Right–left asymmetry of maximum jaw opening

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According to several studies on human populations, the mandible deviates on opening significantly more often to the left than to the right. An association between the asymmetry of opening and handedness has been suggested. The present study of 143 left-handed Finnish conscripts showed no significant difference from the asymmetry reported for populations unselected for handedness. It was concluded that the opening asymmetry and handedness are not associated. The asymmetry proved also to be unassociated with the side of first unilateral tooth contact on guided hinge closure, with the side of palpatory tenderness of the muscles of mastication, and with the side of temporomandibular joint sounds. □ *Dental occlusion; physiology; stomatognathic system*

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The structure and function of the stomatognathic system are in principle considered to be symmetric in spite of asymmetries on the individual level. Contrary to the expected randomness of individual asymmetry, leftward deviation of mandible during opening has, for example, been reported to be significantly commoner than rightward deviation (1–7). A predominance of left-sided unilateral first contacts on guided hinge closure of the jaw has also been reported (5).

No generally accepted explanation for the asymmetry in jaw opening has been presented. Grosfeld & Czarnecka (2) suggested that handedness could be associated with the function of the lateral pterygoid muscles. Nilner (4) repeated this assumption without comments. Gernet (6) hypothesized that there might be an association between the side of deviation and the side of muscular symptoms in patients with temporomandibular joint (TMJ) dysfunction. Gernet's hypothesis does not agree with the results of Grosfeld & Czarnecka (2) and Nilner (4), who found similar asymmetries both in patient and nonpatient groups. Gross & Gale (7) suspect a methodologic error: the investigator usually sits to the subject's right. The subject's head is therefore likely to be turned to the same side, thus causing leftward deviation of the jaw during opening.

The purpose of the present study was to test the hypothesis of an association between deviation on jaw opening and handedness. Associations of opening deviation to asymmetry in tenderness of muscles of mastication, to TMJ sounds, to the side of unilateral first contact on guided hinge closure of jaw, and to the distribution of fillings in posterior teeth were also studied.

Subjects and methods

All conscripts in two cohorts of a Finnish Army garrison considering themselves left-handed were examined. One cohort consists of about 1000 men in that garrison. A total of 143 men were examined, corresponding to 7% prevalence of lefthandedness. The subjects in the first cohort ($n = 67$) were accepted as lefthanded without a test. The subjects in the second cohort ($n = 76$) were tested for lefthandedness by means of a questionnaire in accordance with Raczkowski et al. (8). All were accepted as lefthanded.

The clinical examination was carried out in an ordinary dental chair. The examiner paid special attention to the position of the subject, to eliminate the possible systematic error caused by asymmetry of body or head position. The deviation of the mandible in the maximum opening position was

measured by viewing the position of a toothpick, placed between the lower central incisors, through a transparent plastic plate with parallel lines, enabling direct reading in millimeters. The reference was an imaginary midline of the upper face. Several opening–closing cycles were observed. Deviations of less than 3 mm were ignored.

The muscular sites palpated extraorally were the temporalis, masseter, posterior digastric, and the insertion of medial pterygoid. The insertion of the temporal muscle and the pterygoid complex were palpated intraorally. Tenderness was considered to be present if the subject reported it without hesitation or if the palpation evoked palpebral reflex or withdrawal. A stethoscope and palpation were used for examining the TMJ sounds. The side(s) of first occlusal contact on guided hinge closure was determined with a bimanual technique in accordance with Dawson (9). For the second group the number of fillings in both sides in the premolar–molar area was also counted.

Results

Deviation in the maximum opening position occurred significantly more often to the left than to the right (Table 1). The predominance of leftward deviation remained essentially the same when subjects with tenderness of the muscles of mastication or TMJ sounds were excluded.

More than half of the subjects with unilateral first contact on hinge closure showed it on the left side, but the difference was not statistically significant in the present material (Table 2). There was no association between the side of the first contact and the side of opening deviation. The side of muscular tenderness and the side of joint sounds were also unassociated with the side of deviation. The distribution of the fillings in posterior teeth was symmetric.

Discussion

If the predominance of leftward deviation on maximum jaw opening were associated with righthandedness, lefthanded persons would show rightward deviation or, more likely, random distribution of asymmetry (cf. Ref. 10). Since leftward deviation was significantly commoner than rightward deviation even in lefthanded persons (Table 1), we suggest that the hypothesis of an association between handedness and jaw opening deviation should be rejected.

Left-sided unilateral first contacts on hinge closure may also prove to be an example of unexpected asymmetry in the stomatognathic system. Although the predominance of left-sided contacts was not statistically significant in our material, the percentage difference between sides matched that of Nilner's much larger material (4) (Table 2).

The position of the examiner to the subject's right is a possible source of error.

Table 1. Percentage distribution of right–left asymmetry during maximum jaw opening in some published samples unselected for handedness and in left-handed men. Sign test

Authors	Subjects	*n*	Deviation		*P*<
			Right	Left	
Schulte (1972)	Patients	442	11.6	32.6	0.01
Grosfeld & Czarnecka (1977)	Children 6–8 years	250	0.4	36.4	0.01
	Children 13–15 years	250	2.0	30.8	0.01
Kerschbaum & Voss (1978)	Part. denture wearers	361	8.0	17.2	0.01
Nilner (1981)	Adolescents 15–18 years	309	1.0	32.0	0.01
Nilner & Lassing (1981)	Children 7–14 years	440	1.0	19.0	0.01
Gernet (1982)	Patients	90	8.0	62.0	0.01
Present study	Left-handed conscript men	143	16.1	39.2	0.01

Table 2. Right–left asymmetry in unilateral first contacts on guided hinge closure of jaw. Sign test

Authors	Subjects	*n*	First contact		*P* <
			Right, %	Left, %	
Nilner & Lassing (1981)	Children 7–14 years	440	23.0	43.0	0.05
Alanen (unpublished)	Male industrial workers	599	25.7	33.1	0.05
Present study	Left-handed men	143	39.9	49.7	NS
	Left-handed men, subsample without symptoms*	57	49.1	51.1	NS
	Left-handed men, subsample with symptoms	86	33.7	48.9	NS

* Symptoms refer to temporomandibular joint sounds and palpatory tenderness of muscles of mastication.

However, by paying special attention to the position of the subject and by only counting asymmetries in excess of 2 mm, we believe we managed to control this source of error. The symmetric distribution of dental fillings eliminates the possibility that there could have been iatrogenic asymmetry in the fillings, leading to asymmetry in function.

In spite of the great variation in the relative amount of left-sided predominance (Table 1), probably reflecting differences in method and definitions, we believe the phenomenon is consistent enough to merit further investigation.

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