

# Morphometric variability of the upper airway in healthy adults : Influence of sex and posture



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- OSA : partial or complete obstruction of the upper airway due to pharyngeal collapsibility
- Influenced by skeletal and soft-tissue anatomical factors
- Prevalence: ~4% in men, ~2% in women, and ~10% in the pediatric population.
- Body posture influences airway patency: supine position may worsen obstruction, whereas prone position may improve airway patency

How do sex and posture influence upper airway shape and dimensions in adults without diagnosed OSA?

## Prospective MRI study – volunteer recruitment

Supine study  
n = 21 (12F 9M)  
Mean age = 31 years

Prone study  
n = 20 (11F 9M)  
Mean age = 31 years



Figure 1 : 3D T2 weighted MRI acquisition protocol in supine (left) and prone (right) postures

## Morphometric data collection & Analyses

- Placement of 63 homologous landmarks on axial, coronal, and sagittal slices
- Structures analyzed: Mandible, Maxilla, Palate, Pharynx, Tongue, Hyoid bone, Epiglottis
- Computation of a set of 32 Euclidean distance measurements
- Shape : PCA on log-shape ratios
- Size : Non-parametric comparison of distances

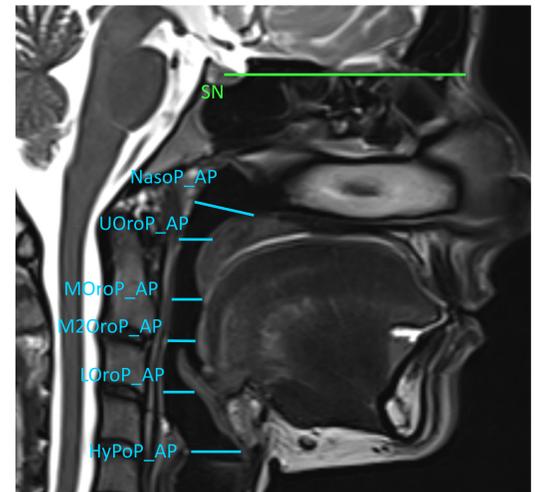


Figure 2 : Localization of anteroposterior pharyngeal measurements on sagittal MRI slice (SN reference line).

## Effects of prone posture

Men

Women

➤ Size related variations involving multiple segments :

- Increased tongue–hard palate distance
- Decreased nasopharyngeal widths
- Increased anteroposterior lengths
- Increased hyoid–cervical spine distance



Figure 3 : Anatomical regions associated with size-related variations in men during prone posture

➤ Pharyngeal shape modifications

- Located in the hypopharynx (AP/L)

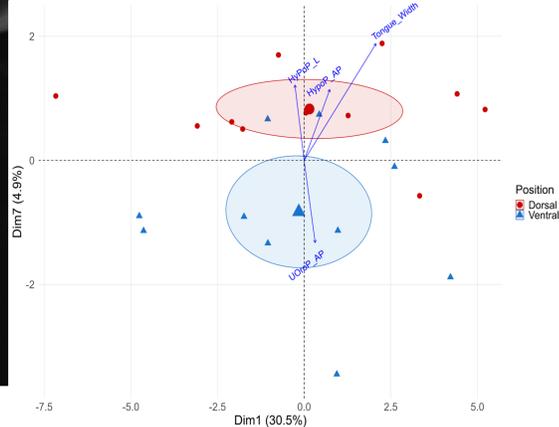


Figure 4 : PCA of upper airway shape variation in women (log-shape ratios). Supine (red) vs prone (blue). Arrows indicate main contributing variables.

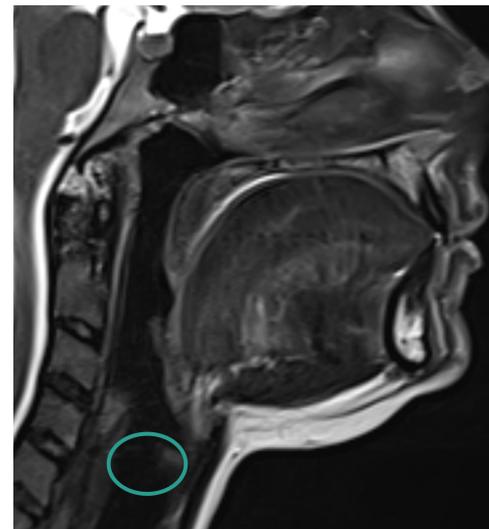


Figure 5 : Anatomical region involved in prone posture shape changes in women.

## Sexual dimorphism - Supine posture



Figure 6 : Anatomical traits associated with sexual dimorphism in supine posture.

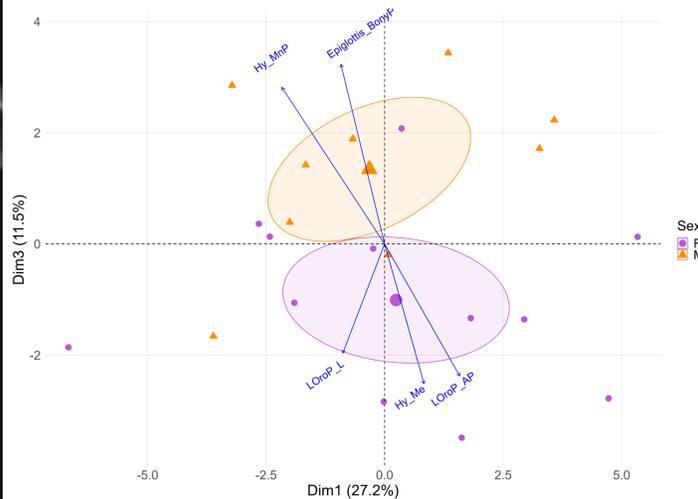


Figure 7 : PCA of upper airway morphology showing sexual dimorphism in supine posture.

Posture alters upper airway morphology in healthy adults

➤ Prone posture → sex-specific changes

- Women : hypopharyngeal shape changes
- Men : Multi-segment size variations

➤ Supine posture : men show risk related traits (↑ Hy–MnP distance, ↑ airway length)