Difference Between Alar Ligament of Male and Female: MRI Perspectives

Raihanah Haroon [1], Siti Kamariah Che Mohamed [1], Karimah Hanim Abd. Aziz [2]

Department of Radiology, Kulliyyah of Medicine, IIUM
Department of Community Medicine, Kulliyyah of Medicine, IIUM

Introduction

Road traffic accidents have caused serious public health concerns; which include whiplash-associated disorders involving cervical spine. MRI is often required to supplant diagnosis of this condition. Nevertheless, alar ligament of the cervical spine may show variability in MR appearance; most profoundly signal hyperintensity easily mistaken as injury.

Aim Of The Study

- To compare the normal anatomy of alar ligament on MRI between male and female in terms of its course, shape, orientation and signal homogeneity
- To determine the association between the heights of respondents with alar ligament dimensions

Methods

- ✓ A descriptive cross-sectional study.
- ✓ 25 males and 25 females healthy volunteers were studied from February 2018 to January 2020 on 3.0T MR scanner Siemens Magnetom Spectra using 2-mm proton density, T2 and fat-suppression sequences.
- ✓ A standard 12-channel head and neck coil was used.
- ✓ Alar ligament visualization and variability of its courses, shapes and signal intensity characteristics were determined on Syngo workstation.
- ✓ The alar ligament dimensions were measured.
- ✓ The results were analysed using IBM SPSS Statistics Version 25.

Results

- Male respondents were 70% more likely to exhibit alar ligament signal inhomogeneity which is statistically significant (p = 0.02).
- No significant difference in alar ligament shape, size and orientation was seen between both genders. Positive correlation between height and the craniocaudal diameter of the alar ligament as well as the anteroposterior diameter, regardless of gender; which were statistically significant.

Conclusions

Presence of gender variability of alar ligament MR signal intensity as depicted in our data shows that caution needs to be exercised when evaluating alar ligament, especially during circumstances of injury.

References

1. Wenz H. et al. (2015). Signal changes of the alar ligament in a healthy population: a dispositional or degenerative consequence? *Journal of Neurosurgery: Spine*, *23*(5), 544–550.
2. Pfirmann C. et al. (2001). MR Morphology of Alar Ligaments and Occipito- atlantoaxial Joints: Study in 50 Asymptomatic Subjects. *Radiology Society of North America*, *218*(1).
3. Dullerud R. et al. (2010). Magnetic resonance imaging of ligaments and membranes in the craniocervical junction in whiplash-associated injury and in healthy control subjects. *Acta Radiologica*, *51*(2), 207–212.

Table 1: Alar ligament signal homogeneity by gender

Alar Ligament Signal Homogeneity	Total (n = 100)	Male (n = 50)	Female (n = 50)
Homogenous/ Complete	2 (2.0)	0 (0.0)	2 (4.0)
Homogenous/ Incomplete with Dark Rim	31 (31.0)	12 (24.0)	19 (38.0)
Inhomogenous/ Fat-suppressed	0 (0.0)	0 (0.0)	0 (0.0)
Inhomogenous/ Non Fat-suppressed	67 (67.0)	38 (76.0)	29 (58.0)

* Frequency, n (Percentage, %)

Figure 1: PD-weighted images with fat suppression on coronal plane showing (A), (B) homogenous signal and (C), (D) inhomogenous signal of alar ligament

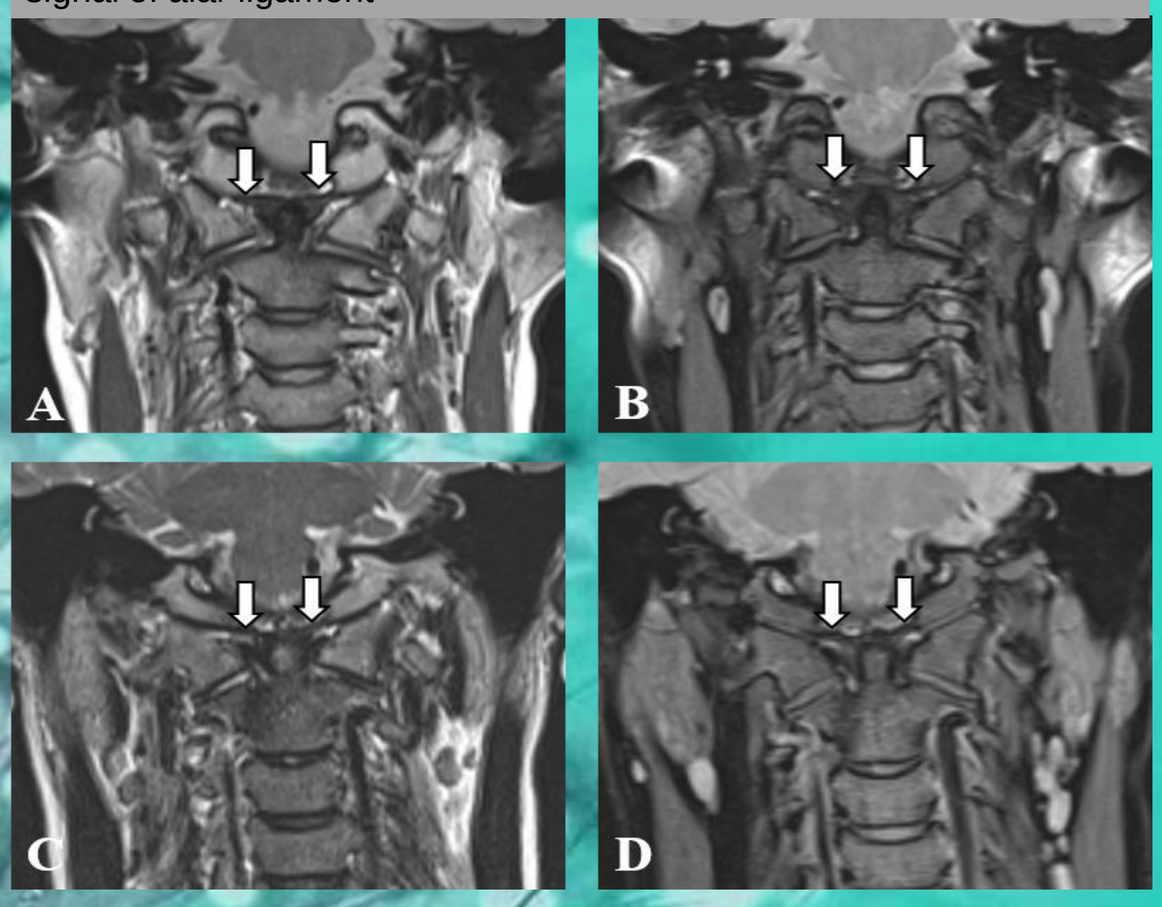


Table 2: Alar ligament signal dimensions by gender

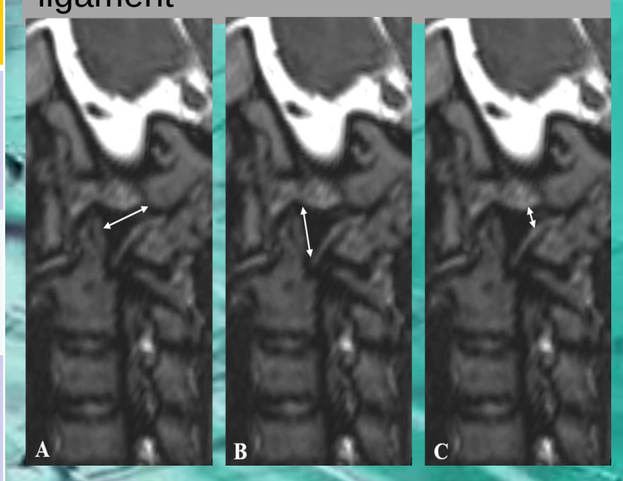
Alar Ligament Dimensions (mm)	Total (n = 100)	Male (n = 50)	Female (n = 50)
AP Diameter	7.6 (2.0)	7.9 (1.9)	7.3 (2.1)
Length	13.3 (2.3)	13.8 (2.4)	12.8 (2.2)
CC Diameter on Coronal	11.8 (1.6)	12.1 (1.4)	11.5 (1.8)
CC Diameter on Sagittal	11.5 (1.7)	11.8 (1.7)	11.3 (1.7)
Midportion CC Diameter on Coronal	5.2 (1.4)	5.6 (1.5)	4.8 (1.1)

* Mean (Standard Deviation)

Table 3: Correlation between height of respondents with alar ligament dimensions

Alar Ligament Dimensions	Height
AP Diameter	
r	0.201
p-value	0.045
Length	
r	-0.31
p-value	0.762
CC Diameter on Coronal	
r	0.254
p-value	0.011
CC Diameter on Sagittal	
r	0.248
p-value	0.013
Midportion CC Diameter on Coronal	
r	0.082
p-value	0.417

Figure 2: PD-weighted images on coronal oblique plane showing of different measurements of alar ligament



Acknowledgement

The Hospital Director, Sultan Ahmad Shah Medical Centre (SASMEC), Head and All Staff in Department of Radiology, SASMEC