Thank you Mr. chairman. It’s a great honor for me to speak today. The concept of GERD has been historically over-simplified in terms of pathogenesis and treatment. There are some myths, wrong concepts about GERD. Today, I'd like to review the issues around hiatal hernia.

Before starting hiatal hernia story, let’s review the prevalence of GERD in Korea briefly. The rate of erosive esophagitis in endoscopy and the rate of typical GERD symptoms are increasing for the past 2 decades.

In our country, gastric cancer screening is a common medical practice. In the screening setting, the rate of erosive esophagitis is about 10 %, and the rate GERD symptoms is about 10 %. Overlap is about 3 %.

I am not sure whether the prevalence of GERD will increase a lot or will reach the plateau in the near future.

From now on, let’s talk about the hiatal hernia. This endoscopy showed a typical case of hiatal hernia. But the endoscopic diagnosis of hiatal hernia is not always so straightforward.

Let’s review the definition of hiatal hernia.

In my opinion, the definition of the hiatal hernia is not defined yet. This is a screenshot from a patient information website of the Mayo Clinic. Yes, it is right. Hiatal hernia is a condition when the upper part of the stomach bulges through the diaphragm into the chest cavity. But, there are two important questions here. How much part of the stomach needs to be bulged? How would you evaluate the length of herniation? With what method?

In this study, the definition of hiatal hernia was bulging of 3 cm or more above the diaphragmatic impression.

In another study, there was no definite criteria in terms of the length. Just the distance was measured like 1 cm, 2 cm, etc.

This is a unique classification system in Japan called Makuuchi’s classification. In this system, hiatal hernia is graded into A, B, and C. Group C is usually not considered as hiatal hernia by most physicians outside Japan.

In Korea, upward bulging of at least 2 cm is considered necessary for the diagnosis of hiatal hernia.

The size of a hiatal hernia can be measured not only vertically, but also horizontally. Sometimes, we call it hiatal width.

With any definition of hiatal hernia, there are some challenges for endoscopists. Upright position is necessary to exactly measure the vertical length. But endoscopy in upright position is impossible. The esophagus may be curved. And we also consider the influence from air inflation and respiration. Paraesophageal hernia is also very confusing. And finally, short segment hiatal hernia less than 2 cm may have some clinical importance.

As you can see in these pictures, distal esophagus is quite often curved especially in the elderly population.

When the esophagus is straight, it is relatively easy to measure the length of the hiatal hernia. However, when the distal esophagus is severely curved, measuring the vertical length is sometimes difficult.

With air inflation, the distal esophagus looks quite differently.

When you push a lot of air, distal esophagus can be changed like the right-side cartoon.

This is an example. Distal esophagus in the straight view and in the retroflection view is quite different. It is mainly due to air inflation.

When sliding hiatal hernia is mixed with paraesopharaesophageal hernia, the landmarks for measuring the vertical length become unclear.

What’s your opinion about these pictures? Do you think there is a hernia or not?

A simple small hiatal hernia measuring less than 2 cm is sometimes called as short segment hiatal hernia.

In a recent study, the incidence of erosive esophagitis in patients with short segment hiatal hernia was higher than the normal control and lower than the patients with hiatal hernia more than 2 cm. So, there may be some clinical meaning for hiatal hernia less than 2 cm.

This is a famous Hill grading system for gastroesophageal flap valve. Grade 4 is hiatal hernia but grade 2 and 3 is just weak gastroesophageal flap valve.

In the doctor Hill’s original study, the appearance of the flap valve was a better predictor of the presence or absence of reflux than LES pressure. We can conclude that there should be something between normal and fixed hiatal hernia.

From now on, I’d like to briefly review the pathogenesis of the hiatal hernia.

During swallowing, the esophageal body shortens, which is caused by contraction of the longitudinal muscles. This results in a proximal movement of the LES and a small portion of the proximal stomach into the thoracic cavity through the diaphragmatic hiatus. After swallowing, all structures return to their original anatomical positions because of the elasticity of the phreno-esophageal ligaments.

A study in opossums showed that acid exposition to the esophagus induces esophageal shortening. Acid gastro-esophageal reflux itself might induce, maintain or even increase a sliding hiatus hernia.

This figure clears shows that acid perfusion induces esophageal length shortening, which can lead to the development of hiatal hernia.

Another possible mechanism is the degeneration of the phrenoesophageal ligament.

Hiatal hernia is not a yes/no phenomenon. It can be intermittent as a result of axial movement of the LES through the diaphragmatic hiatus. So, it’s a dynamic entity.

All hiatal hernias are not the same. In the barium esophagography, the shape of the gastroesophageal junction is quite variable in terms of hiatal hernia.

Previously, doctor Sloan defined the reducing hiatus hernia as a hernia occurring only during mid-swallows, but reducing between swallows. It represents a stage in the development of fixed hiatal hernia.

What is the effect of reducing or transient hiatal hernia? It is the spatial separation. Spatial separation between LES and crural diaphragm increases the risk for reflux by any mechanism, such as swallowing and straining, not just TLESRs

Transient LES relaxation also can induce transient hiatal hernia, because upward migration of gastroesophageal junction is occurring during the transient LES relaxation.

In the high-resolution manometry figure of the right-hand side, the arrows indicate the transient separation of high pressure zone, the meaning of which is exactly the same as the transient hiatal hernia.

The rate of reflux is doubled during the transient hiatal hernia than the reduced state, and most of them were acid or weakly acidic reflux.

Moreover, the mechanisms of reflux are different in the transient hiatal hernia state. Mechanisms other than transient LES relaxation were much more common in the transient hiatal hernia state.

Now, we can say that anatomy and function is closely related.

From now on, I’d like to review the relationship between hiatal hernia and the development of GERD symptoms.

Before 1971, hiatal hernia was a hallmark of gastroesophageal reflux disease. However, after 1971, the meaning of hiatal hernia was shrunk. It became regarded as epiphenomenon. What happened in 1971?

In cases with severe hiatal hernia, prominent mucosal breaks are usually seen.

This is another case of hiatal hernia with severe confluent mucosal breaks. It is LA group D reflux esophagitis.

In 1971, Dr Cohen published a famous report in New England Journal of Medicine. He showed that the mean LES pressure was not different between patients with hiatal hernia and the control. In patients with GERD, the LES pressure was not different by the presence of hiatal hernia. After this clear finding, the meaning of hiatal hernia was under-valued. I think the wrong conclusion of this study came from limitations of the study methodology of that time.

This slide shows the mechanism acid reflux in GERD patients without hiatal hernia. The increase in reflux episodes in patients with a hiatal hernia is mainly explained by the observation that, in addition to TLESRs, other mechanisms come into play. Indeed, half of the reflux episodes in patients with GERD with a hiatal hernia occur during swallowing or straining. We can say that hiatal hernia is important.

In a Korean study by Dr. Yoem from Yonsei University, the frequency of hiatal hernia in patients with reflux esophagitis was 32 %, which is much higher than 3 % in the control. So hiatal hernia must be very important in the pathogenesis of reflux esophagitis.

In this beautiful study, doctor Jones identified that the size of the hiatal hernia and lower esophageal sphincter pressure were significant predictors of erosive esophagitis. Actually, hiatal hernia size is the dominant determinant of esophagitis.

Ladies and gentlemen. I’d like to conclude my presentation by saying that hiatal hernia is relevant in the development of GERD. Hiatal hernia, transient LES relaxation and acid pocket are close related.

Thank you for your attention.