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Maximum mandibular mobility in patients with temporomandibular disorders

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SUMMARY

Assessment of mandibular mobility is an integral part of many dental examinations. Yet, information on the maximum range of mandibular motion in large groups of patients with temporomandibular disorders (TMDs) is limited.

Therefore, we analyzed the corresponding data of 500 TMD patients who had presented at the University Center for Dental Medicine Basel. All measurements had been carried out by one examiner. The average maximal values for unassisted jaw opening, protrusion, and movement to the right and left were 49.3 mm (SD: 9.1), 8.8 mm (SD: 2.3), 9.4 mm (SD: 2.5), and 11.8 mm (SD: 3.1), respectively. Since activities such as chewing, talking, oral hygiene or even yawning require neither

very wide openings nor extensive lateral or protrusive excursions, we would like to propose the following general threshold values for impaired mandibular function: maximum interincisal distance <30 mm; maximum laterotrusion as well as maximum protrusion <5 mm.

These cut-off values, which are lower than those traditionally suggested in the dental literature, appear to be sufficient to carry out functionally undisturbed mandibular movements. By lowering the traditionally higher thresholds, the spectrum of anatomical and functional variability is increased. In this way, patients and non-patients may be protected against medicalization, overdiagnosis, and overtreatment.

Introduction

Assessment of mandibular mobility is an important part of many clinical examinations in dentistry because it provides immediate information about the presence of limitations of mandibular movements. Typical causes for a restricted mobility of the lower jaw are pain located in the temporomandibular joints (TMJs) or the masticatory muscles (MAGNUSSON ET AL. 2000; HANSDOTTIR & BAKKE 2004; PEREIRA ET AL. 2009) and/or the presence of a mechanical obstacle within the TMJs, usually an anterior (and usually somewhat medially/laterally) displaced articular disc without reduction on jaw opening (MATSUBARA ET AL. 2018). The epidemiological multisite project Orofacial Pain: Prospective Evaluation and Risk Assessment (OPPERA), which aims at identifying risk factors for onset and persistence of painful temporomandibular disorders (TMDs), revealed that TMD patients exhibited, on average, significantly less mandibular mobility than individuals without TMDs: while among TMD cases ($n=184$) the average maximal unassisted jaw opening was 47.4 mm, controls ($n=1,617$) were able to open 53.3 mm (OHRBACH ET AL. 2011). The discrepancy was statistically significant; however, its clinical relevance for mandibular function appears to be irrelevant. Interestingly, however, patient-reported functional limitation of jaw opening ranges among the top five clinical predictors of first-onset TMDs (BAIR ET AL. 2013).

It should be noted, however, that a variety of other non-malignant as well as malignant factors may lead to restriction of mandibular mobility, particularly limitation of jaw opening (GOBETTI & TÜRP 1998; SENDUR & GURER 2006; FERNÁNDEZ FERRO ET AL. 2008; GONG ET AL. 2010; TRAUTMANN ET AL. 2010; CHEN ET AL. 2011; SPORNIAK-TUTAK ET AL. 2011; CARVALHO ET AL. 2012; GUARDANARDINI ET AL. 2012; GÜVEN 2012; HADJ SAID ET AL. 2016; KARAALI & EMEKLI 2018; RIERA-PUNET ET AL. 2018; ASSAS ET AL. 2019; HWANG ET AL. 2019). Hence, impairment of mandibular function is a symptom and sign which may warrant a further diagnosis and, possibly, therapy.

Consequently, the clinical examination of many dental patients and all patients with impaired mandibular function embraces, among other diagnostic procedures, the measurement of maximum jaw opening, maximum bilateral mandibular laterotrusion, and maximum protruded movement. The evaluation is usually performed by using a millimeter ruler or a caliper gauge. If carried out correctly, valid and reliable values are achieved (WALKER ET AL. 2000; VITALI ET AL. 2015; RAUCH & SCHIERZ 2018).

In the Third German Oral Health Study, a cross-sectional, multi-center, nationwide, socio-epidemiological study to investigate the oral health status and behavior of the German resident population (age range: 35–44 years), 3.4% of participants (22/655) reported an impairment or difficulties during jaw opening. Clinically, 1.1% of the sample (7/655) had a maximal jaw opening less than 40 mm (JOHN & WEFERS 1999). Conversely, in the Study of Health in Pomerania (SHIP), a population-based cross-sectional investigation in Northeastern Germany, such a low mandibular opening was present among 9.1% (390/4289) of the examined subjects (age range: 20–81 years) (GESCH ET AL. 2004).

The assessment of maximal jaw opening shows a high degree of interrater reliability. DWORKIN ET AL. (1990) as well as RAUCH & SCHIERZ (2018) reported intraclass correlation coefficients (ICCs, range: 0–1) of 0.98 and 0.93, respectively, for maximum assisted opening, and 0.96 and 0.88, respectively, for maximum unassisted opening. According to KOO ET AL. (2016), “values

between 0.75 and 0.9 indicate good reliability, and values greater than 0.90 indicate excellent reliability.” Hence, DWORKIN ET AL. (1990) stated that “[v]ertical range of motion, measured in millimeters, was associated with extremely high reliability levels.”

In contrast to measures of the vertical range of motion, interexaminer reliability of horizontal mandibular movements is considerably lower (DWORKIN ET AL. 1990; GOULET ET AL. 1998; WAHLUND ET AL. 1998; LEHER ET AL. 2005; RAUCH & SCHIERZ 2018). In the study by DWORKIN ET AL. (1990), for lateral excursions and protrusion ICCs of 0.70 and 0.68 were achieved. KOO ET AL. (2016) note that “values between 0.5 and 0.75 indicate moderate reliability.” Therefore, DWORKIN ET AL. (1990) concluded that “[a]ssessing extent in millimeters of lateral and protrusive excursions was associated with less than desirable reliability.”

Since data on mandibular mobility among large groups of TMD patients are scarce, it was the aim of this investigation to evaluate the maximum range of motion among these patients. Another goal was to propose clinically relevant threshold values for impaired jaw mobility.

Materials and methods

This study is a retrospective single-center analysis of 500 patient data that had previously been recorded during routine diagnostic assessments of the masticatory system and subsequently archived at the University Center for Dental Medicine Basel. The examinations had been carried out exclusively by one clinician (JCT). The files of the individuals included in this study were randomly selected from a database containing about 2400 TMD patients. A random generator (www.zufallsgenerator.net) was used for this purpose. The patients had originally been referred by dentists or physicians to our clinic for diagnosis and management of TMD-related complaints. The patients had received at least one of the following diagnoses:

- myalgia of the temporal and/or masseter muscles,
- TMJ arthralgia,
- articular disc displacement with or without reduction upon jaw opening,
- restriction of mandibular mobility.

Based on each patient’s record, the following data and findings were entered in an Excel sheet:

- patient registration number;
- sex;
- year of birth;
- year of examination;
- age of the patient at the day at the examination date;
- incisal overbite (vertical overlap, vertical overbite): the vertical relationship of the incisal edges of the maxillary incisors to the mandibular incisors when the posterior teeth are in the maximal intercuspal position. The measurement was carried out as follows: reference tooth was the most vertically (caudally) oriented maxillary central incisor. In maximal intercuspal position, a horizontal pencil mark was drawn on the labial surface of the opposing mandibular central incisor at the level of the overlapping maxillary incisor. The distance between the mark and the incisal edge of the lower tooth was measured by placing the zero end of a metallic ruler next to the horizontal line. Measurements were made in 0.5-mm steps. In the case of an anterior open bite (“negative incisal overlap”), the distance between the edges of the

maxillary and mandibular incisors was recorded as a negative value;

- maximal unassisted interincisal distance between the central incisors (without any assistance of the examiner): the patient opened the jaw slightly. The zero edge of the ruler with a millimeter scale was placed at the incisal edge of the right or left mandibular central incisor (depending on the maxillary reference tooth). Then the patient was asked to open the jaw as wide as possible. The extent of the opening was measured at the labio-incisal edge of the opposing maxillary incisor. To avoid distortion, the ruler was brought in direct contact with that tooth.

After the first attempt, the opening movement was repeated by asking the patient “Can you open any further?” If an increased interincisal distance was achieved (which was the case in most instances), another opening was carried out. Further repetitions followed until no wider opening could be reached. All measurements were made in 1-mm steps and rounded to the next millimeter if needed. The highest value of the repetitive openings was recorded.

If an anterior open bite was present, the negative overbite value was subtracted from the value of the interincisal distance;

- maximum unassisted anterior jaw opening: the sum of incisal overbite and interincisal distance. This is sometimes called “maximum active mouth [or jaw] opening” (BRETISCHWERDT ET AL. 2010; SAWAIR ET AL. 2010) or “corrected interincisal distance” (RIEDER 1978) in the literature;
- incisal overjet (horizontal overlap, vertical horizontal overjet): the projection of the central incisors beyond their antagonists in the horizontal plane when the teeth are in maximal intercuspal position. To this end, with the posterior teeth in maximal intercuspal position, the distance from the labial surface of the mandibular central incisor to the labial surface of the maxillary reference incisor was determined. Measurements were made in 1-mm steps;
- maximal protrusive movement (full protrusion): the patient was asked to protrude the mandible as far as possible. The distance between the labial surface of the maxillary reference incisor and the labial surface of the opposing mandibular central incisor was measured in 1-mm steps. To this value, the amount of the incisal overjet was added;
- maximal laterotrusive movement to the left and right: with the posterior teeth in maximal intercuspal position, a vertical line was drawn with a pencil between the mesio-labial surfaces of the maxillary central incisors (i.e., the maxillary midline). That line was extended onto the labial surface of the opposing mandibular antagonistic incisor. By doing so, possible discrepancies between the maxillary and mandibular midlines were considered. The patient was asked to move the mandible as wide as possible to the left and to the right, respectively. Lateral excursion measures were made between the two lines. Measurements were made in 1-mm steps.

After finishing the entries of the 500 patient data by the last author (AS), she made duplicate entries of the data of 50 randomly chosen subject numbers (software: www.zufallsgenerator.net) without knowledge of the numbers and data of the original (first) entry. The set of the 50 double-checked data were subsequently compared by the first author (JCT) with those from the first entry. The purpose of this step was to verify the correctness

of the originally entered data, i.e. to examine the reliability of the person (AS) entering the data.

The patient-related values were statistically described with measures of central tendency (mean; mode) and variability (minimum/maximum values; standard deviation [SD]). In addition, inferential statistics, i.e. Pearson correlation analyses (Pearson's r), and t -tests were used (HL).

The study protocol was approved by the Ethics Committee of Northwest and Central Switzerland (Ethikkommission Nordwest- und Zentralschweiz; project-ID 2019-20154).

Results

Data entry

Comparison of the 50 repeated entries did not reveal any discrepancies between the data.

Demographic data

The 500 patients were between 12 and 90 years old. There were 392 females and 108 males (ratio 3.6:1).

Incisal overbite

An open bite was present among 12 individuals. The anterior gap ranged between -0.5 mm and -4 mm. While 31 patients had an edge-to-edge bite (overbite = 0 mm), an incisal overlap was present among the remaining 457 patients, ranging between 0.5 mm and 11 mm. The average incisal overbite of all patients was 2.97 mm (SD: 1.88 mm, mode: 3 mm).

Incisal overjet

Two individuals showed an anterior crossbite (negative horizontal overlap), and 11 patients had an overjet of 0 mm. Thus, 487 subjects showed a positive horizontal overlap, ranging between 0.5 mm and 11 mm. The mean incisal overjet of all patients was 2.94 mm (SD: 1.71 mm; range: -5 mm to +11 mm; mode: 2 mm).

Maximal unassisted jaw opening

The average maximal jaw opening was 49.28 mm (SD: 9.11 mm, mode: 50 mm), ranging from 8 mm to 70 mm. Figure 1 shows an accumulation of values between 41 mm and 60 mm. This interval embraces more than three-quarters of the subjects (384 patients: 76.8%). Forty individuals (8%) had maximum mandibular openings of more than 60 mm. On the other hand, 37 patients (7.4%) could open less than 35 mm. Figure 1 indicates that on average men could open wider than women (54.2 mm vs. 47.9 mm).

Fifty-two subjects (10.4%) had an interincisal distance of less than 35 mm, and 30 patients (6%) could not separate the incisal surfaces more than 29 mm.

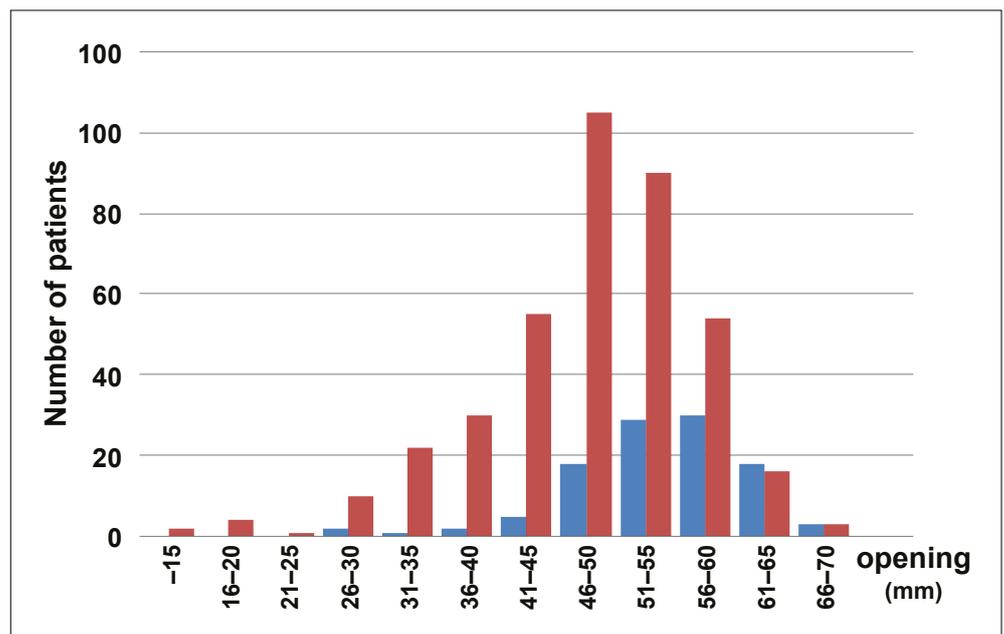
Maximal protrusive movement

The mean maximal full protrusion of the mandible was 8.79 mm (SD: 2.34 mm; range: 2 mm to 16 mm, mode: 9 mm). The distribution of the patient values is summarized in Table I. The protrusive movement of 17 patients (3.4%) was less than 5 mm.

Maximal laterotrusive movement

The average maximal excursion was 10.61 mm (SD: 2.42 mm). There was a side-specific difference between the movement to the left and right side: 11.78 mm (SD: 3.05 mm; range: 0 mm to 21 mm; mode: 11 mm and 12 mm) to the left as opposed to 9.43 mm (SD: 2.49 mm; range: 0 mm to 17 mm; mode: 10 mm)

Fig.1 Frequency distribution of maximum mandibular opening (in mm) among a total of 500 female (red) and male (blue) TMD patients.



to the right ($p < 0.001$). The distribution of the mobility values is displayed in Table I. A laterotrusion of less than 5 mm to the right and left was present in 15 (3%) and 4 (0.8%) patients, respectively.

Correlation between incisal overbite and incisal overjet

Pearson correlation coefficient, ranging from perfect negative correlation ($r = -1$) to perfect positive correlation ($r = +1$), was 0.24 ($p < 0.001$), suggesting a weak positive association between these two functional variables.

Correlation between maximal unassisted jaw opening and maximal lateral excursion

Pearson's r was 0.50 ($p < 0.001$), suggesting moderate positive association between these two functional variables.

Correlation between maximal unassisted jaw opening and maximal protrusive movement

Pearson correlation coefficient was 0.36 ($p < 0.001$), suggesting a weak positive association between these two functional variables.

Correlation between maximal lateral excursion and maximal protrusive movement

Pearson's r was 0.53 ($p < 0.001$), pointing at a moderate association between these two functional variables.

Discussion

To our knowledge, this has been the largest investigation of mandibular mobility among TMD patients published thus far. The fact that women were overrepresented among individuals affected by and seeking care for TMDs is a well-known phenomenon (BUSH ET AL. 1993; LERESCHE 1997; BUENO ET AL. 2018). The 500 subjects included in this analysis represent about 20% of the total number of TMD patients seen in our clinic since 2004. As the subjects (i.e., their data) were randomly chosen, they appear to be not only representative for the whole patient population seen in our clinic, but also to be predictive for future

Tab.I Maximal excursive movements of the mandible (n = 500). 0.5- mm values (protrusion) were rounded down to the lower full millimeter value.

	Protrusion	Laterotrusion to the right	Laterotrusion to the left
0 mm	0	1	1
1 mm	0	1	1
2 mm	1	1	0
3 mm	8	3	1
4 mm	8	9	1
5 mm	25	21	4
6 mm	35	32	17
7 mm	67	38	18
8 mm	82	60	25
9 mm	85	64	36
10 mm	75	105	56
11 mm	52	71	68
12 mm	33	42	68
13 mm	18	32	67
14 mm	7	14	43
15 mm	2	4	48
16 mm	1	1	17
17 mm	0	1	13
18 mm	0	0	10
19 mm	0	0	4
20 mm	0	0	1
21 mm	0	0	1

patients. Due to the fact that the patients had been clinically evaluated by one examiner, the question of interexaminer variability is not an issue here. In fact, it is well known that intraobserver reliability is greater than interobserver reliability (CARLSSON ET AL. 1980).

Our analysis has revealed a wide interindividual variability of mandibular mobility in both vertical and horizontal directions. Besides disease-related factors (cf. introduction), biological and anatomical variables may contribute to this phenomenon. As far as the amount of maximal jaw opening is concerned, biological sex (RIEDER 1978), age (SZENTPÉTERY ET AL. 1986; STOUSTRUP ET AL. 2016), body height (VITALI ET AL. 2015), mandibular length (DIJKSTRA ET AL. 1999), and individual mobility of the TMJs (DIJKSTRA ET AL. 1999) are known to have a direct influence. An additional factor that may contribute to the variability among studies is the fact that recording the first jaw opening is likely to underestimate the true opening capacity in most cases. It has therefore been suggested to repeat the measurement of interincisal distance until no further increase of the opening can be achieved; and the largest value should be recorded (HESSE ET AL. 1990; TÜRP ET AL. 1996; HANSDOTTIR & BAKKE 2004; YAO ET AL. 2009). The question is how far the jaw can be opened, and not how far the jaw can be opened at the first try.

The average maximal jaw opening of 49.3 mm is close to the 47.4 mm of the TMD cases in the OPPERA study (OHRBACH ET AL. 2011). The large standard deviation indicates a broad range of measurement values. The bell-shaped, left-skewed distribution of maximum openings of our patients is remarkably similar to the one displayed by RIEDER (1978). RIEDER, who measured the maximum interincisal distance among 125 male and 198 female TMD patients aged between 20 and 70 years, reported that 85% of men with a TMD history showed a maximum interincisal distance of 40 mm to 60 mm, whereas 87% of the women with a TMD history had an opening of 35 mm to 55 mm. In our sample, the corresponding interincisal distance values were somewhat lower, but comparable: 81.5% and 79%, respectively. The wider opening capacity among men as opposed to women is an anthropometric constant reported in every article dealing with sex differences upon jaw opening (e.g. MEZITIS ET AL. 1989; COX & WALKER 1997; GALLAGHER ET AL. 2004; PLACKO ET AL. 2005; YAO ET AL. 2009; SAWAIR ET AL. 2010; KATYAYAN ET AL. 2014; VITALI ET AL. 2015).

We concur with the view of LIGNELL & RANSJO (1967) that measurements of maximum jaw opening are particularly suitable when performed at various times for intraindividual comparison, considering that even during long observation periods vertical mandibular mobility shows little variation among individuals with a functionally unremarkable mandibular locomotor system (AGERBERG 1987).

In order to assess *maximum opening capacity* of the mandible, it is important not to restrict this measurement to the determination of the maximum interincisal distance as has been done in an appreciable number of studies (e.g. TRAVELL 1960; RIEDER 1978; MEZITIS ET AL. 1989; COX & WALKER 1997; GALLAGHER ET AL. 2004; PLACKO ET AL. 2005; YAO ET AL. 2009; SAWAIR ET AL. 2010; VITALI ET AL. 2015). However, if it is of interest to assess whether there is enough space to insert a fork or chopsticks loaded with food into the oral cavity, the *interincisal distance* is of greater value than the maximum opening capacity of the mandible. Hence, it depends on the question of which of the two measures is more suitable.

The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) have introduced a cut-off value of 40 mm (maximum jaw opening) to distinguish between limited opening (< 40 mm) and no limitation (SCHIFFMAN ET AL. 2014). Coincidentally, 40 mm corresponds to one standard deviation below the mean maximal jaw opening found in our study. The rationale for choosing a threshold of 40 mm is unknown. Was it based on statistical measurements, on a systematic search of the literature, on a survey among experts in the field, or maybe on tradition?

Yet, an even more important question is how far the minimum opening should be to be considered “normal.” Data from the literature about this issue is surprisingly rare. Nonetheless, mandibular function, for example during chewing (which is the prime task of the masticatory system), talking (articulation), oral hygiene or even yawning, usually requires neither very wide openings nor extensive lateral and protrusive excursions. HANSDOTTIR & BAKKE (2004) reported that during unilateral mastication of soft gum, the maximum vertical opening (i.e., the maximum vertical chewing distance) as kinematically assessed by a computerized jaw tracking system was 23 mm (SD: 4.5 mm) in both healthy subjects and TMD patients. In another study, SCHINDLER ET AL. (1998A) found among healthy volunteers that vertical jaw movements (also measured at the incisal point) did not exceed 20 mm when chewing boiled potatoes, raw carrots and wine gum.

Therefore, one should presume that a maximum interincisal distance of, say, 35 mm (embracing 89.6% of our patients) or even 30 mm (embracing 92.8% of our patients) would still be sufficient to carry out the usual functional tasks and would not be associated with impairment of mandibular function. As a matter of fact, a value of 35 mm lies within the 95th percentiles of the normative data for maximum interincisal distance among TMD-free subjects provided by VITALI ET AL. (2015). It is also close to the 34 mm minimum interincisal distance measured in healthy adults by COX & WALKER (1997) as well as near the 38 mm interincisal distance as the adult minimum suggested by LANDTWING (1978). At a certain point, however, the execution of mandibular movements will be markedly impaired. According to KROGH-POULSEN (1966) an interincisal distance of 30 mm or less should be considered limited. Further suggestions for a threshold of a functionally acceptable jaw opening are given by maxillofacial surgeons. In a meta-analysis on the improvement of postoperative jaw opening (interincisal distance) after surgical intervention in 1,215 patients with TMJ ankylosis, DE ROO ET AL. (2016) reported a range from 33.0 mm to 36.1 mm (depending on the surgical technique), thus exceeding the goal of at least 30 mm interincisal distance which was defined by CHOSSEGROS ET AL. (1997) as a “good result” after treatment of TMJ ankylosis. Accidentally, a maximal jaw opening < 30 mm had been considered a “severe symptom” in the legendary, yet, due to its questionable internal validity (VAN DER WEELE & DIBBETS 1987), outdated “Helkimo index” (“Clinical Dysfunction Index”) (HELKIMO 1974).

Among the overwhelming majority of patients, the range of lateral motion during normal mandibular function, such as chewing, is much lower than the maximum achievable laterotrusive movements. SCHINDLER ET AL. (1998B) found that among asymptomatic subjects lateral jaw movements during the mastication of the above-mentioned three food textures ranged between 4 mm to 6 mm. Taking 5 mm as the desired minimum value for sufficient lateral mobility of the mandible, the cut-off

value of <5 mm was exceeded by 97% and 99.2% of patients for movements to the right and left side, respectively.

Our patients were able to shift the mandible more to the left than to the right side. This finding corroborates previous observations among non-patients and patients (WERTHEIM 1921; AGERBERG 1987; SZENTPÉTERY ET AL. 1987; TÜRP ET AL. 2005; RAUCH & SCHIERZ 2018). Hence, clinicians measuring discrepancies between right and left movements should consider that such an observation is not necessarily a sign of pathology.

There was a fair to good correlation between maximal unassisted jaw opening and maximal lateral excursion, suggesting that a wider vertical capacity is likely to be associated with a wider horizontal mobility. In a study among non-TMD children and adolescents in Denmark (STOUSTRUP ET AL. 2016), this relationship was less pronounced ($r = 0.38$), however. Yet, these correlations do not seem to have clinical implications.

In order to bite off food with the incisors, the mandible is moved from an open position until the anterior teeth meet approximately edge-to-edge. Hence, the incisal overjet defines the minimum protrusive movement required for incising. Therefore, the value of average incisal overjet of all patients plus one standard deviation (in our study 4.85 mm) appears to be a good approximation of the minimum protrusive mobility.

The low prevalence of clinically relevant limitations of mandibular mobility, one of the classical cardinal features of TMDs (GALE 1992; CARLSSON & DE BOEVER 1994; DE LEEUW & KLASSER 2018), shows that the likelihood of encountering such a sign even in a population of TMD patients is relatively low – in contrast to pain, which is the main symptom why TMD patients seek professional advice (VOLLARO ET AL. 2001; MANFREDINI ET AL. 2011). If present, vertical restrictions are more frequent than the limitation of lateral movements. While OHRBACH ET AL. (2011) have argued that certain clinical manifestations, such as a slightly limited jaw opening, “might represent signs or symptoms of subclinical TMD”, we would like to suggest that certain clinical features traditionally construed as “non-normal” should be reinterpreted as variation of normality. Consequently, based on the statistical data of our study and modified by the biological arguments provided in this discussion, we would like to propose the following general cut-off values for impaired mandibular function:

- maximum interincisal distance: < 30 mm;
- maximum laterotrusion as well as maximum protrusion: < 5 mm.

These cut-off values, which are lower than those commonly found in the dental literature, turn many seemingly (pre)pathological findings into biological variations.

Recommendations that have been made with regard to established pathology-suggesting terminology have the same goal. Terms such as “condylar displacement”/“eccentric condylar position,” “anterior disc displacement,” and “degenerative joint disease”/“TMJ osteoarthritis” could alternatively be expressed as “[anterior, posterior] condylar position,” “anterior disk position,” and “bony adaptation to increased loading,” respectively (TÜRP ET AL. 2016). Both the lowering of thresholds considered functionally acceptable and the “terminological disarmament” give room for the idea of anatomical and functional variability. In this way, patients and non-patients may be protected against medicalization, disease mongering, overdiagnosis, and overtreatment.

Zusammenfassung

Einleitung

Die Messung der Unterkieferbeweglichkeit ist ein fester Bestandteil vieler zahnärztlicher Untersuchungen. Allerdings liegen nur wenige diesbezügliche Daten von grossen Patientengruppen vor. Daher analysierten wir aus einem Pool von 2350 Myoarthropathie-Patienten die erhobenen unterkieferfunktionsbezogenen Messwerte von 500 zufällig ausgewählten Personen, die sich in den Jahren zuvor im Universitären Zentrum für Zahnmedizin Basel vorgestellt hatten.

Material und Methoden

Die Messungen waren vom Erstautor mithilfe eines Millimeterlineals durchgeführt worden. Alle relevanten demografischen Informationen und Messwerte wurden in eine Excel-Tabelle übertragen und deskriptiv und induktiv statistisch ausgewertet.

Resultate

Die Patienten (392 Frauen, 108 Männer) wiesen im Mittel einen frontalen Überbiss von 2,97 mm (Standardabweichung [SD]: 1,88 mm) auf und eine sagittale Frontzahnstufe von 2,94 mm (SD: 1,71 mm). Der Durchschnittswert für die aktive maximale Kieferöffnung lag bei 49,28 mm (Standardabweichung [SD]: 9,11 mm). 30 Patienten wiesen eine Schneidekantendistanz von weniger als 30 mm auf. Der Unterkiefervorschub betrug im Mittel 8,79 mm (SD: 2,34 mm), der Seitschub nach rechts und links 9,43 mm (SD: 2,49 mm) bzw. 11,78 mm (SD: 3,05 mm). Die stärkste Korrelation lag zwischen maximaler Kieferöffnung und maximalem Seitenschub vor (Korrelationskoeffizient nach Pearson: 0,50).

Diskussion

Nach unserem Kenntnisstand handelt es sich um die hinsichtlich der Patientenzahl bis dato grösste Untersuchung zur Unterkiefermobilität bei MAP-Patienten. Es zeigte sich, dass im Gegensatz zu myoarthropathischen Schmerzen eine klinisch relevante eingeschränkte Unterkieferbeweglichkeit eher selten anzutreffen ist. Zu der beobachteten ausgeprägten Streuung der Werte tragen neben beschwerde- bzw. krankheitsbezogenen Einflüssen (z.B. orofaziale Schmerzen; mechanische Hindernisse in den Kiefergelenken) biologische Variablen bei, wie Geschlecht, Alter, Unterkieferlänge und individuelle Beweglichkeit der Kiefergelenke. In anderen Studien kann ein weiterer Faktor darin bestehen, dass die maximale Interinzisaldistanz nur einmal gemessen wurde; daher wurde empfohlen, die maximale Kieferöffnung mehrmals hintereinander ausführen zu lassen und den höchsten Wert zu notieren.

Funktionelle Unterkieferbewegungen, wie sie beispielsweise beim Kauen, Sprechen, bei der Mundhygiene oder auch beim Gähnen auftreten, erfordern in der Regel weder eine sehr weite Kieferöffnung noch ausgedehnte Bewegungen in der Horizontalebene. Unter Zugrundelegung der statistisch ermittelten Werte und unter Berücksichtigung biologischer Überlegungen schlagen wir daher folgende Schwellenwerte für das Vorliegen einer eingeschränkten Kieferfunktion vor: maximaler Schneidekantenabstand: < 30 mm; maximaler Seit- und Vorschub: < 5 mm. Diese Grenzwerte, die geringer sind als die traditionell vorgeschlagenen, erscheinen ausreichend, um funktionell ungestörte Unterkieferbewegungen auszuführen. Durch das Absenken der Schwellen wird zugleich der Bereich der Normalität verbreitert, was dazu beitragen kann, Patienten und Nichtpatienten vor Pathologisierung, Überdiagnostik und Übertherapie zu bewahren.

Résumé

Introduction

En médecine dentaire, la mesure de la mobilité mandibulaire fait partie intégrante de nombreux examens. À cet égard, on dispose cependant de peu de données concernant de grands groupes de patients. C'est pourquoi, à partir d'un groupe de 2350 patients atteints de myoarthropathie de l'appareil manducateur, nous avons analysé les résultats des mesures de la fonction mandibulaire recueillies auprès de 500 personnes, choisies au hasard parmi celles qui s'étaient présentées au cours des années précédentes au Centre universitaire de médecine dentaire de Bâle.

Matériel et méthodes

Les mesures avaient été effectuées par le premier auteur à l'aide d'une règle millimétrée. Toutes les informations démographiques pertinentes et les valeurs mesurées ont été reportées sur une feuille de calcul Excel et évaluées statistiquement de manière descriptive et inductive.

Résultats

Les patients (392 femmes, 108 hommes) présentaient une supraclusion frontale moyenne de 2,97 mm (écart-type: 1,88 mm) et une avancée sagittale des dents antérieures (overjet) de 2,94 mm (écart-type: 1,71 mm). La valeur moyenne de l'ouverture maximale active de la mâchoire était de 49,28 mm (écart-type: 9,11 mm). 30 patients présentaient une distance de moins de 30 mm entre les bords incisifs. L'avancement mandibulaire moyen était de 8,79 mm (écart-type: 2,34 mm), le déplacement latéral vers la droite et la gauche était de 9,43 mm (écart-type: 2,49 mm) et 11,78 mm (écart-type: 3,05 mm), respectivement. La corrélation la plus forte était observée entre l'ouverture maximale de la mâchoire et le déplacement latéral maximal de la mandibule (coefficient de corrélation selon Pearson: 0,50).

Discussion

Il s'agit à ce jour et à notre connaissance de la plus grande étude, en termes de nombre de patients, sur la mobilité mandibulaire lors de myoarthropathies (MAP) de l'appareil manducateur. Il a été montré, à la différence des douleurs myoarthropathiques, que la limitation cliniquement pertinente de la mobilité mandibulaire est plutôt rare. La dispersion prononcée des valeurs observées résulte non seulement de l'influence des symptômes ou de la maladie elle-même (par exemple douleurs orofaciales, entraves mécaniques au niveau des articulations temporo-mandibulaires), mais aussi de variables biologiques telles que le sexe, l'âge, la taille de la mâchoire inférieure et la mobilité individuelle des articulations temporo-mandibulaires. Dans d'autres études, un facteur supplémentaire a peut-être joué, à savoir que la distance interincisive maximale n'a été mesurée qu'une seule fois; il a donc été recommandé de réaliser l'ouverture maximale de la mâchoire plusieurs fois de suite et d'enregistrer la valeur la plus élevée.

Les mouvements fonctionnels de la mâchoire inférieure, comme ceux qui se produisent lors de la mastication, en parlant, lors de l'hygiène buccale ou aussi en bâillant, ne nécessitent généralement ni une ouverture très large de la mâchoire, ni des mouvements importants dans le plan horizontal. Sur la base des valeurs déterminées statistiquement et en tenant compte de considérations biologiques, nous proposons donc les valeurs seuils suivantes pour la présence d'une limitation fonctionnelle de la mâchoire: distance maximale entre les bords incisifs: < 30 mm; amplitude maximale des mouvements latéraux et d'avancement: < 5 mm. Ces valeurs seuils, inférieures à celles traditionnellement proposées, semblent suffisantes pour permettre des mouvements mandibulaires non perturbés sur le plan fonctionnel. L'abaissement de ces valeurs seuils a pour conséquence d'élargir la plage de normalité, ce qui peut contribuer à protéger les patients et les non-patients de la pathologisation, du surdiagnostic et de la surthérapie.

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