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Introduction

This report is compiled using Computational Fluid Dynamics (CFD) tools. CFD is a division of fluid mechanics that employs the techniques of numerical analysis to find solutions to problems involving fluid flow. This report does not contain medical claims.

CFD can be used to analyse airflow parameters such as air pressure, air distribution and many more airflow characteristics in the nasal cavity. It is suggested that such parameters are evaluated by a medical specialist to identify the causes, if any, of nasal obstruction, bearing in mind that CFD although accurate, presents margins of error. Sinuflow advises to always accompany this study with thorough medical examinations.

CFD Results Summary

Legend

Legend	
	Region may require inspection
	Region likely requires inspection

Figure 1: Legend

Left Channel

Left Airway			
		Value	Percentage
Average Airflow	Inferior Meatus	3.23 L/min	50%
	Middle Meatus	2.60 L/min	40%
	Upper Meatus	0.64 L/min	10%
Tot		6.46 L/min	
Average Area	Nasal Valve	1.02 cm^2	
	Inferior Meatus	0.47 cm^2	
	Middle Meatus	0.52 cm^2	
	Upper Meatus	0.29 cm^2	
Sharpest Pressure Drop		3.0 cm from nasal aperture	

Figure 2: Left Airway Summary

Right Channel

Right Airway			
		Value	Percentage
Average Airflow	Inferior Meatus	1.85 L/min	38%
	Middle Meatus	3.06 L/min	62%
	Upper Meatus	0.00 L/min	0%
Tot		4.92 L/min	
Average Area	Nasal Valve	0.50 cm^2	
	Inferior Meatus	0.85 cm^2	
	Middle Meatus	0.76 cm^2	
	Upper Meatus	0.35 cm^2	
Sharpest Pressure Drop		1.6 cm from nasal aperture	

Figure 3: Right Airway Summary

Nasal Anatomy

A 3D reconstruction of the nasal anatomy allows doctors to visualise all areas of the nasal cavity some of which are not easily accessible through conventional methods due to the narrow nasal passages. Nasal airway reconstruction often provides an effective way to visualise nasal abnormalities such as nasal valve stenosis, deviated septum, nasal polyps and many more. Note in the figures below sinuses are excluded for clarity.

Left Channel

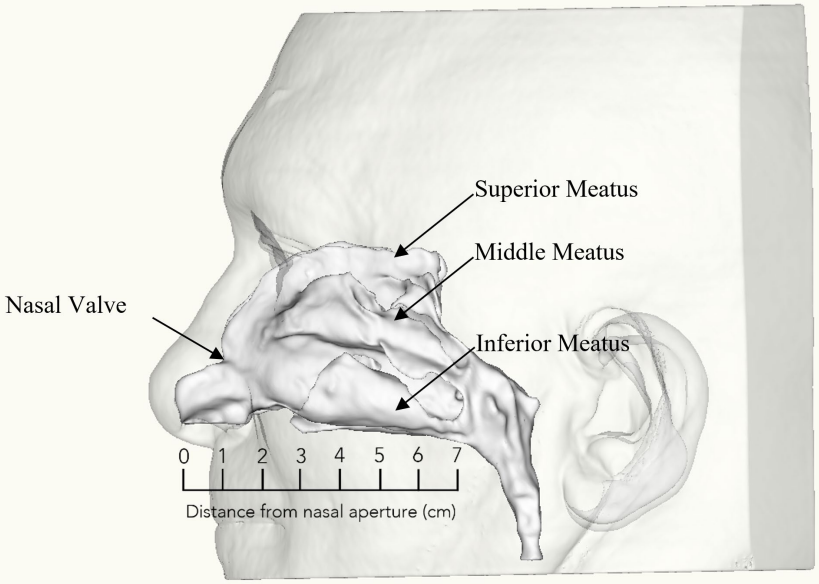


Figure 4: 3D reconstruction of left nasal channel

Right Channel

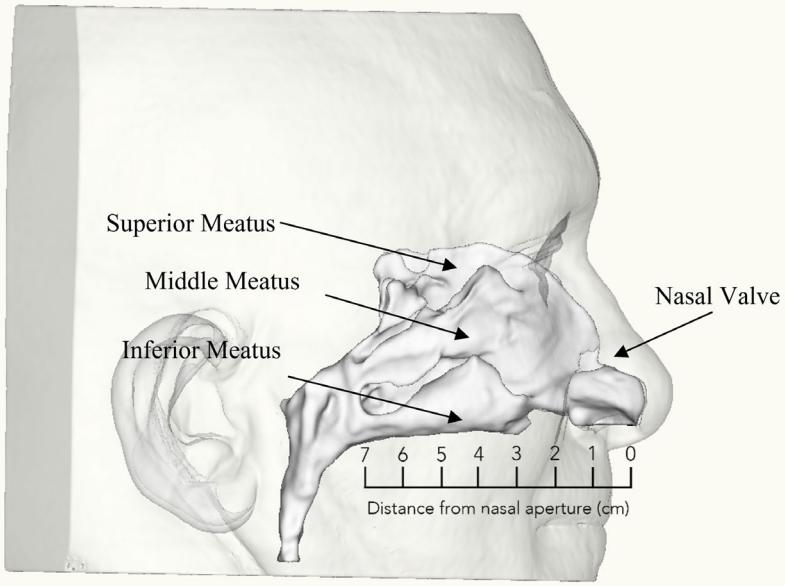


Figure 5: 3D reconstruction of right nasal channel

Nasal Area

Left Channel

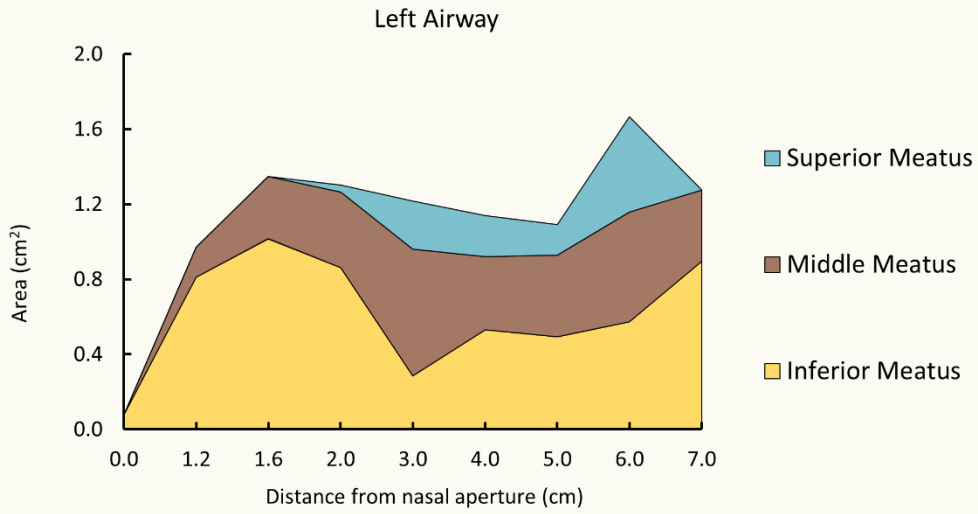


Figure 6: Area distribution left channel

Right Channel

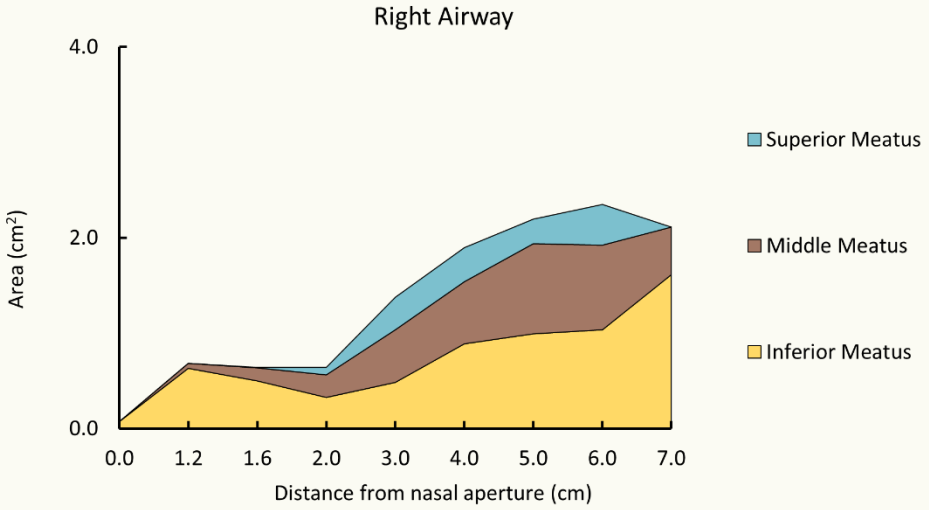


Figure 7: Area distribution right channel

Nasal Airflow

Left Channel

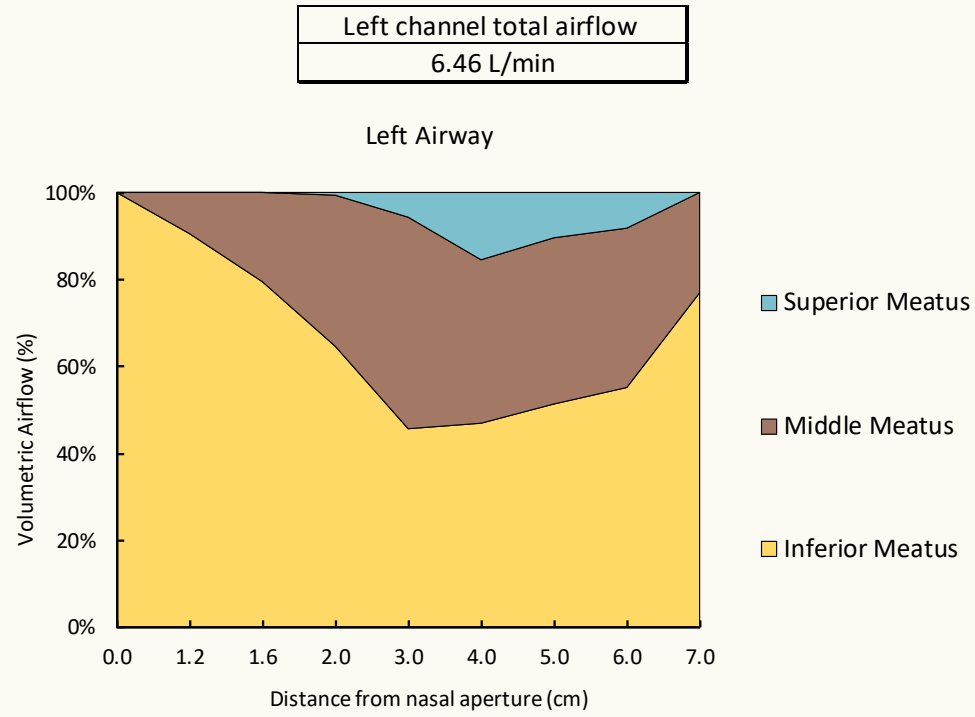


Figure 8: Airflow distribution left channel

Right Channel

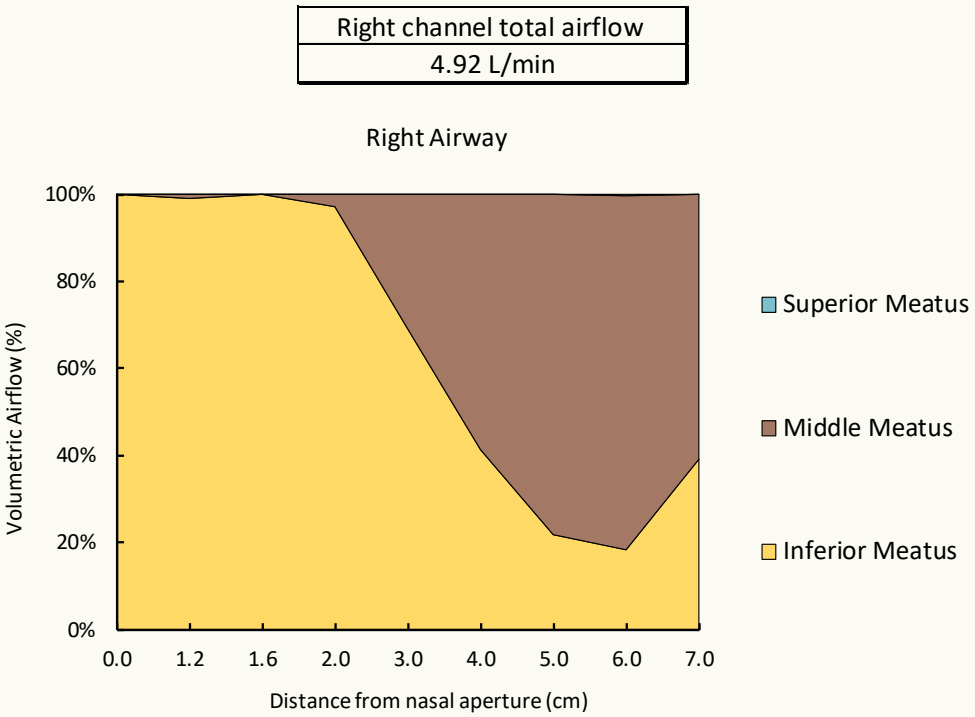


Figure 9: Airflow distribution right channel

Airflow

Airflow streamlines provide a visual image of the airflow in the nasal cavity. Generally, in a healthy nasal cavity, streamlines are uniformly distributed. Uniformly distributed streamlines ventilate the inferior, middle and superior meatus alike. In unhealthy nasal cavities streamlines are localised in few areas leaving other areas unventilated

Left Channel

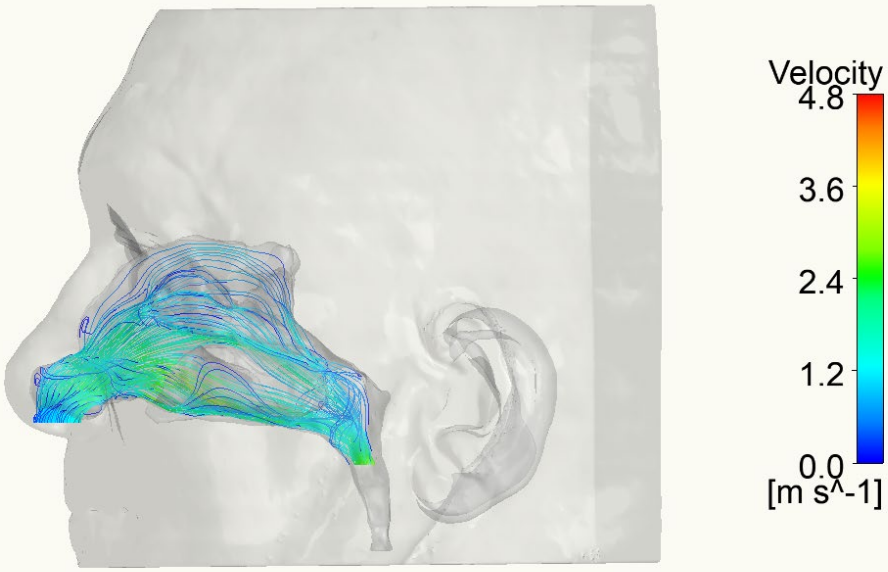


Figure 10: Left channel streamlines

Right Channel

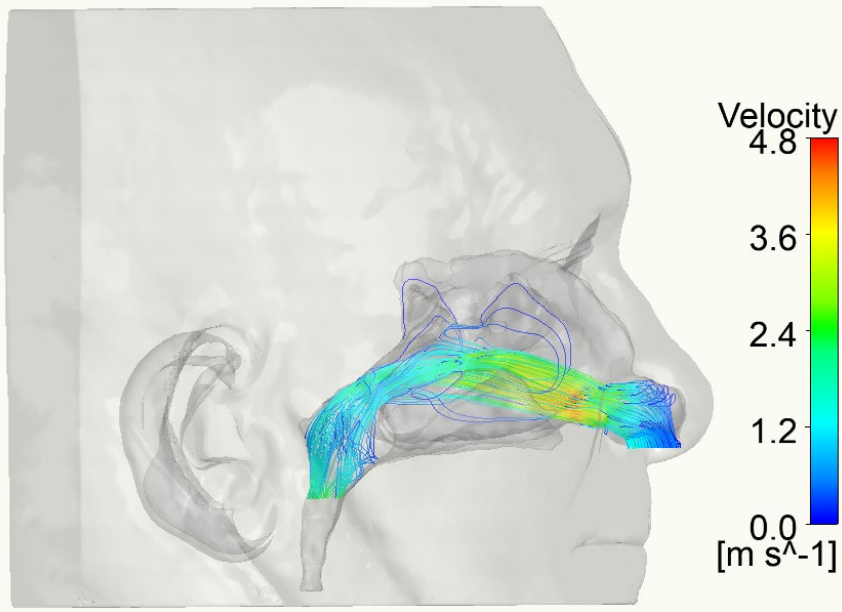
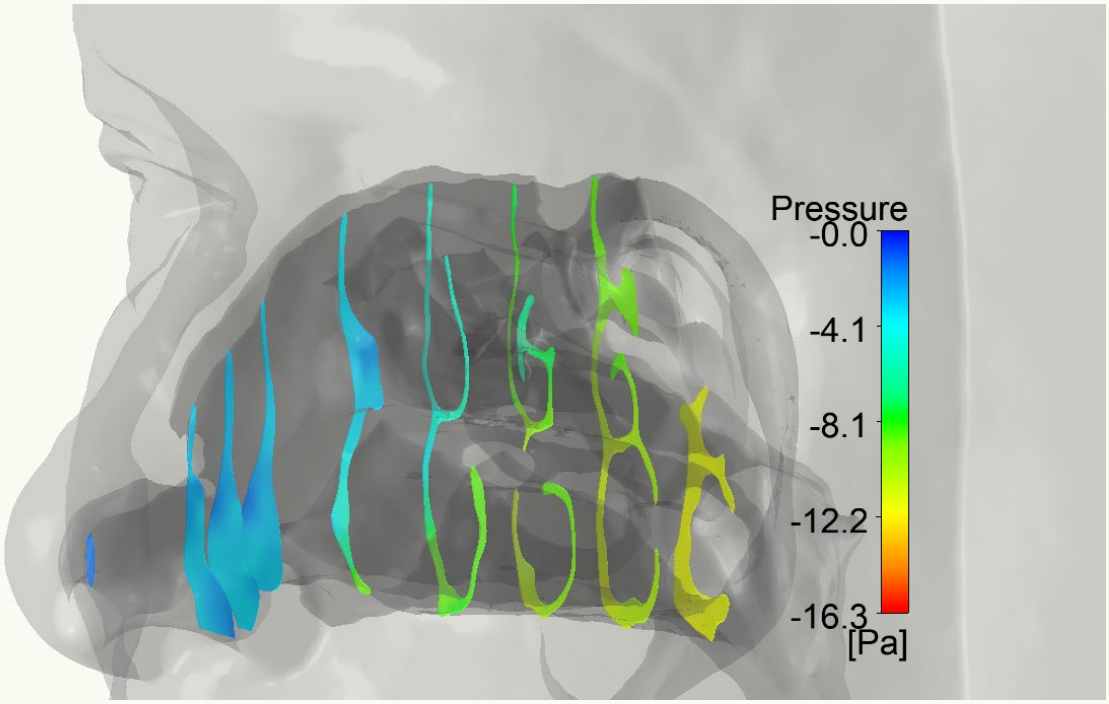


Figure 11: Right channel streamlines

Pressure

In healthy nasal cavities there is a gradual decrease in pressure between the nostrils and the pharynx. Generally, if obstruction is present, it causes a sharp pressure drop, however this may vary

Left Channel



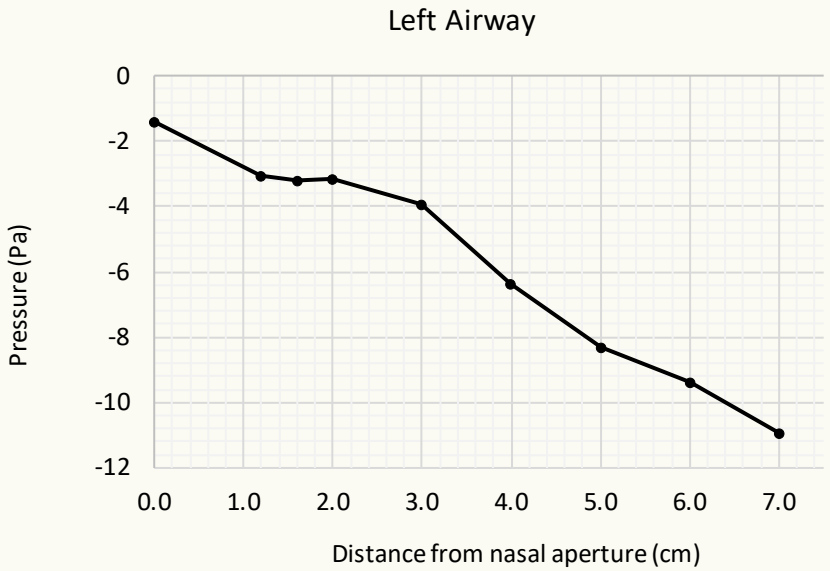


Figure 12: Left channel pressure

Right Channel

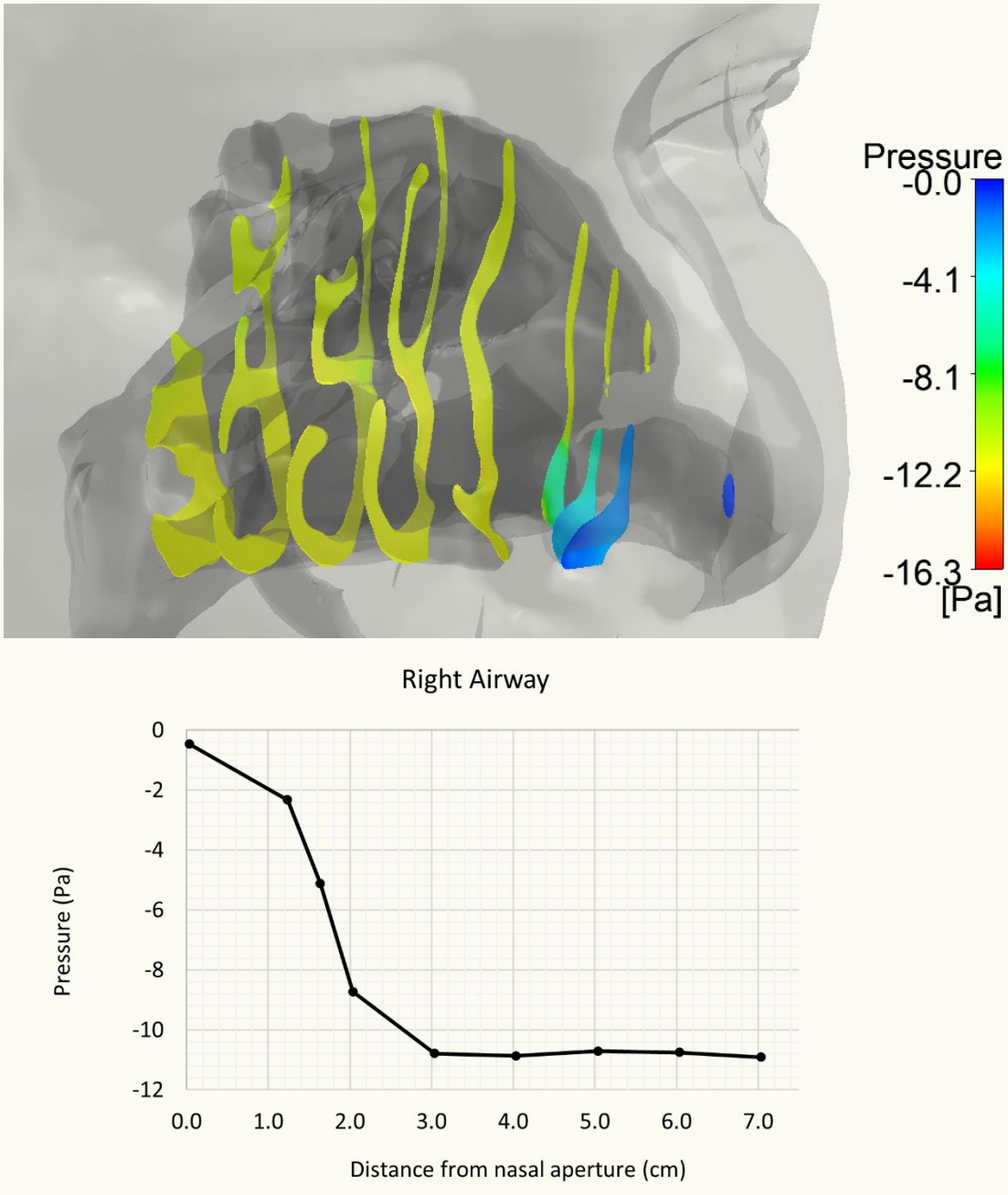


Figure 13: Right channel pressure