomly. We then rubbed Japanese ink into the holes to make the cleavage lines visible, as we reported in the previous papers27,28).

For the observation of the postoperative scarring we studied 42 patients (33 males, 9 females) between the ages of 26 and 75 who had been treated at the Department

*1 Department of Oral Surgery (Chief: Prof. T. Oka), Nagoya University School of Medicine (Nagoya Daigaku).

*2 Department of Oral Surgery (Chief: Prof. T. Ueno), School of Dentistry, Tokyo Medical and Dental University (Tokyo Ika Shika Daigaku).

Received for publication, January 10, 1977.
of Oral Surgery of Tokyo Medical and Dental University during the period from 1957 to 1974. They had all been operated on in the neck region for the removal of metastatic nodules derived from the malignant tumors of the oral region (radical neck dissection). Observations were made by inspection and direct measurements. The period of observation varied, the longest being for 14 years and 11 months after surgery. In the cases where direct observation was not possible, color slides of the operation site were projected so that the image was of natural size and observations were made on this projection, in close connection with the medical record of the case.

The subjects were divided into 3 groups: the “surgery only” group of 12 who had received no treatment other than the operation; the “chemotherapy group” of 8 who had received some form of anticancer chemotherapy in addition to surgery; and the “radiotherapy group” of 22 who had received radiation treatment of the neck before or after surgery. In the chemotherapy group 4 received bleomycin (50–300 mg), 2 Toyomycin (chromomycin A₅), 1 Endoxan (cyclophosphamide) and 1 carzinophilin. In the radiotherapy group 6 were treated with X-ray (1,200–10,200 R) and 6 with electron beams (2,000–5,000 rads).

Photo. 1 shows one example of the cadaver showing cleavage lines of the neck. The other cadavers showed the same results. Fig. 1 shows the lines in a diagrammatic form. The lines run parallel in a ring-form around the neck, with the exception of the back of the neck. Seen from one side, they run sideways across the neck. At the lowermost part of the base of the neck some lines show a tendency to continue vertically down toward the chest.

Fig. 2 shows diagrammatically the T-shaped incision that we normally make for the radical neck dissection. The top of the T-shaped incision runs parallel to the cleavage lines (we call this the parallel incision) and the body (the perpendicular incision) is perpendicular to the lines.
a much higher and broader elevation of the scar tissue than the parallel incision.

Table 1 shows the incidence of the ridges of the scar tissue at the site of both the parallel and perpendicular incisions. Of the 42 cases, there was a scar ridge at the site of the parallel incision in 4 cases (9.5%) and at the site of the perpendicular incision in 12 cases (28.6%). This shows a 5% level of significance, which was applied also to the rest of the statistics stated below. There were no scar ridges at either the site of the parallel or perpendicular incision in the radiotherapy group. When we exclude this group, the percentage of scarring is larger: of the 30 cases in the surgery-only and chemotherapy groups, 40.0% had a scar ridge at the site of the perpendicular incision and 13.3% at the site of the parallel incision. There was no significant difference in the incidence of scar ridges between these two groups. The scar ridges first appeared 1 month after surgery; 6 years after surgery no scar ridges could be seen.

Table 2 shows the incidence of scars more than 2 mm wide at both the site of the parallel and perpendicular incisions in the three groups. Of the total of 42 cases, there were 10 cases (23.8%) with such scars at the site of the parallel incision and 24 cases (57.1%) at the site of the perpendicular incision. Among the three groups there was no difference in the incidence of such scars.

The redness of the scars at the site of both incisions disappeared within about 6 months, but in 4 cases it still remained after 1 year. The scar tissue began to turn white after 6 months, and most of it turned white after 1 year. After 3 years there was no redness left even in the most prominent scar ridges.

Depending on the time of observation, there were times even in the same individual case when the disfiguration caused
Table 1. Incidence of Scar Ridges

<table>
<thead>
<tr>
<th>Group</th>
<th>Parallel scars</th>
<th>Perpendicular scars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rridged</td>
<td>Not riddled</td>
</tr>
<tr>
<td>Surgery-only</td>
<td>2 (9.1%)</td>
<td>20 (90.9%)</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>2 (25.0%)</td>
<td>6 (75.0%)</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>0 (0.0%)</td>
<td>12 (100.0%)</td>
</tr>
<tr>
<td>Total</td>
<td>4 (9.5%)</td>
<td>38 (90.5%)</td>
</tr>
</tbody>
</table>

Table 2. Incidence of Widened Scars

<table>
<thead>
<tr>
<th>Group</th>
<th>Parallel scars</th>
<th>Perpendicular scars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Widened</td>
<td>Not widened</td>
</tr>
<tr>
<td>Surgery-only</td>
<td>6 (27.3%)</td>
<td>16 (72.7%)</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>3 (37.5%)</td>
<td>5 (62.5%)</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>1 (8.3%)</td>
<td>11 (91.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>10 (25.8%)</td>
<td>32 (74.2%)</td>
</tr>
</tbody>
</table>

by the height and width of the scars was very apparent and times when it was less so. In such cases we used the time of the greatest disfigurement for our statistics. Not all patients returned frequently for observation, so that they might not have been seen at the time of greatest disfigurement. For this reason, the ratio of disfigurement is probably greater than that shown in Table 1 and 2.

**DISCUSSION**

We observed that the cleavage lines of the skin of the neck run in parallel, encircling the neck, with the exception of the back of the neck. Seen from the side, the lines run horizontally across the neck. Davis and Kitlowski, Kirschner and Shuber, Anson and Maddock, Eller, Kruger and Herlyn reported essentially the same results as we have, but Langer, Hunt and Suzuki described the cleavage lines on the side and front of the neck as running parallel to the sternocleidomastoid muscle in a vertical pattern that does not always agree with our results.

After elucidating the pattern of the cleavage lines using Japanese cadavers, we have shown that the height and width of the postoperative scars are much less at the site of the incisions made parallel to these lines than at the site of the incisions made perpendicular to the lines.

According to Ito, the scar keloid in the skin wounds appears after 1–2 months, the ridge remains very prominent for about 2
years and after 10 years it is only slightly noticeable. Redness begins to disappear after 1 year and virtually disappears after 3 years. According to Onizuka\textsuperscript{35}, scarring is unstable during the 3 months after the healing of the wound, and widening of the scar and hypertrophic scar and keloid sometimes appear; redness usually disappears after 1 year, but some keloids do not lose their color for 5–10 years.

In the cases we studied, redness usually disappeared in about 6 months, while the few cases where the redness was still apparent after 1 year were probably examples of hypertrophic scar reported by Fujimori\textsuperscript{35} and the scar keloid by Ito\textsuperscript{34}. Some scar ridges appeared as early as 1 month after surgery, but none could be observed after 6 years. These observations are also in general agreement with Ito's report\textsuperscript{34}.

Suyama\textsuperscript{36} reports that radiotherapy aids in preventing scar keloids. In our observations also there was not a single scar ridge in any of the patients who had received radiotherapy prior to the time of observation.

**Acknowledgement**

We wish to express our sincere thanks to Professor T. Oka of the Department of Oral Surgery, Nagoya University School of Medicine, for his guidance, to Professor T. Ichijo of the Department of Oral Anatomy, Tokyo Medical and Dental University, for the use of the cadavers, and to Associate Professor J. Horiuchi of the Department of Radiotherapy, Tokyo Medical and Dental University, for providing us with the data.

**References**


29) Cited by 5).


31) Cited by 9).

32) Cited by 14).

33) Cited by 14).

