# A Clinical Conversation on the Progression of Hiatal Hernias to Gastroesophageal Reflux Disease

Valerie Schultz, OMS II MU-COM and David Dufeau, PhD MU-COM

vschultz384@marian.edu; ddufeau@marian.edu

Marian University Indianapolis College of Osteopathic Medicine 3D Visualization Laboratory

## Introduction

Hiatal hernias are a very common medical condition and present as the pathologic passage of the foregut through the esophageal hiatus. While most hiatal hernias are asymptomatic, presenting symptoms can easily progress to gastroesophageal reflux disease (GERD). It is important to diagnose and treat GERD to avoid more severe esophageal conditions. Understanding the anatomy of hiatal hernias through 3D visualization analysis can aid medical students in assessing the clinical considerations of hiatal hernias, GERD, and the risk for more severe esophageal conditions.

## Background

Imaging studies (CT and MRI) from the NIH Cancer Imaging Archives were used to create 3D models of a Type I hiatal hernia and relevant anatomy. Software used to create the models included the 3D analytical tools Amira and MeshMixer.

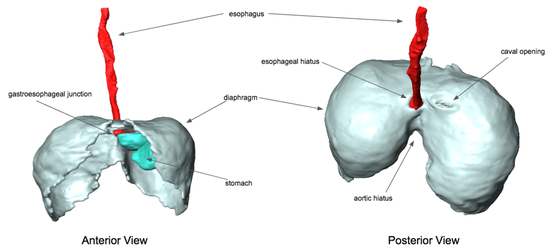


Figure 1: 3D-generated anatomical structures of normal anatomy

There are four categories of hiatal hernias, each increasing in severity. They are as follows:

| | Classification | Herniated Organs |
|---|---|---|
| **Type I (most common)** | Sliding | Gastroesophageal junction & stomach cardia |
| **Type II** | Paraesophageal | Aforementioned & stomach fundus |
| **Type III** | Mixed (sliding & paraesophageal) | Aforementioned. Gastroesophageal junction detaches |
| **Type IV** | Paraesophageal | Aforementioned & other viscera |

## Results

**Diagnosis - Hiatal Hernia**

- From patient history of symptom severity and frequency
  - Severity: determined by impact on quality of life
  - Frequency:
    - Intermittent = <2 episodes of symptoms / week
    - Frequent = 2+ episodes of symptoms / week
- Often asymptomatic
- Symptoms: heartburn, regurgitation, acid reflux, dysphagia, chest pain, etc.
- Upper endoscopy for diagnosis in certain circumstances

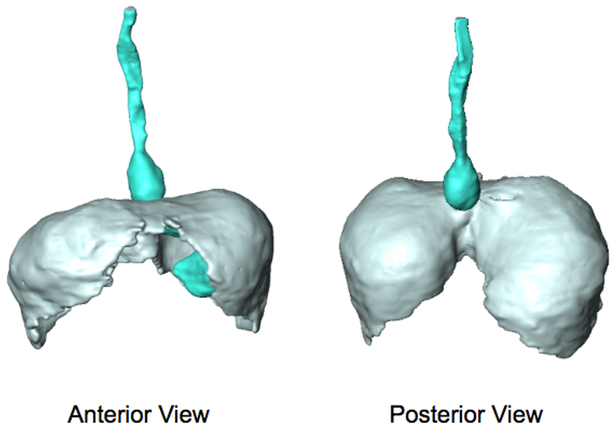


Figure 2: 3D-generated anatomical representation of a Type I hiatal hernia

**Progression to Gastroesophageal Reflux Disease (GERD)**

- GERD diagnosis made if frequency or severity of the symptoms become troublesome to the patient or if complications occur.
- GERD prevalence: 20% of adults

**Treatment of GERD - Two Approaches**

- "Step-Up" Therapy Approach = start small, then incrementally increase intensity of treatment
  - 1. Lifestyle and dietary modifications.
  - 2. Histamine 2 receptor antagonist (H2RA)
  - 3. Add proton pump inhibitor (PPI)
- "Step-Down" Therapy Approach = start aggressive, then incrementally decrease intensity of treatment
  - 1. Lifestyle and dietary modifications & standard-dose PPI
  - 2. Decrease dosage
  - 3. Discontinue all therapy

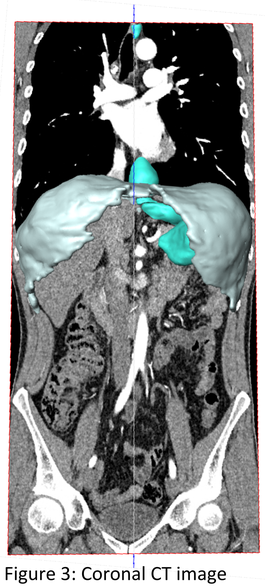

Figure 3: Coronal CT image interposed with 3D-generated anatomical representation of a Type I hiatal hernia

**GERD - Risks if Untreated**

- Esophagitis: esophageal mucosa becomes irritated due to the excessive reflux and can eventually undergo necrosis.
- Esophageal adenocarcinoma: as esophageal cells react to the excessive irritation from the reflux, there is a predisposition for esophageal cells to mutate into cancer cells.
- Barrett's esophagus: metaplasia of the esophageal epithelium due to recurrent irritation, further increasing the risk for esophageal adenocarcinoma.

## Discussion

Hiatal hernias are a very common condition involving herniation through the esophageal hiatus. If symptoms occur, they can easily lead to the diagnosis of gastroesophageal reflux disease. There are many levels of treatment available for GERD depending on the severity of symptoms. If GERD goes untreated, it predisposes the patient to developing conditions such as esophagitis, esophageal adenocarcinoma, or Barrett's esophagus.

## Conclusion

3D visualization software allows us better understand the anatomy pertaining to hiatal hernias. In applying this anatomical knowledge to the clinical topic of gastroesophageal reflux disease, a more thorough understanding is achieved because of the foundation of anatomical knowledge.

3D visualizations are a beneficial tool to more completely understand anatomy. Understanding anatomy plays an imperative role in learning about many clinical conditions.

## Future Developments

The researchers wish to continue to use 3D anatomical models to aid in clinical comprehension. They plan to promote the use of anatomical models in enriching medical student education.

## Acknowledgements

This project was supported by Marian University College of Osteopathic Medicine 3D Anatomical Research Lab.