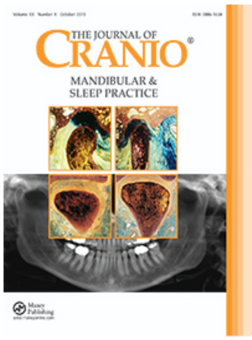

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Rehabilitative Medicine

The effect of a mandibular advancement appliance on cervical lordosis in patients with TMD and cervical pain

Hugo Santander[1], Claudia Zúñiga[1,2], Rodolfo Miralles[1], Saúl Valenzuela[1,3], Montserrat Carolina Santander[2], Mario Felipe Gutiérrez[1,3], Rosa Córdova[4,5]

[1]Oral Physiology Laboratory, Biomedical Sciences Institute, Faculty of Medicine, University of Chile, Santiago, Chile, [2]Finis Terrae University, Santiago, Chile, [3]Institute for Research in Dental Sciences, Faculty of Odontology, University of Chile, Santiago, Chile, [4]Faculty of Odontology, University of Chile, Santiago, Chile, [5]Faculty of Medicine, Diego Portales University, Santiago, Chile

Aims: A preliminary study to compare cervical lordosis by means of cervical cephalometric analysis, before and after six months of continuous mandibular advancement appliance (MAA) use, and to show how physical therapy posture re-education would improve the cervical lordosis angle.
Methodology: Twenty-two female patients with temporomandibular disorders (TMD) and cervical pain with lordosis $<20^\circ$ were included. Patients had to have a muscle pain history for at least six months, and with an intensity $\geqslant 6$, measured by means of a visual analog scale (a horizontal 0–10 numeric rating scale with 0 labeled as 'no pain' and 10 as 'worst imaginable pain'). Patients had to present the angle formed by the posterior tangents to C2 and C7 of equal or less than 20°. Cephalometric and clinical diagnostics were performed initially (baseline) and at the end of the study period (six months). During the third month with MAA treatment, a physical therapist evaluated the postural deficit and performed a program of postural re-education. Angular and linear dimension data presented a normal distribution ($P>0.05$; Shapiro Wilk Test), so the paired comparison of the cephalometric measurements was made by t-test for dependent samples.
Results: Angle 1 (OPT/7CVT); angle 3 (CVT/EVT) and angle 4 (2CL/7CL) showed a significant increase in the cervical lordosis. Angle 2 (MGP/OP), angle 5 (HOR/CVT) and the distances C0–C2 and Pt–VER, presented no significant changes.
Conclusions: The increase in cervical lordosis implies that six months of continuous MAA use, together with a program of postural re-education, promotes the homeostasis of the craniocervical system.

Keywords: Cervical lordosis, temporomandibular disorders, cervical pain, mandibular advancement appliance

Introduction

Temporomandibular disorders (TMD) involve clinical problems in the masticatory muscles, the temporomandibular joints (TMJ) and associated structures.[1]

Several treatment methods for TMD have been used, including occlusal appliances, physiotherapy, relaxation therapy, pharmacological interventions, as well as educational and behavioral counseling.[1,2] Self-care and behavioral therapies are recognized initial treatment methods for all patients, and they are recommended before resorting to invasive or permanent therapies.[3,4]

There is no consensus on the effect of an occlusal appliance on the cranio-cervical relationship, spine curvature and cervical position. Some authors found no significant changes in head and neck posture after the insertion of a splint,[5–7] whereas other authors found significant differences.[8–10] These results could be due to differences in the baseline cervical lordosis of the patients studied, cephalometric measurements used, type of devices and time of use.

Interrelationships between the orofacial area and the cervical spine have been documented at both the neuroanatomical and neurophysiological levels.[11] Moreover, a significant correlation between cervical spine and TMD has been reported. TMD patients exhibit significantly more segmental limitations,

Correspondence to: Dr Rodolfo Miralles, Oral Physiology Laboratory, Biomedical Sciences Institute, Faculty of Medicine, University of Chile, Independencia 1027, Clasificador 7, Correo 7, Independencia, Santiago, Chile. Email: rmiralle@med.uchile.cl

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especially in the high cervical region, and also report significantly more tender points upon palpation of the shoulder and neck muscles.[12,13] TMD have been associated with alterations in head and cervical posture. Nicolakis *et al.*[14] and Braun[15] reported that patients with TMD had a tendency to have a forward head position and also a decrease in cervical lordosis, compared to healthy controls.

The presence of a 'clinically normal' cervical lordosis in a range of 31 to 40° is an important parameter of cervical postural health. McAviney *et al.*[16] found a statistically significant association between cervical pain with lordosis less than 20°.

Mandibular advancement appliances (MAAs) are indicated as a primary treatment option for the management of anterior disc displacement with or without reduction. Anterior repositioning splints have proven effective in reducing or eliminating joint noise, joint pain and associated secondary muscle symptoms.[17–19] Andrade *et al.*[20] showed that individuals with TMD, when compared with asymptomatic subjects, presented higher levels of perception of pain in all cervical muscles. Therefore, the purpose of this study was to determine if the continuous use of an MAA during a period of six months promotes a change toward a 'clinically normal' cervical lordosis in patients with TMD and cervical pain with lordosis <20°. Postural correction is an integral component of the management of patients with TMD,[12,21] therefore, a program of postural re-education was performed at three months of treatment by a physical therapist specialist.

Materials and Methods

Patients

Participants were patients of a private practice. Each of them gave informed written consent before participating in the study, and they could withdraw from the study at any point in time. Patients were treated by a TMD specialist under a protocol based on ethical principles that have their origin in the Declaration of Helsinki.

Twenty-two women (mean age 27.45 years; range, 11 to 59 years), with a clinical TMD diagnosis and chronic cervical pain were selected for this study. They were included based on the following criteria:[22]

1. symptoms of TMJ internal anterior disc displacement with or without reduction: joint pain, joint tenderness, pain on palpation, and joint pain during masticatory movements;
2. tenderness and pain in the masticatory and neck muscles during palpation;
3. cervical pain;
4. cervical lordosis equal or less than 20°.

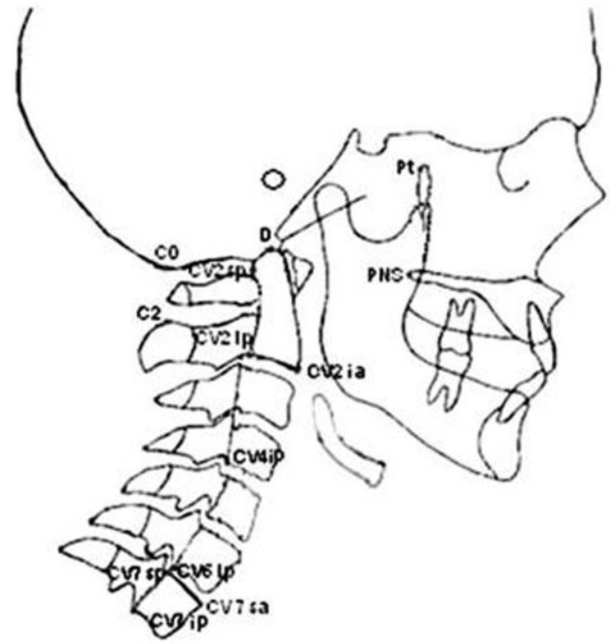

Figure 1 Diagram of the points used in the cephalometric analysis.

A TMD specialist performed clinical history and a functional examination that included neck structures. To be included in the study, patients had to have a muscle pain history for at least six months, and with an intensity ≥6, measured by means of a visual analog scale (a horizontal 0–10 numeric rating scale with 0 labeled as 'no pain' and 10 as 'worst imaginable pain').

A visual evaluation of the cervical spine was made in a lateral radiograph, and then a cephalometric evaluation was performed. Patients who presented the angle formed by the posterior tangents to C2 and C7 equal or less than 20° were included in the present study.[23–25]

Exclusion criteria were patients with a history of rheumatoid arthritis, those undergoing surgery of the spine, signs of cervical root compression, and previous orthodontic treatment.

Cephalometric analysis

Two lateral radiographs were taken for each patient in a self-balanced, natural head position in erect posture without a head holder,[8,9,26] in a standardized manner, whereby the patient is asked to assume a neutral stance and look straight ahead without moving. This positioning procedure has been shown to be reliable.[27] The first radiograph, with the mandible in the intercuspal position, served as the baseline record, and the second radiograph was taken six months later at the first slight muscular contact position immediately after removal of the MAA. A

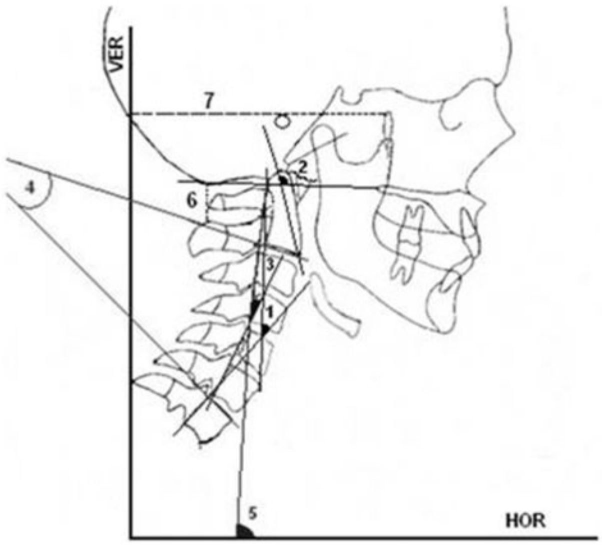

Figure 2 Angular and linear dimensions used in the present study (see text): Angle 1: OPT/7CVT: angle 2: MGP/ OP; Angle 3: CVT/EVT; Angle 4; Angle 5: HOR/CVT; Distance C0–C2; Distance Pt–VER: distance between Pt point and VER through C7.

free-hanging plumb line, located behind each patient's head, was mounted in front of the cassette to indicate a true vertical on all of the film. The radiographic equipment used was the Cranex Tome Ceph (Seredex USA). The focus median plane distance was 163 cm, standardized 70 kV, 20 mA, for 1 second of exposure, and the radiographic film used was Konica Minolta Medical Film (24 × 30 cm). A sheet of transparent acetate was placed over the radiographs and the anatomical structures were outlined.

Figure 1 shows the cephalometric points used in the present study.

- Pt: Pterygoid, the most superior posterior point of the pterygoid fossa.
- D: Dens, odontoid vertex.
- PNS: posterior nasal spine.
- C0: the most posterior inferior point of the occipital.
- C2: the most superior point of the spiny process of the second cervical vertebrae.
- CV2sp: the most superior posterior point of the second cervical vertebrae.
- CV2ip: the most inferior posterior point of the second cervical vertebrae.
- CV2ia: the most inferior anterior point of the second cervical vertebrae.
- CV4ip: the most inferior posterior point of the fourth cervical vertebrae.
- CV6ip: the most inferior posterior point of the sixth cervical vertebrae.
- CV7sa: the most superior anterior point of the seventh cervical vertebrae.
- CV7sp: the most superior posterior point of the seventh cervical vertebrae.
- CV7ip: the most inferior posterior point of the seventh cervical vertebrae.

Figure 2 presents the planes, angular and linear dimensions used in this study, according to Solow and Talgren,[28] Rocabado,[29] Moya *et al.*,[8] Miralles *et al.*,[9] Valenzuela *et al.*,[30] Hellsing *et al.*,[31] and the angle of intersection of the posterior tangents at C2 and C7.[23–25]

- Angle 1: OPT/7CVT: Odontoid Posterior Tangent; line through CV2sp (the most superior–posterior point of the second cervical vertebrae) and CV2ip (the most inferior–posterior point of the second cervical vertebrae)/7CVT, Seventh Cervical Vertebrae Posterior Tangent, line through 7CVTsp (the most superior–posterior point of the seventh cervical vertebrae), and 7CVTip (the most inferior–posterior point of the seventh cervical vertebrae).
- Angle 2: MGP/OP: McGregor's plane, line through PNS and C0/Odontoid Plane; line through CV2ia and D.
- Angle 3: CVT/EVT: Cervical Vertebrae Tangent, line through CV2sp (the most superior–posterior point of the second cervical vertebrae) and CV4ip: the most inferior–posterior point of the fourth cervical vertebrae/Spine Vertebrae Tangent, line through CV4ip (most inferior–posterior point of the fourth cervical vertebrae) and CV6ip (the most inferior–posterior point of the sixth cervical vertebrae).
- Angle 4: 2CL/7CL: inferior of second cervical vertebrae line, through CV2ia (the most inferior–anterior point of the second cervical vertebrae) and CV2ip: the most inferior–posterior point of the second cervical vertebrae/superior of the seventh cervical vertebrae line, through CV7sa (the most superior anterior point of the seventh cervical vertebrae), and CV7sp (the most superior posterior point of the seventh cervical vertebrae).
- Angle 5: HOR/CVT: true horizontal/cervical vertebrae tangent, line through CV2sp (the most superior–posterior point of the second cervical vertebrae) and CV4ip: the most inferior–posterior point of the fourth cervical vertebrae.
- Distance C0–C2: distance between C0 (the most inferior point of the occipital bone) and C2 (the superior and posterior point of the spinous process of the second cervical vertebrae) points.
- Distance Pt–VER: distance between Pt point and VER (true vertical) through C7.

Angular and linear dimensions were carried out using a protractor and ruler marked in millimeters. In order to minimize methodological error, two outlines and measurements were taken in the first roentgenogram by a calibrated specialist orthodontist. The mean value of both measurements was used. The same procedure was done with the second radiograph taken after six months.

Figure 3 Mandibular advancement appliance used in the present study.

Mandibular advancement appliance

An MAA was made for each patient, with transparent, thermo-cured dental resin, which moves the jaw to a more protruded position to avoid TMJ blocking and to allow greater jaw opening (Fig. 3). The patients were instructed to use the appliance continuously, maintaining the jaw in the postural position with their lips apart, with interruptions only for oral hygiene. Patients were requested to eat soft food, and each time they needed to swallow, the appliance guided the mandible into a forward position by the contact of the upper supporting cusps.

The patients were seen during the first week and then every two weeks for a period of six months. The splint was modified and adjusted to obtain bilateral, simultaneous, and symmetric occlusal contacts in centric relation (centric occlusion), with immediate, progressive and uniform canine laterotrusive guidance.

During the third month a physical therapist specialist evaluated the postural deficit and performed a program of postural re-education to improve the posture of the head and neck to recover joint mobility and restore muscular normality.[21,32] At the end of treatment, the increase of the occlusal vertical dimension (iOVD) caused by the MAA was a mean of 9.2 mm measured in the midline (between central incisors), with a range between 8 and 12.5 mm.

No patient withdrew from treatment; therefore, the results correspond to the 22 patients initially included.

Statistical analysis

The data were analyzed using the SYSTAT 13 program (Systat Software Inc. (SSI), San José, CA, USA). Angular and linear dimension data presented a normal distribution ($P>0.05$; Shapiro Wilk Test), therefore the paired comparison of the cephalometric measurements was made by t-test for dependent samples. An alpha value of 0.05 was used to establish statistical significance for all analyses.

Results

Table 1 shows the group mean values of the angles and distances measured before and after the continuous use of MAA in each one of the patients studied.

Table 2 shows the comparisons for each one of the angular and linear dimensions studied, before and after the continuous use of MAA. Angle 1 (OPT/7CVT) initially presented a decrease in the cervical lordosis (mean=11.02°; range from −15.93 to 19.93°), and at the end of the treatment presented an increase in the cervical lordosis (mean=15.28°; range from −6.07 to 27.60°). This change in the cervical lordosis was statistically significant ($P<0.01$; Student's t-test for dependent samples). Angle 3 (CVT/EVT) initially presented a decrease in the cervical lordosis (mean=4.06°; range from −12.17 to 12.27°), and at the end of the treatment presented an increase in the cervical lordosis (mean=7.15°; range from −14.77 to 21.00°). This change in the cervical lordosis was statistically significant ($P<0.01$). Angle 4 (2CL/7CL) initially presented a decrease in the cervical lordosis (mean=4.78°; range from −10.30 to 20.13°), and at the end of the treatment presented an increase in the cervical lordosis (mean=7.87°; range from −10.00 to 28.20°). This change in the cervical lordosis was statistically significant ($P<0.05$). Angle 2 (MGP/OP), angle 5 (HOR/CVT) and the distances C0–C2 and Pt–VER, did not present any significant changes ($P>0.05$).

Table 3 presents initial TMJ diagnosis, initial and final muscular pain on palpation, initial and final cervical pain, and the specialist to whom the patients were referred to continue the multi-disciplinary treatment according to the specific need of each patient.

Discussion

The major finding of the current study is the significant increase in cervical lordosis observed (angle 1: OPT/7CVT; angle 3: CVT/EVT; and angle 4: 2CL/7CL) after six months of continuous use of an MAA). This means a recovery of the cervical sagittal alignment, therefore a significant improvement in the

Table 1 Initial and final group mean values of each angular and linear measurement studied

Patients	Angle 1	Angle 1	Angle 2	Angle 2	Angle 3	Angle 3	Angle 4	Angle 4	Angle 5	Angle 5	C0–C2	C0–C2	Pt–VER	Pt–VER
	Initial Mean	Final Mean	Initial Mean	Final Mean	Initial Mean	Final Mean	Initial Mean	Final Mean	Initial Mean	Final Mean	Initial Mean	Final Mean	Initial Mean	Final Mean
1	9.00	7.87	97.17	96.00	6.00	1.27	6.37	7.07	89.67	82.10	14.93	13.23	96.67	106.17
2	12.50	19.70	94.23	104.17	9.70	21.00	1.93	13.70	81.80	91.40	16.87	20.17	115.00	113.37
3	9.93	9.37	101.23	98.90	9.00	6.30	−1.60	−3.00	86.27	88.73	18.33	17.93	118.23	119.00
4	6.37	9.80	97.07	108.07	0.00	2.77	5.93	4.70	82.80	86.60	18.77	24.33	107.17	109.23
5	11.70	9.13	96.93	95.33	6.93	8.07	16.13	10.60	86.33	82.37	13.43	16.13	101.27	108.27
6	12.70	11.93	121.83	117.50	4.70	7.07	14.93	11.07	79.27	81.23	23.00	22.00	122.93	119.07
7	11.70	18.00	94.60	100.40	6.07	12.00	2.93	11.60	80.50	89.00	8.50	12.07	108.00	94.67
8	−15.93	−6.07	75.17	79.20	−12.17	−14.77	−8.07	−4.00	65.60	67.60	3.17	5.17	118.43	117.77
9	19.33	26.07	103.23	102.00	12.27	11.17	13.87	20.10	88.23	94.97	21.67	21.33	109.83	91.67
10	14.33	27.23	112.50	108.00	5.13	17.07	20.13	28.20	93.93	89.00	30.00	26.67	98.43	109.77
11	6.00	5.70	88.50	93.50	−2.87	−4.00	−6.87	−10.00	71.67	71.50	17.00	21.17	129.00	129.00
12	19.23	26.87	102.07	105.50	−2.37	5.50	−4.70	2.27	81.00	85.50	19.23	22.00	117.83	112.00
13	7.87	11.17	81.93	87.00	4.30	8.13	−7.80	−3.70	82.00	80.43	9.83	14.67	108.67	117.93
14	12.23	15.07	100.07	95.83	8.50	15.40	12.70	12.87	82.37	82.23	19.17	16.50	114.50	113.30
15	19.93	22.87	104.57	92.93	9.00	14.63	14.60	18.00	86.13	91.70	19.77	18.87	101.33	92.87
16	11.00	13.87	95.53	101.43	7.00	5.50	5.87	7.07	87.07	92.37	16.77	18.33	94.50	86.20
17	18.13	16.87	99.70	101.00	1.37	0.87	14.07	12.00	90.00	89.93	18.83	19.67	103.93	107.83
18	15.60	19.70	100.13	105.07	1.93	6.10	1.70	9.23	82.43	89.60	26.00	28.00	115.00	102.17
19	8.93	15.63	85.23	88.00	2.43	14.00	9.13	17.17	75.00	79.60	15.07	16.37	121.00	124.33
20	16.37	17.87	99.07	90.60	2.17	5.93	11.87	12.70	87.07	77.23	18.43	12.43	108.13	125.07
21	8.43	27.60	92.23	105.00	7.13	10.60	−10.30	5.00	85.20	90.93	15.00	21.27	103.43	94.07
22	7.07	9.93	82.93	77.50	3.00	2.70	−7.60	−9.50	75.60	75.00	11.70	10.50	116.00	114.70

Note: For angle and distance description see text.

Table 2 Comparisons of cephalometric variables between baseline and after six months of use of a MAA (Student's t-test)

Variables	Baseline			After six months			
		95% confidence interval			95% confidence interval		
	Arithmetic mean	Lower limit	Upper limit	Arithmetic mean	Lower limit	Upper limit	*P* value
Angle 1: OPT/7CVT	11.02	(−15.93)	19.93	15.28	(−6.07)	27.60	0.001 **
Angle 2: MGP/OP	96.63	75.17	121.83	97.86	77.50	117.50	0.372 NS
Angle 3: CVT/EVT	4.06	(−12.17)	12.27	7.15	(−14.77)	21.00	0.006 **
Angle 4: 2CL/7CL	4.78	(−10.30)	20.13	7.87	(−10.00)	28.20	0.015 *
Angle 5: HOR/CVT	82.72	65.60	93.93	84.5	67.60	94.97	0.118 NS
Distance C0–C2	17.07	3.17	30.00	18.13	5.17	18.13	0.120 NS
Distance Pt–VER	110.42	94.50	129.00	109.47	86.20	129.00	0.616 NS

Note: *$P<0.05$; **$P<0.01$; NS= Not Significant.

cervical lordosis, which is an important parameter of health.[16] Thus, MAAs used in the present study promoted a homeostasis of the craniocervical system.

It is important to consider that when measuring the angle formed by the posterior tangents to C2 and C7,[23–25] patients initially presented a decrease in the cervical lordosis (mean=11.02°; range from −15.93 to 19.93°), and at the end of the treatment the mean value was 15.28° (range from −6.07 to 27.60°). This significant cervical lordosis increase in angle 1, together with the significant increase observed in angles 3 and 4, suggest that MAAs promote an improvement on the cervical alignment (Table 2).

Cervical lordosis improvement could also be due to the clinical protocol of careful occlusal adjustment of MAAs the first week and then every two weeks for a period of six months. Cervical lordosis recovery was clinically associated with an improvement of the initial clinical symptoms reported by the patient, based on fewer clinical symptoms at six months of examination

Table 3 Characteristics of the participants in the present study

Patients	Age	TMJ diagnosis Right side	TMJ diagnosis Left side	Muscular pain on palpation Initial	Muscular pain on palpation Final	Cervical pain Initial	Cervical pain Final	The patient was referred to:
1	50	ADDWR	ADDWR	+	(−)	+	(−)	Periodontist and OR
2	16	ADDWOR	ADDWR	+	(−)	+	(−)	Orthodontist
3	25	ADDWR	No diagnosis	+	(−)	+	(−)	Orthodontist
4	31	ADDWR	Osteoarthritis	+	(−)	+	(−)	OR
5	11	ADDWR	No diagnosis	+	(−)	+	(−)	Orthodontist
6	11	No diagnosis	ADDWOR	+	(−)	+	(−)	Orthodontist and OR
7	55	No diagnosis	ADDWR	+	(−)	+	(−)	Periodontist and oral surgeon
8	16	ADDWOR	No diagnosis	+	(−)	+	(−)	Traumatologist
9	26	No diagnosis	ADDWOR	+	(−)	+	(−)	Orthodontist and periodontist
10	11	ADDWOR	No diagnosis	+	(−)	+	(−)	Orthodontist, periodontist and OR
11	14	No diagnosis	ADDWR	+	(−)	+	(−)	Psychiatrist
12	16	Luxation	Luxation	+	(−)	+	(−)	Orthodontist
13	33	ADDWR	No diagnosis	+	(−)	+	(−)	OR
14	17	ADDWR	No diagnosis	+	(−)	+	(−)	Orthodontist
15	47	ADDWR	Osteoarthritis	+	(−)	+	(−)	OR
16	59	Osteoarthritis	ADDWOR	+	(−)	+	(−)	OR
17	27	ADDWR	ADDWR	+	(−)	+	(−)	Orthodontist and surgeon
18	38	ADDWR	No diagnosis	+	(−)	+	(−)	Periodontist and OR
19	15	ADDWOR	No diagnosis	+	(−)	+	(−)	Orthodontist
20	33	No diagnosis	ADDWR	+	(−)	+	(−)	Psychiatrist
21	28	ADDWOR	No diagnosis	+	(−)	+	(−)	Orthodontist, periodontist and OR
22	25	No diagnosis	ADDWOR	+	(−)	+	(−)	Oral surgeon

Note: ADDWR=anterior disc displacement with reduction; ADDWOR=anterior disc displacement without reduction.
+=muscular pain (numeric rating scale, with a value equal or higher than 6) in three points in the elevator muscles.
(−)=muscular pain (numeric rating scale, with a value equal or lower than 2) in three points in the elevator muscles.
OR=Oral Rehabilitation.

(Table 3). This is in agreement with previous reports that have found that anterior repositioning splints were successful in reducing or eliminating joint noise (clicking), joint pain and associated secondary muscles symptoms.[17,33–35] The possible reasons for this effect is that they may alter adverse loading in the joint, correct pathologic disc position, and reduce the muscle splinting that affects the joint.[17]

Physical therapy was not included at baseline, because at first, the authors proceeded with the insertion of the MAA and then carefully adjusted the splint to achieve adequate stability and mandibular dynamics. At three months of treatment, the patient was sent to a physical therapist specialist to assist the patient with postural correction, as an integral component of the management of patients with TMD. The examination of the cervical spine comprised the evaluation of the head and neck posture, the range of motion of the head in different directions, the palpation of soft tissues and bony landmarks, and a verbal report of cervical noises during movement or neurosensory alterations.[12]

The placement of the MAA in the mouth produces an increment of occlusal vertical dimension (iVDO), which could change the afferent discharge from periodontal, mucosal and lingual mechanoreceptors, tongue muscles, jaw muscles, neck muscles and temporomandibular joint proprioceptors. This may influence the pool of motoneurons that control the muscles of the cranio-cervical mandibular unit. It is probable that an adaptive mechanism in the threshold and/or afferent discharge frequency occurred in these receptors upon the use of the MAA during the six months. There is a recent report on an experimental model in rats in which iOVD causes a transient change on the sensitivity of afferent input from muscle spindles of the masseter muscle[36,37] and from TMJ proprioceptors.[38] Both studies showed an adaptation of afferent discharges from the receptors to long-term iVDO. Most likely, the clinical protocol of careful occlusal adjustment of the MAA could act as a counterbalance effect, avoiding the adaptation mechanisms of these receptors mentioned during the period of treatment.

Study limitations

The current study has some limitations that should be considered. First, the sample was small and included only women; therefore it will be important to include more participants of both genders in a future study. The role of gender in the development of TMD has been extensively discussed in the literature, and it is considered to be more prevalent in women than in men.[39] A recent study[40] corroborates this: It was found that gender showed a statistically significant difference, with women showing more TMD signs and symptoms (62.28%). Second, the improvement in cervical lordosis cannot be attributed only to the effect of the MAA, but also in part to the program of postural re-education performed by the physical therapist specialist. Therefore, further study needs to be done on a greater sample size to determine if this data can be generalized across differing populations. Third, there is no long-term follow-up. Most criticism of research is not being able to extrapolate long-term results.

Finally, the improvement in cervical homeostasis observed suggests that the indication of the MAA together with a protocol of careful adjustments and control of this appliance and a program of postural re-education to improve the posture of the head and neck is a good therapeutic approach for patients with TMD, chronic cervical pain with lordosis equal or less than 20°. The change in the cervical lordosis observed in this study implies that craniocervical relation should be evaluated before and after the use of an MAA.

Implications

The clinical relevance of this study is to improve the planning, treatment and prognosis of patients with TMD, cervical pain and cervical lordosis angle less than 20°.

Conclusions

1. The significant cervical lordosis increase in angle 1 (OPT/7CVT), together with the significant increase observed in the angles 3 (CVT/EVT) and 4 (2CL/7CL), suggest that the MAA promotes an improvement on the cervical alignment.
2. Six months of continuous MAA use, together with a program of postural re- education, are an integral component of the management of patients with TMD and cervical pain that promotes homeostasis of the craniocervical system.

Disclaimer Statements

Contributors All authors.

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Conflicts of interest None.

Ethics approval A protocol based on ethical principles that have their origin in the Declaration of Helsinki was used.

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