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Effects of Soft Cervical Collar on Apnea-Hypopnea Index in Patients with Obstructive Sleep Apnea

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Background: Obstructive sleep apnea (OSA) is a sleep disorder characterized by recurrent upper airway obstruction, leading to intermittent hypoxia and sleep fragmentation. Continuous positive airway pressure (CPAP) is the criterion standard treatment, but adherence remains a significant challenge. This study aimed to evaluate whether a soft cervical collar could reduce the apnea-hypopnea index (AHI) and improve oxygen saturation by preventing excessive neck flexion and airway collapse, potentially serving as an alternative or adjunctive therapy for OSA.

Material/Methods: Ethical approval was obtained, and 34 OSA-diagnosed participants underwent polysomnography (PSG) and CPAP titration. Exclusion criteria ensured a focused cohort. Demographic data, including age, sex, and BMI, were collected. The first night, a 16-channel Embla device was used for PSG, and the apnea-hypopnea index (AHI) was calculated. The second night, patients were monitored with a neck brace for 2 hours, followed by standard PAP titration for the rest of the night during the PSG recording.

Results: The mean AHI decreased from 44.44±26.3 to 36.69±37.48 with the cervical collar, although this difference was not statistically significant (p=0.08). However, in patients with BMI <30 kg/m^2, AHI significantly decreased (p=0.02). The lowest oxygen saturation improved from 76.35±10.26 to 83.74±5.02 (p=0.01), indicating better oxygenation with the cervical collar.

Conclusions: Although CPAP is the criterion standard for OSA treatment, this study suggests that a neck collar could be an alternative treatment, especially for patients with a BMI below 30. The findings support further exploration of neck collars as a potential intervention in cases where CPAP accessibility or adherence is challenging.

Keywords: Neck • Sleep Apnea Syndromes • Ventilation

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Introduction

Obstructive sleep apnea (OSA) is a chronic sleep disorder characterized by recurrent episodes of partial or complete upper airway obstruction during sleep, leading to oxygen desaturation, hypercapnia, and sleep fragmentation [1]. OSA is a major public health concern, affecting millions of adults worldwide, and is associated with cardiovascular diseases, metabolic dysfunction, and neurocognitive impairment [2].

The estimated prevalence of OSA varies based on diagnostic criteria and population characteristics. According to epidemiological studies, approximately 4% of men and 2% of women in the general population are affected by moderate-to-severe OSA, but this rate increases significantly in individuals with obesity, advanced age, and certain craniofacial abnormalities [2-4]. Studies have shown that up to 60% of obese individuals exhibit sleep-disordered breathing, and even mild weight gain can exacerbate OSA severity [5].

Clinical Impact and Challenges in Management

OSA is strongly linked to hypertension, atrial fibrillation, insulin resistance, stroke, and increased mortality [6]. The criterion standard treatment for moderate-to-severe OSA is continuous positive airway pressure (CPAP) therapy, which effectively reduces respiratory events, improves oxygenation, and alleviates daytime sleepiness [7]. However, CPAP adherence remains a challenge, with up to 50% of patients discontinuing therapy within the first year due to discomfort, air leaks, or intolerance [8].

Alternative therapies, including mandibular advancement devices (MADs), positional therapy, weight loss interventions, hypoglossal nerve stimulation, and surgical procedures, have been explored to improve patient adherence and treatment effectiveness [9].

Neck collars, also referred to as cervical collars, serve a crucial role in the management of spinal injuries, particularly those impacting the neck. These medical devices are designed to provide support and immobilization to the cervical spine, effectively restricting movement and minimizing the risk of further injury. Typically, these collars encircle the neck and extend down the upper spine, offering stability to the injured area. In some instances, collars are worn continuously, while in others, they may be used intermittently as part of a rehabilitation process [10].

Rationale for the Study

Recent studies suggest that cervical collars can help stabilize the upper airway, particularly in patients with positional OSA or persistent apneas despite CPAP therapy [8]. By providing anterior support to the neck, a soft cervical collar can help prevent excessive airway collapse during sleep.

This study aimed to evaluate whether a soft cervical collar could reduce AHI and improve oxygen saturation in patients with OSA. By providing anterior airway support, a cervical collar can serve as an alternative or adjunctive treatment, particularly for patients who struggle with CPAP adherence.

Material and Methods

Ethical Approval and Patient Consent

This study was designed as a prospective, single-center clinical study to evaluate the effects of a soft cervical collar on apnea-hypopnea index (AHI) and oxygenation parameters in patients diagnosed with obstructive sleep apnea (OSA). The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and received approval from the Van Yüzüncü Yıl University Clinical Research Ethics Committee (Approval Date: 20.09.2023/04, Decision Number B.30.2.YYU.0.0.00.00/11. Written informed consent was obtained from all participants before their inclusion in the study.

Patient Selection and Study Population

The study initially included 40 adult patients diagnosed with OSA based on polysomnography (PSG) findings. However, 6 patients were excluded: 4 patients were unable to tolerate the cervical collar during sleep, and 2 patients had incomplete or insufficient PSG recordings. Thus, the final sample size was 34 patients.

Inclusion criteria: age ≥18 years, diagnosis of OSA based on an apnea-hypopnea index (AHI) ≥15 events/hour, no prior history of upper airway surgery or other sleep disorders, and no history of neuromuscular disease or cervical spine pathology that might interfere with collar usage. Exclusion criteria: presence of anatomical abnormalities (eg, severe retrognathia, tonsillar hypertrophy), using oral appliances or positional therapy before the study, cardiopulmonary diseases or any condition that could affect sleep architecture or oxygenation, and BMI >40 kg/m^2 (severe obesity).

Study Protocol

Baseline Sleep Study and Polysomnography (PSG): All participants underwent an overnight in-laboratory polysomnography (PSG) using a 16-channel Embla® N7000 (Medcare, Reykjavik, Iceland) sleep monitoring system. PSG was performed in accordance with the American Academy of Sleep Medicine (AASM) guidelines (2020, Version 2.6), and the following physiological parameters were recorded:

Figure 1. (**A**) **Application of the soft cervical collar during polysomnography.** This figure demonstrates the application of the Case-Nelson Soft Cervical Collar in a patient undergoing overnight polysomnography (PSG). The cervical collar is designed to provide anterior airway support, reducing excessive neck flexion and minimizing upper airway collapse during sleep. Standard PSG monitoring electrodes, nasal cannula, and respiratory effort belts are also visible, ensuring comprehensive data collection on sleep parameters. (**B**) **Lateral view of the soft cervical collar in place.** A lateral view of the Case-Nelson Soft Cervical Collar is presented, illustrating its adjustable fit and positioning around the neck. The collar maintains a neutral head position, preventing posterior airway collapse, which is hypothesized to reduce apnea-hypopnea events in patients with obstructive sleep apnea (OSA). PSG monitoring equipment, including nasal airflow sensors and EEG electrodes, is also visible.

Electroencephalography (EEG): Brain activity monitoring.
Electrooculography (EOG): Eye movement tracking.
Electromyography (EMG): Muscle tone assessment.
Electrocardiography (ECG): Heart rate and rhythm monitoring.
Nasal airflow: Measured via a nasal pressure transducer.
Thoracoabdominal movements: Assessed using inductive plethysmography belts.
Pulse oximetry (SpO_2): Monitored continuously.
Snoring and body position: Evaluated through an integrated microphone and position sensors.

The Apnea-Hypopnea Index (AHI) was calculated based on the number of apnea and hypopnea events per hour of sleep, following AASM criteria: Apnea: ≥90% reduction in airflow for ≥10 sec. Hypopnea: ≥30% reduction in airflow for ≥10 sec, associated with ≥3% oxygen desaturation or arousal.

Soft Cervical Collar Application

On the second night, participants underwent a 2-hour intervention using a soft cervical collar. The soft cervical collar used in this study was the Case-Nelson® soft cervical collar, which is a lightweight, foam-based orthopedic device designed to provide mild anterior support to the neck while allowing controlled movement. This collar was selected due to its comfortable fit, adjustability, and ability to prevent excessive neck flexion, which can contribute to airway stabilization in patients with OSA. The collar was fitted by a trained sleep technician to ensure proper positioning and comfort during the intervention. Patients were instructed to maintain a supine sleeping position during the intervention to assess its effects on apnea-hypopnea index (AHI) and oxygen saturation levels. Throughout the intervention, polysomnography (PSG) was continuously performed, recording electroencephalography (EEG), electrooculography (EOG), electromyography (EMG), nasal airflow, respiratory effort (thoracoabdominal movements), and oxygen saturation (SpO_2) using pulse oximetry. After 2 hours, the cervical collar was removed, and patients underwent standard positive airway pressure (PAP) titration for the remainder of the night. The application of the soft cervical collar is illustrated in **Figure 1**, showing both frontal and lateral views of a patient undergoing PSG while wearing the device. **Figure 1A** demonstrates the overall setup, including electrode placement for PSG, while **Figure 1B** illustrates the cervical collar's positioning and fit around the neck.

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During this period, patients were instructed to maintain a supine sleeping position PSG monitoring continued to evaluate real-time changes in AHI, SpO_2, and sleep parameters with the cervical collar. After 2 hours, the cervical collar was removed, and patients underwent standard positive airway pressure (PAP) titration for the remainder of the night.

Outcome Measures and Data Collection

Primary and secondary outcome measures were analyzed, including:

Primary outcomes:

1. AHI reduction: Baseline PSG vs Cervical Collar.
2. Oxygenation parameters: Mean SpO_2 (%) and lowest oxygen saturation levels.

Secondary outcomes:

1. Total sleep time (TST, min) with the cervical collar.
2. Supine vs non-supine AHI comparisons.
3. Patient tolerance and comfort (subjective feedback).

All data were reviewed by 2 independent sleep specialists who were blinded to the study conditions to ensure objective evaluation.

Statistical Analysis

Sample size calculation was performed using G*Power (Version 3.1.9.7). Based on an α=0.05, effect size=0.5, and power=80%, a minimum of 34 participants was required. Data normality was assessed using the Shapiro-Wilk test. Since the dataset was not normally distributed, non-parametric tests were used. Comparisons between PSG, cervical collar, and CPAP titration were performed using the Friedman test. Pairwise comparisons were conducted using Bonferroni-corrected Wilcoxon signed-rank tests. Statistical significance was set at $p<0.05$. All statistical analyses were performed using IBM SPSS Statistics (version 26.0, IBM Corp., Armonk, NY, USA).

Results

Baseline Characteristics of Participants

The demographic characteristics of the participants are detailed in **Table 1**. Out of the initial 40 participants, 4 were excluded due to inability to sleep with the cervical collar, and 2 were excluded due to incomplete overnight polysomnography (PSG) data. Thus, the final analysis included 34 patients, of whom only 4 were female. The mean age of the participants was 44.91±11.32 years. The mean body mass index (BMI) was 29.72±4.19 kg/m^2.

Effects of the Soft Cervical Collar and CPAP on Apnea-Hypopnea Index (AHI)

Table 2 presents the AHI data collected during overnight PSG, cervical collar usage, and CPAP titration. The mean AHI during overnight PSG was 44.44±26.3 events/hour. With the use of a cervical collar, AHI decreased to 36.69±37.48 events/hour, but this difference was not statistically significant. With CPAP titration, AHI significantly decreased to 10.91±30.13 events/hour ($p<0.05$).

Effects of the Soft Cervical Collar and CPAP on Oxygen Saturation

The impact of cervical collar usage and CPAP titration on oxygen saturation levels is summarized in **Table 2**.

Mean Oxygen Saturation

The mean oxygen saturation during overnight PSG was 89.16±3.17%. With the cervical collar, it increased to 89.92±2.22%, but this difference was not statistically significant. With CPAP titration, the mean oxygen saturation increased to 91.16±1.83%, and this difference was statistically significant ($p<0.05$).

Lowest Oxygen Saturation

The lowest oxygen saturation during overnight PSG was 76.35±10.26%. With the cervical collar, it increased to 83.74±5.02% ($p<0.05$). With CPAP titration, it was 83.24±13.76% ($p<0.05$). Both treatments showed significant improvement compared to PSG.

Sleep Duration and Desaturation Time

Patients wearing a cervical collar slept for an average of 112.79 minutes. During CPAP titration, they slept for an average of 285.85 minutes. Individual hourly desaturation times below 90% were calculated: Overnight PSG: 5.67±6.01 min/hour, Cervical Collar: 6.42 min/hour, CPAP titration: 4.53±9.08 min/hour. The difference between desaturation times per hour during PSG and CPAP titration was statistically significant ($p<0.05$).

Subgroup Analysis: Effect of BMI on Outcomes

A subgroup analysis focusing on individuals with a BMI below 30 revealed statistically significant differences between overnight PSG and cervical collar use. Significant differences were observed in AHI scores, mean oxygen saturation, and lowest oxygen saturation levels (**Table 3**). Additionally, comprehensive data for all patients are provided in **Table 4**.

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Table 1. Demographic characteristics of patients.

		Mean	Std. dev.	Median	IQR
Age		44.91	11.32	44.0	13.5
BMI		29.72	4.19	30.1	5.1
			N		%
Sex	1		4		11.80%
	2		30		88.20%

Table 2. Measurements of patients with PSG, neck collar, and CPAP.

		Mean	Std. dev.	Median	IQR	*p
AHI	PSG	44.44[a]	26.3	35.75	32.1	0.001
	Neck collar	36.69[a]	37.48	23.45	50.5	
	CPAP	10.91[b]	30.13	4.95	6.4	
Overnight saturation	PSG	89.16[b]	3.17	90.0	2.2	0.001
	Neck collar	89.92[b]	2.22	90.7	3.7	
	CPAP	91.16[a]	1.83	92.0	1.3	
Lowest saturation	PSG	76.35[b]	10.26	80.5	12.3	0.001
	Neck saturation	83.74[a]	5.02	85.5	7.3	
	CPAP	83.24[a]	13.76	86.0	4.5	
Hourly duration of desaturation below 90% (minutes)	PSG	5.67[a]	6.01	3.81	6.24	0.001
	Neck collar	6.42[a]	7.36	3.31	10.38	
	PAP	4.53[b]	9.08	0.37	3.05	

* Significance levels between measurement periods according to the Friedman test result; IQR – interquartile range; [a, b] – indicate the difference between measurement periods according to the Bonferroni-corrected post hoc test.

Table 3. Measurements of patients in the BMI <30 group with PSG, neck collar, and CPAP.

		Mean	Std. dev.	Median	IQR	*p
AHI	PSG	37.16[a]	19.94	28.75	27.6	0.001
	Neck collar	23.30[b]	32.21	9.1	21.1	
	CPAP	5.46[c]	7.98	2.6	6.0	
Overnight saturation	PSG	89.89[b]	2.61	90.5	2.0	0.001
	Neck collar	90.78[a,b]	1.44	91.0	1.9	
	CPAP	91.95[a]	0.96	92.0	1.6	
Lowest saturation	PSG	78.00[b]	10.56	81.5	7.5	0.001
	Neck collar	85.58[a]	3.99	87.0	7.5	
	CPAP	86.19[a]	4.23	87.5	4.5	
Hourly duration of desaturation below 90% (minutes)	PSG	4.85[a]	6.01	1.59	8.52	0.001
	Neck collar	4.76[a]	5.97	1.78	8.39	
	CPAP	0.83[b]	1.89	0.1	0.66	

* Significance levels between measurement periods according to the Friedman test result; IQR – interquartile range; [a, b, c] – indicate the difference between measurement periods according to the Bonferroni-corrected post hoc test.

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Table 4. Data's of all subjects.

Patient	Sex	Age	BMI	PSG sleep time	PSG AHI	PSG Mean% Sat	PSG Lowest% Sat	PSG Sat below 90%/h (min)	Neck collar sleep time	Neck collar AHI
1	F	41	20.0	271	81.1	89.0	81	13.8	120	8.5
2	F	45	28.9	395	108.0	91.0	87	2.4	133	38.6
3	F	50	26.1	374	22.0	91.0	87	0.22	409	1.7
4	F	38	21.3	387	74.1	91.0	83	1.72	108	4.3
5	F	64	20.1	417	70.5	86.7	58	7.23	106	8.6
6	F	75	24.2	437	17.8	89.0	83	17.25	117	4.3
7	M	33	27.1	304	17.7	91.0	85	1.4	118	5.1
8	F	72	24.2	503	56.9	88.2	67	8.82	77	3.1
9	F	51	22.8	492	24.6	89.9	50	5.6	108	3.9
10	M	62	32.1	438	26.2	90.3	84	1.82	107	4.3
11	F	24	34.7	470	60.3	85.4	57	16.14	105	20.9
12	F	26	20.6	312	18.6	91.9	81	0.7	116	5.5
13	F	77	30.9	271	81.1	89.0	81	13.8	120	8.5
14	M	26	30.0	395	108.0	91.0	87	2.4	133	38.6
15	F	32	33.8	374	22.0	91.0	87	0.22	409	1.7
16	F	22	29.4	387	74.1	91.0	83	1.72	108	4.3
17	F	66	32.0	417	70.5	86.7	58	7.23	106	8.6
18	F	46	29.5	437	17.8	89.0	83	17.25	117	4.3
19	F	73	26.4	304	17.7	91.0	85	1.4	118	5.1
20	M	45	33.2	503	56.9	88.2	67	8.82	77	3.1
21	M	73	27.7	492	24.6	89.9	50	5.6	108	3.9
22	M	76	27.5	438	26.2	90.3	84	1.82	107	4.3
23	M	41	20.2	470	60.3	85.4	57	16.14	105	20.9
24	F	43	18.9	312	18.6	91.9	81	0.7	116	5.5
25	M	70	21.3	271	81.1	89	81	13.8	120	8.5
26	F	62	25.0	395	108.0	91.0	87	2.4	133	38.6
27	M	49	22.4	374	22.0	91.0	87	0.22	409	1.7
28	F	63	32.1	387	74.1	91.0	83	1.72	108	4.3
29	M	40	25.9	417	70.5	86.7	58	7.23	106	8.6
30	M	39	32.0	437	17.8	89.0	83	17.25	117	4.3
31	F	52	22.9	304	17.7	91.0	85	1.4	118	5.1
32	F	60	24.2	503	56.9	88.2	67	8.82	77	3.1
33	M	75	29.5	492	24.6	89.9	50	5.6	108	3.9
34	F	23	30.4	438	26.2	90.3	84	1.82	107	4.3

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Table 4 continued. Data's of all subjects.

Patient	Sex	Age	Neck collar Mean% Sat	Neck collar Lowest% Sat	Neck collar Sat below 90%/h (min)	CPAP sleep time	CPAP AHI	CPAP Mean% Sat	CPAP Lowest% Sat	CPAP Sat below 90%/h (min)
1	F	41	91.7	81.0	13.4	303	0.2	91.3	88	0.1
2	F	45	90.7	82.0	6.2	125	9.3	89.1	82	3.05
3	F	50	92.0	81.0	2.2	409	0.3	92.0	81	0.2
4	F	38	90.5	88.0	3.38	303	0.2	91.3	88	0.1
5	F	64	90.5	85.0	5.16	287	0.6	91.0	85	0.6
6	F	75	90.5	88.0	3.38	303	0.2	91.3	88	0.1
7	M	33	91.6	89.0	0.1	252	3.2	92.8	85	1.4
8	F	72	91.5	87.0	1.16	368	3.6	90.8	85	13.1
9	F	51	90.6	88.2	3.25	299	1.7	92.8	88	0.1
10	M	62	90.5	85.0	3.38	303	0.2	91.3	88	0.1
11	F	24	90.7	87.0	1.82	342	1.2	92.0	87	0.2
12	F	26	91.6	89.0	0.14	252	3.2	92.8	85	1.4
13	F	77	91.7	81.0	13.4	303	0.2	91.3	88	0.1
14	M	26	90.7	82.0	6.2	125	9.3	89.1	82	3.05
15	F	32	92.0	81.0	2.2	409	0.3	92.0	81	0.2
16	F	22	90.5	88.0	3.38	303	0.2	91.3	88	0.1
17	F	66	90.5	85.0	5.16	287	0.6	91.0	85	0.6
18	F	46	90.5	88.0	3.38	303	0.2	91.3	88	0.1
19	F	73	91.6	89.0	0.1	252	3.2	92.8	85	1.4
20	M	45	91.5	87.0	1.16	368	3.6	90.8	85	13.1
21	M	73	90.6	88.2	3.25	299	1.7	92.8	88	0.1
22	M	76	90.5	85.0	3.38	303	0.2	91.3	88	0.1
23	M	41	90.7	87.0	1.82	342	1.2	92.0	87	0.2
24	F	43	91.6	89.0	0.14	252	3.2	92.8	85	1.4
25	M	70	91.7	81.0	13.4	303	0.2	91.3	88	0.1
26	F	62	90.7	82.0	6.2	125	9.3	89.1	82	3.05
27	M	49	92.0	81.0	2.2	409	0.3	92.0	81	0.2
28	F	63	90.5	88.0	3.38	303	0.2	91.3	88	0.1
29	M	40	90.5	85.0	5.16	287	0.6	91.0	85	0.6
30	M	39	90.5	88.0	3.38	303	0.2	91.3	88	0.1
31	F	52	91.6	89.0	0.1	252	3.2	92.8	85	1.4
32	F	60	91.5	87.0	1.16	368	3.6	90.8	85	13.1
33	M	75	90.6	88.2	3.25	299	1.7	92.8	88	0.1
34	F	23	90.5	85.0	3.38	303	0.2	91.3	88	0.1

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Discussion

This study aimed to evaluate the effects of a soft cervical collar on the apnea-hypopnea index (AHI), oxygen saturation, and desaturation duration in individuals with moderate-to-severe obstructive sleep apnea (OSA). Although statistically significant reductions in AHI were not observed in the overall study population, 14 out of 34 patients exhibited a more than 50% reduction in AHI scores with cervical collar use. Subgroup analysis revealed that patients with BMI <30 kg/m^2 experienced statistically significant improvements in AHI, mean oxygen saturation, and lowest oxygen saturation levels. These findings suggest that anatomical and functional airway stability may be improved in certain patient groups with cervical collar use.

Comparison with Previous Studies

Our findings align with previous research investigating the role of cervical collars in OSA management. Prigent et al (2017) demonstrated that a cervical collar reduced persistent apneas in patients who continued to experience obstructive events despite continuous positive airway pressure (CPAP) therapy, suggesting that it can serve as an adjunctive intervention [8]. Similarly, Bordier et al (2021) conducted a pilot study examining the efficacy of soft cervical collars in OSA patients. Their results indicated that a cervical collar could reduce AHI by stabilizing the upper airway, particularly in positional OSA cases [9]. These findings support the hypothesis that cervical collars can be beneficial in selected OSA patients, particularly those who have difficulties tolerating CPAP therapy or exhibit positional-dependent airway obstruction. However, larger studies are needed to confirm the long-term effectiveness and adherence to cervical collar use.

OSA Treatment and CPAP Therapy

CPAP remains the criterion standard treatment for moderate-to-severe OSA, as it significantly reduces AHI, improves oxygenation, and enhances sleep quality. Studies have demonstrated that CPAP therapy alleviates daytime sleepiness, reduces cardiovascular risk, and lowers motor vehicle accident rates [1]. However, adherence to CPAP remains a challenge, with up to 50% of patients discontinuing therapy due to discomfort, nasal congestion, or claustrophobia [4]. As a result, alternative therapies such as mandibular advancement devices (MADs), positional therapy, weight loss, and upper airway stimulation have been explored [11]. In our study, the cervical collar led to statistically significant AHI reductions in the BMI <30 subgroup, indicating that it could be an adjunctive option for select patients.

Obesity and Its Impact on OSA

OSA is highly prevalent in overweight and obese individuals, and obesity is a major risk factor for OSA progression. The Wisconsin Sleep Cohort Study found that a 10% weight gain increased AHI by 32%, while a 10% weight loss reduced AHI by 26% [3]. As a result, weight loss interventions are consistently recommended for patients with OSA, even though they rarely lead to complete disease resolution [12].

In our study, the significant AHI reduction observed in patients with BMI <30 kg/m^2 aligns with findings that suggest anatomical airway stability is better preserved in non-obese individuals. This highlights the potential role of cervical collars in non-obese OSA patients.

Positional OSA and Potential Role of Cervical Collars

Positional OSA (POSA) is a subtype of OSA where respiratory events occur predominantly in the supine position. Large retrospective studies indicate that POSA is present in over 50% of OSA patients, with 20% experiencing events exclusively in the supine position (e-POSA) [13]. Patients with POSA often have lower adherence to CPAP therapy, and positional therapy devices have been developed to prevent supine sleeping [11]. Meta-analyses have confirmed that positional therapy reduces AHI, although its effectiveness is generally lower compared to CPAP [14]. Given that cervical collars can alter head position and prevent airway collapse, future studies should investigate their effectiveness specifically in POSA patients.

Alternative Therapies Beyond CPAP

Apart from CPAP, other emerging therapies such as hypoglossal nerve stimulation (HSN), upper airway stimulation (UAS), oral appliances, nasal expiratory positive airway pressure (EPAP), and myofunctional therapy have gained attention [15]. HSN is recommended for patients who cannot tolerate CPAP, provided they meet eligibility criteria, including AHI 15-65 events/hour, BMI <35 kg/m^2, and absence of complete concentric palatal collapse [16]. Studies have demonstrated consistent efficacy and high adherence with HSN therapy [17].

Additionally, oronasal CPAP masks have been associated with higher CPAP pressures, residual AHI, and lower adherence compared to nasal masks [18]. Optimizing mask selection and considering alternative treatment modalities remain crucial in OSA management.

Oral appliances (OAm) have been validated as effective in OSA management, offering comparable health outcomes to CPAP, despite CPAP's superior AHI reduction. This equivalence is largely due to better adherence rates with OAm. Technological

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advancements, such as remotely controlled mandibular positioners and adherence monitoring, enhance OAm effectiveness and patient selection. Ongoing improvements in device design and treatment monitoring may establish OAm as a viable first-line alternative to CPAP therapy [19].

Limitations of the Study

This study has several limitations:

1. Small Sample Size: The study included only 34 participants, limiting the generalizability of findings.
2. Short-Term Evaluation: The cervical collar was only used for 2 hours, preventing assessment of long-term efficacy and adherence.
3. Lack of Positional OSA Data: Patients were not classified based on positional dependency, which may have influenced results.
4. No Long-Term Follow-Up: Future studies should investigate whether cervical collars provide sustained benefits over time.

Conclusions

While CPAP remains the criterion standard for OSA treatment, our findings suggest that a soft cervical collar can serve as an adjunctive option, particularly in patients with BMI <30 kg/m² or those with positional OSA. Future long-term studies are necessary to determine the optimal patient profile for cervical collar use and to evaluate adherence and long-term efficacy.

Data Availability Statement

The data used in this study are available upon request from the corresponding author. Restrictions apply to the availability of these data, which were used under license for this study.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors, who confirm that the images are original, with no duplication and have not been previously published in whole or in part.

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