

Novel Orthosis Reduces Neck Pain Associated with Forward Head Posture in Active Duty Service Members – A Randomized Trial

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The study protocol was approved by the Walter Reed National Military Medical Center Institutional Review Board in compliance with all applicable Federal regulations governing the protection of human subjects.

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Background

Prevalence from
2016-2021: 6.9-7.8%¹

*Highest prevalence of head/neck injuries were in the **U.S. Air Force** and **U.S. Army**¹*



- Chronic neck pain is a common health condition for military personnel across all occupational specialties contributing to limited duty days and heightened healthcare costs.¹⁻¹⁰
- The etiology of neck pain is often multi-factorial and can include mechanical (e.g., poor posture), occupational (e.g., desk work, manual labor), and psychosocial factors (e.g., anxiety, depression).^{1,3}

Background

Considering the postural demands among military occupational specialties, reducing FHP warrants further study.^{5,13,14}

Systematic review

Factors associated with neck pain in fighter aircrew: a systematic review and meta-analysis

James B Wallace ^{1,2} Phil M Newman ¹ Aoife McGarvey ^{3,4,5}
Peter G Osmotherly ⁴ Wayne Spratford ¹ Tim J Gabbett ^{6,7}

- Current multi-disciplinary treatments (i.e., soft tissue/joint mobilizations, dry needling, medications, injections) may not be as effective with the military population.^{3,6,11,12}
- The reduction of cervical lordosis in forward head posture (FHP) → muscular imbalances, degenerative spinal changes, and ↑ neck pain.^{4,5,13}



Study Overview

PURPOSE: To determine whether FHP correction using a novel neck collar device can alleviate neck pain and improve function in a sample of active duty military personnel

DESIGN: Randomized Waitlist-Controlled Trial (**WRNMMC-2021-0347**)

INCLUSION CRITERIA:

- ☐ 18 – 55 year-old active duty Service Members (ADSMs)
- ☐ Neck pain $\geq 4/10$ lasting ≥ 3 months
- ☐ Forward head posture
- ☐ Conventional treatments have not decreased neck pain

EXCLUSION CRITERIA:

- ☐ Acute head/neck trauma within last 6 months OR healing fracture
- ☐ New, progressive and/or bilateral neurological signs/symptoms
- ☐ Surgical fusion
- ☐ Generalized medical disorders (e.g., tumor, infection, autoimmune disorders, bone pathology)



Methods

INTERVENTION: 6-week trial of 20-minute daily collar use

Immediate Treatment Group: Daily collar use from Baseline to 6 weeks post-enrollment

6-Week Waitlist Group: Daily collar use from 6 weeks to 12 weeks post-enrollment

DATA COLLECTION:

Demographics: Baseline

X-rays: Baseline, 6 weeks and 12 weeks

Patient Reported Outcome Measures (PROs):

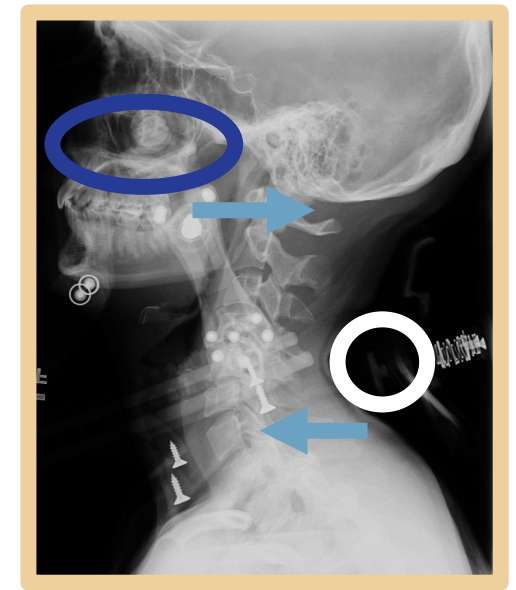
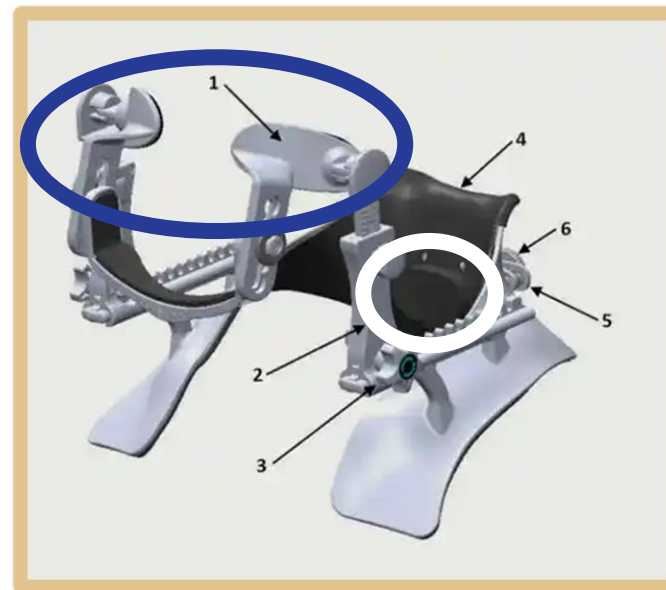
Baseline, 6 weeks, 12 weeks, and 12 months

- ✓ Numeric Pain Rating Scale (NPRS)
- ✓ Neck Disability Index (NDI)
- ✓ Patient Global Impression of Change (PGIC)*

*6 weeks, 12 weeks and 12 months only

Weekly Check-In: Weeks 1-5 during collar use

- ✓ NPRS and Compliance



Cheek Pads: Posterior head translation

Fulcrum: Increase/maintain cervical lordosis

Lateral X-ray Views with and without Collar



Lateral X-ray Measurements^{15,16}

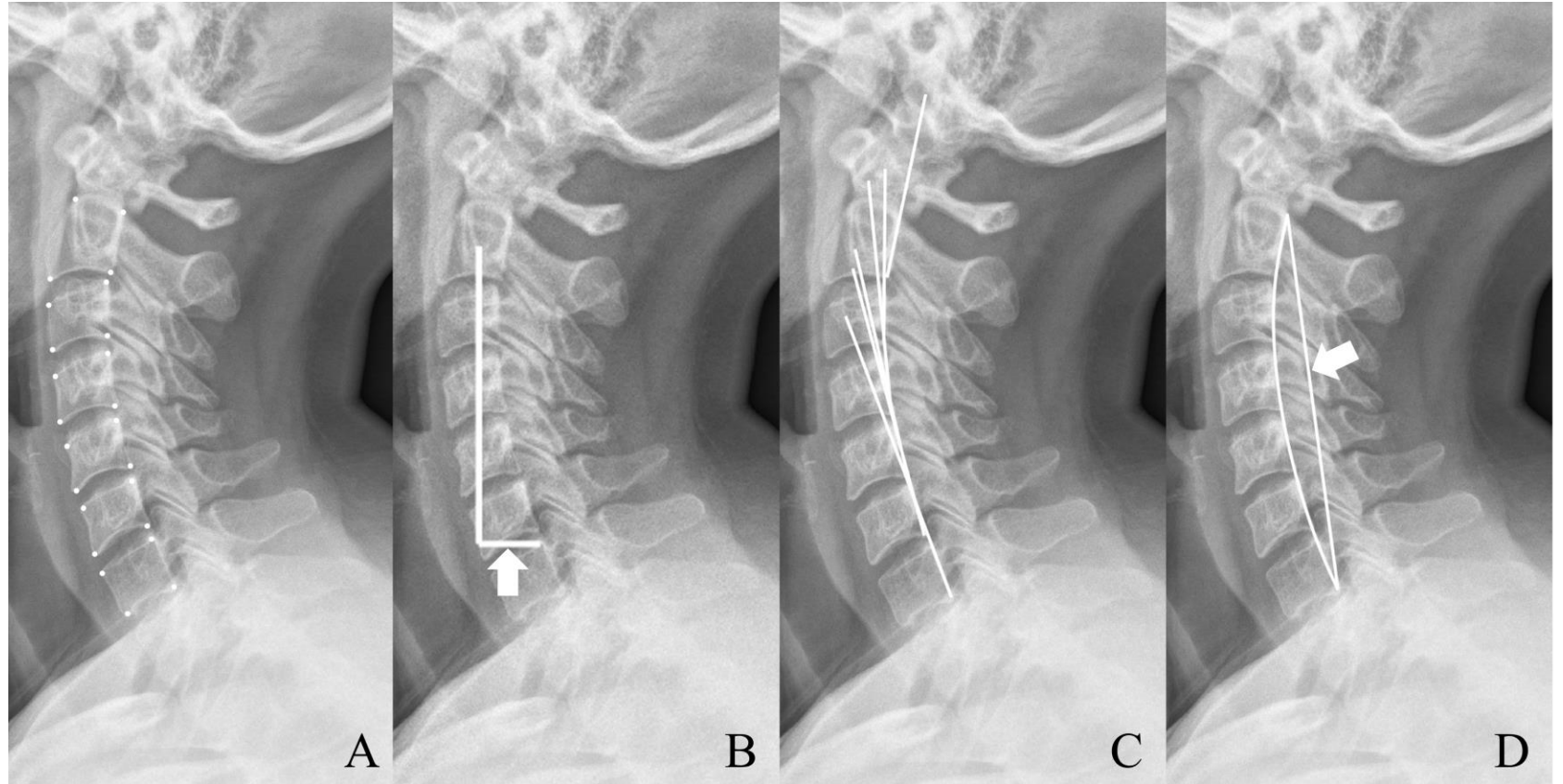
A: Vertebra corner measurement markers

B: Sagittal Vertical Axis

C: Absolute Rotation Angle

D: Cervical Curve Area

***Cobb Angle also measured but not pictured**



Results

Demographics

Final Analysis Sample: 35

49 patients were screened. 40 were enrolled and randomized. 5 participants were excluded from data analysis.

TABLE 1: Demographic characteristics of study participants

		IT (n = 18)	WC (n = 17)
Age (years)		37.9 (6.8)	39.0 (6.6)
Height (inches)		65.0 (5.1)	66.3 (3.8)
Weight (pounds)		166.0 (29.0)	173.0 (24.8)
Sex	Male	5 (27.8)	9 (52.9)
	Female	13 (72.2)	8 (47.1)
Race/Ethnicity	NHB	5 (27.8)	5 (29.4)
	NHW	8 (44.4)	9 (52.9)
	Hispanic	3 (16.7)	2 (11.76)
	Asian/Pacific Islander	1 (5.6)	1 (5.9)
	Other	1 (5.0)	0 (0.0)
Marital Status	Divorced	0 (0.0)	0 (0.0)
	Legally Separated	0 (0.0)	1 (5.9)
	Married	14 (77.8)	12 (70.6)
	Never Married	4 (22.2)	4 (23.5)

Notes. Continuous data are presented as means (standard deviations). Categorical data are presented as frequencies (percentages). IT: Immediate Treatment Group; NHB: Non-Hispanic Black; NHW: Non-Hispanic White; WC: Waitlist-Control Group

Demographics

Majority of study population are Female ADSMs of Senior Enlisted or Senior Officer Rank in the U.S. Army and U.S. Air Force

TABLE 1: Demographic characteristics of study participants

		IT (n = 18)	WC (n = 17)
Military Status	Active Duty	13 (72.2)	15 (88.2)
	Guard/Reserve on Active Duty	5 (27.8)	2 (11.8)
Military Branch	Air Force	2 (11.1)	4 (23.5)
	Army	15 (83.3)	9 (52.9)
	Navy	1 (5.6)	2 (11.8)
	Public Health Service	0 (0.0)	1 (5.9)
	Other	0 (0.0)	1 (5.9)
Military Rank	Enlisted, Junior (E1-E4)	1 (5.6)	0 (0.0)
	Enlisted, Senior (E5-E9)	7 (38.9)	7 (41.2)
	Officer, Junior (O1-O3)	2 (11.1)	3 (17.7)
	Officer, Senior (O4-O11)	7 (38.9)	7 (41.2)
	Warrant Officer (W1-W5)	1 (5.6)	0 (0.0)
Military Occupation	Acquisition	1 (5.6)	1 (5.9)
	Intelligence	4 (22.2)	4 (23.5)
	Information Technology/MIS	3 (16.7)	1 (5.9)
	Medical	4 (22.2)	5 (59.4)
	Personnel/administration	2 (11.1)	2 (11.8)
	Pilot	1 (5.6)	0 (0.0)
	Supply	0 (0.0)	1 (5.9)
	Other unspecified	3 (16.7)	3 (17.7)
Service Duration (years)		14.4 (6.8)	17.0 (7.5)
Deployed to Combat Zone		9 (50.0)	12 (70.6)

Notes. Continuous data are presented as means (standard deviations). Categorical data are presented as frequencies (percentages). IT: Immediate Treatment Group; MIS: Management Information Systems; WC: Waitlist-Control Group

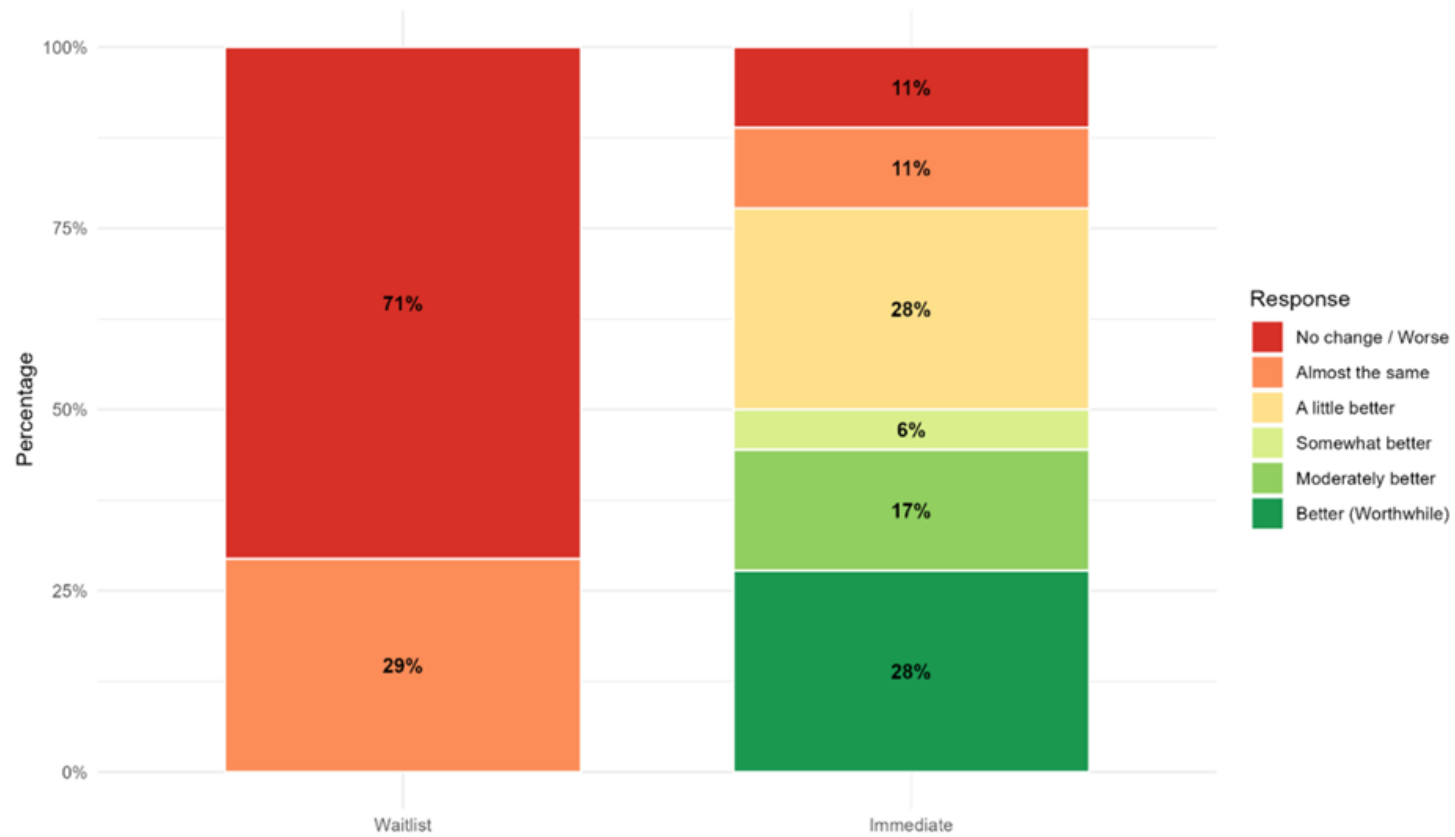
PROs: NPRS and NDI

TABLE 2: Between-group differences in pain and function at 6-week follow-up

	Baseline		Week 6		Change		p	t	d
	Mean	SD	Mean	SD	Mean	SD			
NPRS									
IT	5.06	1.70	3.06	1.55	-2.00	1.78	< 0.0001	-4.97	-2.38
WC	4.47	0.72	5.06	1.03	0.59	1.23			
NDI									
IT	29.8%	14.0	26.1%	15.0	-3.67%	7.89	0.026	-2.34	-1.12
WC	32.9%	8.25	35.6%	10.2	2.71%	8.24			

Notes: Bold values indicate statistical significance at $p < 0.05$ for between-group comparisons of changes from baseline to 6 weeks. d = Cohen's d, effect size; IT: Immediate Treatment Group; NDI: Neck Disability Index; NPRS: Numeric Pain Rating Scale; WC: Waitlist-Control Group

PROs: PGIC



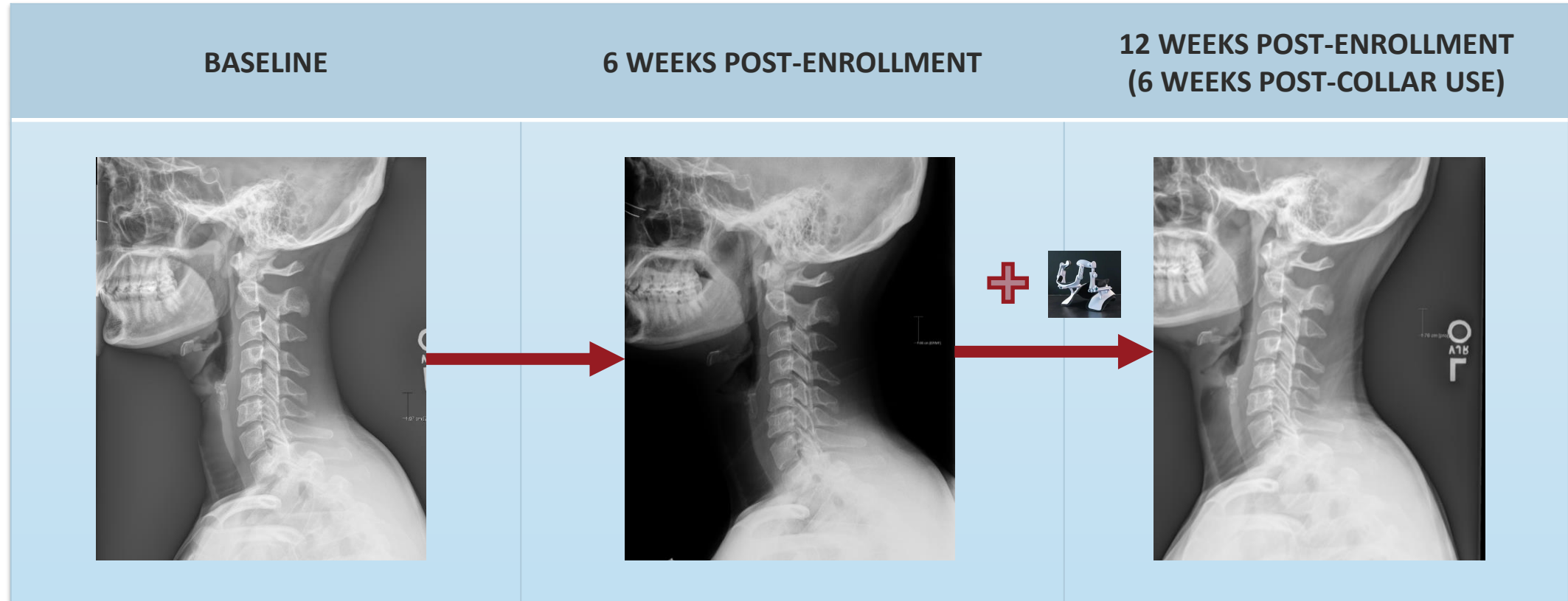
X-ray Measures

TABLE 2: Between-group differences in X-ray measures at 6-week follow-up

	Baseline		Week 6		Change		p	t	d
	Mean	SD	Mean	SD	Mean	SD			
SVA (cm)									
IT	1.56	1.25	1.34	1.22	-0.22	0.70	0.342	-0.96	-0.46
WC	1.15	0.96	1.15	1.01	-0.00	0.61			
Cobb Angle (°)									
IT	1.81	14.15	0.96	15.59	-0.85	7.06	0.689	-0.40	-0.19
WC	9.02	11.2	9.11	10.58	0.09	6.75			
Curve Area (cm²)									
IT	1.59	1.85	1.86	2.36	0.28	1.71	0.154	1.46	0.70
WC	1.98	2.56	1.53	2.32	-0.46	1.22			
ARA (°)									
IT	-7.90	15.15	-8.01	16.14	-0.11	8.91	0.581	-0.56	-0.27
WC	-17.31	12.69	-15.95	11.40	1.36	6.34			

Notes: Bold values indicate statistical significance at $p < 0.05$ for between-group comparisons of changes from baseline to 6 weeks. d = Cohen's d, effect size; IT: Immediate Treatment Group; ARA: absolute rotation angle; SVA: Sagittal Vertical Axis; WC: Waitlist-Control Group

Example of Radiographic Improvement



Conclusion

Evaluating the effects of a wearable, take-home device for neck pain due to FHP is highly relevant to ADSMs considering their occupational requirements.



- ✓ Prior literature has demonstrated the potential utility of neck orthoses with minimal focus on the military population.¹⁷⁻¹⁹
- ✓ Results suggest donning a therapy collar for 6 weeks can yield pain reduction and functional improvement compared to conventional treatment out to 12 weeks, despite no significant radiographic changes.
- ✓ This suggests the short-term pain reduction may be in part due to improvements in myofascial restrictions, although further research is needed to explore potential mechanisms, responder characteristics, as well as long-term outcomes.

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Questions?

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