

RESTRICTION OF CERVICAL SPINE MOTION BY CERVICAL COLLARS

Thomas B. Ducker, M.D., F.A.C.S.
Associate Professor, Johns Hopkins University

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Abstract

We studied five different neck collars in thirty-five subjects. We measured each subject's full range of motion and each with the different collars. We tested flexion, extension, lateral tilt and rotation with the CROM goniometer. If the average range of motion for the thirty-five subjects was 56 degrees flexion, 65 degrees extension, 82 degrees lateral tilt and 134 degrees rotation, and if that motion were considered 100% of normal, cervical collar restrictions were as follows:

Collar	Flexion	Extension	Lateral Tilt	Rotation
Soft Foam	70%	73%	87%	78%
Philadelphia	26%	41%	71%	51%
Stifneck	27%	37%	49%	35%
NecLoc	14%	22%	35%	21%
Miami J	15%	25%	37%	24%

None of the collars were very effective in controlling tilt, for reduction to 35% of normal motion was all that could be achieved. Rotation could be reduced to nearly 20% in the Necloc® systems. Extension was difficult to control, being as high as 41% of normal in the Philadelphia collar and as low as 22-25% in the Jerome Medical products. Flexion was fairly well controlled in the NecLoc EMS system, reduced to 14% of normal.

Conclusion

Both in the emergency situation and in the operating room, it is commonly not possible to initiate immobilization of the cervical spine with custom braces, halo vests, or traction. So what cervical collar is best to use?

In conclusion, the two-piece rigid plastic collars demonstrated better immobilization than the one piece rigid collars, semi-rigid collars, or soft collars. The NecLoc® EMS achieved the best immobilization but was not significantly different from the Miami J®, which is a prototype that may be better tolerated by the patient.

TABLE 1
AVERAGE ANGULAR ROM AND PERCENT RESTRICTION OF MOTION AS COMPARED TO
NORMAL UNRESTRAINED MOTION

(N=35)

	Mean ROM	Standard Deviation	% Normal Motion		Mean ROM	Standard Deviation	% Normal Motion
No Collar				Stifneck			
Flexion	56.41	11.24	100.0	Flexion	15.47	7.70	27.3
Extension	64.68	10.21	100.0	Extension	24.00	10.38	36.8
Lateral Tilt	82.37	13.21	100.0	Lateral Tilt	40.01	15.46	48.8
Rotation	133.97	16.68	100.0	Rotation	46.92	22.47	34.7
Soft Foam				Necloc			
Flexion	39.97	14.32	70.0	Flexion	7.64	4.06	13.7
Extension	47.08	14.13	73.1	Extension	14.14	5.76	22.4
Lateral Tilt	71.40	15.25	87.0	Lateral Tilt	28.86	12.69	35.3
Rotation	105.18	25.18	78.3	Rotation	28.00	15.12	20.8
Philadelphia				Miami J			
Flexion	14.87	7.35	25.9	Flexion	8.45	4.69	15.0
Extension	26.49	9.55	41.2	Extension	16.62	7.15	25.1
Lateral Tilt	58.27	16.77	71.0	Lateral Tilt	30.34	10.95	37.1
Rotation	68.52	23.14	51.0	Rotation	31.62	15.84	23.6

TABLE 2
SUBJECT PROFILE DATA

	Mean	Std.	SEX:	
Age (yrs)	33.34	13.81	Male	11
Height (in)	66.40	4.47	Female	24
Weight (lbs)	150.66	30.92	Total	35

TABLE 3

RESTRICTION OF CERVICAL SPINE MOTION
BY CERVICAL COLLARS

