The contact zone of the human lips

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In the resting position and in persons with normal jaw relations the lips have a mutual surface of contact. Clinically, the area of contact constitutes a well-defined zone. This contact zone was made visible by smearing with ointment and measured in 24 young and 21 older persons. In all subjects the contact zone was band-shaped. Its widest dimension occurred laterally, narrowing medially. In the corner of the mouth it measured approx. 7.0 mm on an average, and in the median plane approx. 3.5 mm. A comparison was made of the changes that occur in the pars intermedia and the contact zone with advancing age. In the older subjects a significant reduction was recorded in the width of the pars intermedia (approx. 40 %). The dimensions of the contact zone on the other hand altered only slightly with age. The function of the contact zone is probably to seal the oral fissure when the mouth is closed. Surface contact between the two lips ensures effective adhesion.

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During the course of a study of the topography of the sebaceous glands in the vermilion border of the lips in man, the author ascertained that the available literature contained insufficient information on the relations of the human lips in contact.

The purpose of the present work is to describe the *contact zone* of the lips (i.e. the part of the lips which is in contact when the mouth is closed). The contact zone is compared with the transition zone, and an account is given of the effect of age on the dimensions of the two zones.

Earlier sub-divisions of the lips

One classical sub-division of the lips comprises three zones: the cutaneous zone (*pars cutanea*), the transition zone (*pars intermedia*, »Lippenrot», »vermilion border»), and the mucosal zone (*pars mucosa*). The zones are clinically and histologically distinct.

Clinically, the *pars cutanea* is recognized by its hairy surface and skin structure. In Caucasians and Orientals the *pars intermedia* is characterised by its red colour. The *pars mucosa* is sited inside the oral cavity and is constantly moistened by saliva.

Histologically the *pars cutanea* contains hairs, sweat glands and sebaceous glands. It is covered with hornified epithelium. The *pars intermedia* never incorporates hairs or sweat glands but frequently sebaceous glands; it has a thin covering of non-keratinized epithelium. The *pars*

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mucosa incorporates various types of salivary glands and is covered with non-keratinized epithelium.

Clinically, it is difficult to determine the border between the *pars intermedia* and the *pars mucosa. Liepmann* (1900) defined the pars intermedia as the part of the *rubor labium* which is visible from the outside when the mouth is closed naturally. This is the definition applied in the present study.

Present sub-division

From a *functional* point of view each lip can be sub-divided into three zones: (1) a *free exterior zone* (comprising the pars cutanea and the pars intermedia), (2) a *contact zone* (peripheral area of the pars mucosa), and (3) a *free interior rizone* (remaining area of the pars mucosa).

The *free exterior zone* is dry. It is exposed to the effects of its surroundings (irradiation, dehydration, contamination, physical traumata, contagious attacks). In the resting position, the *contact zone* of one lip touches the corresponding mucosal surface of the opposite lip and is thus protected. During speech and at other times when the lips are apart, the contact zone is subject to dehydration. The *free interior zone* is well protected against external influence. Forming part of the vestibule of the mouth, it is constantly moist.

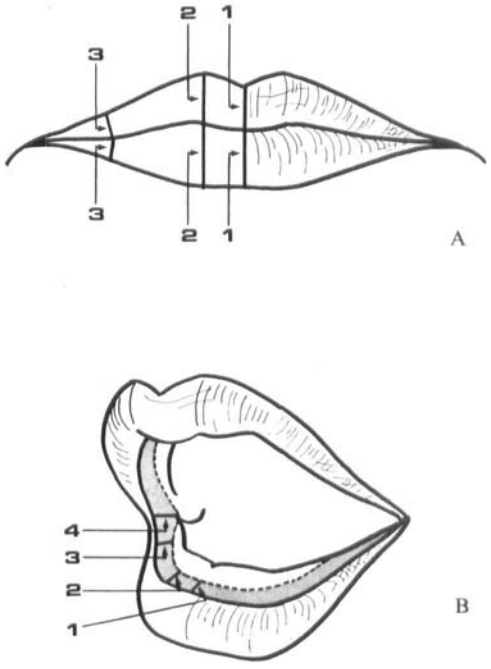

Fig. 1. The points of measurement of A, the pars intermedia and B, the contact zone.

MATERIAL AND METHODS

The material comprised 24 persons aged 20—29 years ($\bar{x}$=24 years) and 21 persons over the age of 50 years ($\bar{x}$=64 years). Each group contained approximately an equal number of men and women.

It was required that the subjects should have (1) regular jaw forms, (2) sound or well-restored anterior teeth, (3) normal overjet and vertical overlap, (4) normal vertical dimensions of the face, (5) normal sagittal lip relations, and (6) adequate closure of the lips.

The width of the *pars intermedia* was measured at three points on the upper lip and three points on the lower lip, Fig. 1 A:

1. in the median plane,
2. opposite the lateral border of the philtrum, and
3. 1 cm medially of the corner of the mouth.

To determine the dorsal extent of the zone, the latter was painted while the lips were in contact. Red correcting fluid drying within a few seconds was used.

All measurements were made on the right side with a standard graduated ruler. The final figure was taken to be the

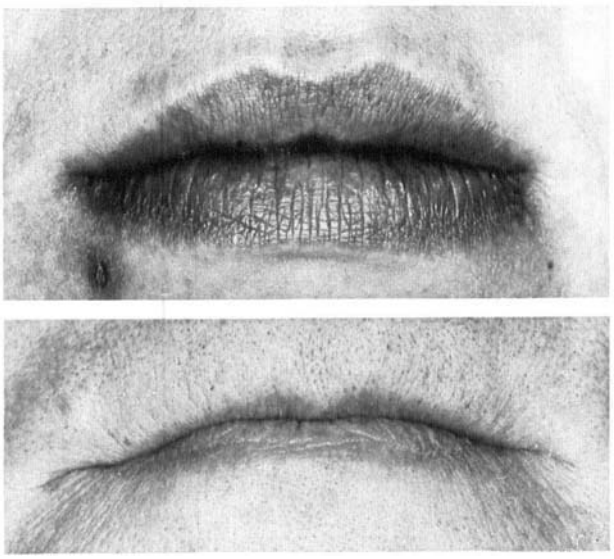

Fig. 2. Reduction in width of the pars intermedia with increasing age. A, young individual. B, old individual.

average of three readings. Measurements were rounded down to the nearest whole millimeter.

To render the *contact zone* visible, a fat, adhesive ointment in a contrasting colour was smeared on the upper lip. The subject was requested to close his mouth in a relaxed manner. This caused a distinct staining of the area of the lower lip that had been in contact with the upper lip.

The width of the contact zone was measured at four points, Fig. 1 B:

1. in the median plane,
2. opposite the lateral border of the philtrum,
3. 1 cm medially of the corner of the mouth, and
4. in the corner of the mouth.

The experiment was repeated with ointment applied to the lower lip and the contact zone on the upper lip was measured.

The final dimension was taken to be the average of the readings on the upper and lower lips. A slide gauge was used for the measurements, which were taken to the nearest 0.5 mm.

RESULTS

Young persons

Table I (left) shows the mean values and standard deviations of the readings. No distinction was made between the sexes.

On the *upper lip* the *pars intermedia* (Fig. 2 A) was widest opposite the lateral border of the philtrum and on the *lower lip* it was widest in the median plane. In both lips the average width of the pars intermedia was found to be approx. 10.5 mm. At a point 1 cm medially to the corner of the mouth the width of both lips was less than half (approx. 4.7 mm).

The *contact zone* (Fig. 3) was found to be band-shaped. It was widest laterally and narrowed toward the median plane. At the corner of the mouth the average width was approx. 7 mm, and in the median plane approx. 3.5 mm. This lateral: medial ratio was found in all the subjects.

Table I. *Measurements of the vermilion border and the contact zone in young and older persons*

	20—29 years N = 24		⩾50 years N = 21		Significance of difference
	$\bar{x}$	S.D.$_k$	$\bar{x}$	S.D.$_k$	
Vermilion border					
Upper lip					
point 1	9.38	1.66	5.95	1.69	+++
point 2	10.46	1.64	6.76	1.81	+++
point 3	4.71	1.04	2.71	0.96	+++
Lower lip					
point 1	10.42	1.69	5.71	1.49	+++
point 2	9.88	1.54	5.48	1.40	+++
point 3	4.75	1.15	2.76	0.70	+++
Contact zone					
point 1	3.75	1.00	3.45	0.91	
point 2	3.94	1.15	3.45	0.95	
point 3	4.29	0.88	4.26	1.03	
point 4	7.04	0.74	6.52	0.77	+

For definition of the points of measurement, see text. The symbols for level of significance are:

P<0.05 : +
P<0.01 : ++
P<0.001 : +++

All measurements are in mm.

The dimensions of the contact zone varied less than those of the pars intermedia.

The complementary width dimensions of the contact zone and the pars intermedia are illustrated in Fig. 4.

Older persons

The metrical data are shown in Table I (right).

The *pars intermedia* (Fig. 2 B) was narrower than in young persons at all corresponding points. The differences varied from 35 % to 45 %.

The shape of the *contact zone* was the same as in the young persons. The zone was roughly twice as wide laterally as medially. At all corresponding points of measurement it was narrower than in the young persons. The differences were substantially less than for the pars intermedia. They varied between 0.7 % and 12 %.

Comparison between young and older persons

The values in Table I were compared by means of a t-test.

The difference in the width of the *pars intermedia* of the young and older persons at all measurements was statistically significant at a level of 1 $^0/_{00}$ (t-values between 6.65 and 9.95).

In the case of three points of measurement, the width of the *contact zone* of young and older persons did not differ significantly (t-values between 0.11 and 1.54). Only the reduction in the width of

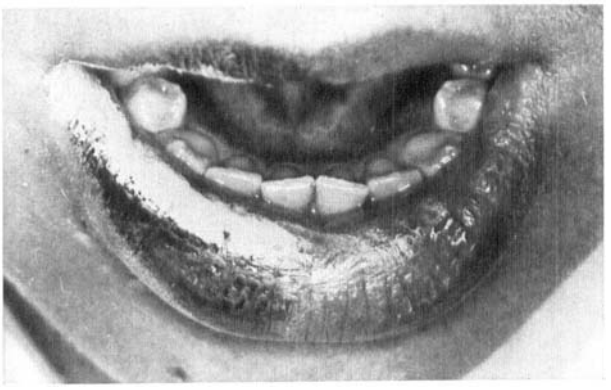

Fig. 3. The contact zone made visible by ointment. The zone is approximately half as wide medially as laterally.

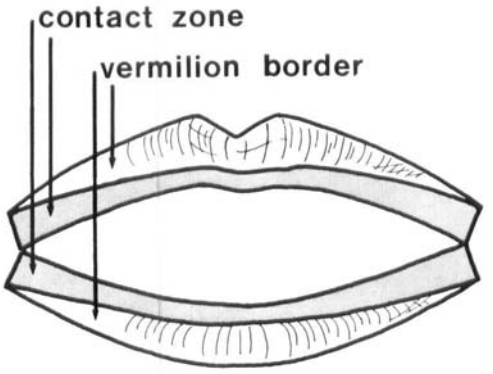

Fig. 4. The complementary dimensions of the pars intermedia and the contact zone.

the contact zone at the corner of the mouth was statistically significant at a level of 5 % (t=2.31).

DISCUSSION

The contact of the lips has formerly been described as *linear* (*Sicher & DuBrul*, 1970).

The present study has shown that both in young and older persons the upper and lower lips make *surface contact* with each other in the resting position. In persons with normal teeth and normal lip position the shape and dimensions of the *contact zone* are markedly constant. The *pars intermedia* narrows with increasing age but the *contact zone* does not vary correspondingly.

The function of the contact zone is presumably to seal the oral fissure when the mouth is closed. Surface contact between the lips ensures adhesion even during a certain degree of movement of the lips. The degree of adhesion is greater laterally than medially.

It is not known whether the contact zone possesses any special histological characteristics. The findings of *Binnie & Lehner* (1970) illustrate that the major part of the contact zone in the corner of the mouth is made up of normal oral mucosa.

There are certain unsolved problems in connection with the occurrence of free sebaceous glands in the contact zone. There are opposing views as to whether the glands are confined to the pars intermedia of the lips or whether they are also present in the pars mucosa, including the contact zone.

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