

The Roentgen Incidence of Hiatal Hernia and Colonic Diverticula in Korea

Eung Ho Kim, M.D.

*Department of Radiology, St. Mary's Hospital, Catholic Medical College, Catholic Medical Center,
Seoul, Korea.*

The incidence of hiatal hernia has been reported by many authors and varied from 2.3% to 50%. Boyd³⁾ found an incidence of 2.3% in 1,500 barium examinations. Krothe,¹³⁾ quoted by Bockus, reported an 8% incidence. Hafter⁷⁾ noted a frequency of 12.5% in a large series of 2,402 barium meal examinations. In 1960, Stein²³⁾ reported 50% in 100 consecutive barium meal examinations. These wide variations in the reported incidence of hiatal hernia may be attributable in part to the technique used to demonstrate a hiatal hernia and the diagnostic criteria used in the diagnosis of a hiatal hernia. Diverticulosis of the colon is generally considered as a disease of the late decade of life and its incidence increases with age. Spriggs,²³⁾ as quoted by Shanks, found 10% in 3,000 barium examinations and Groud⁶⁾ reported about 8% in 2,179 consecutive barium examinations. However, it has been our impression that hiatal hernia and diverticulosis of the colon are rare in Korea.

Diverticulosis of the colon is practically an unknown condition in the pure Indian population of the Peruvian Andes²³⁾. This condition is also very rare in Japanese and only about 30 cases of colonic diverticula were reported up to 1958, and most of them were single diverticulum.²⁵⁾ With these facts in mind, we decided to make a special effort to demonstrate a hiatal hernia in 1,000 consecutive patients, referred to our Department of Radiology for roentgen examination of the upper gastrointestinal tract from Jan. 1963 to Oct. 1964 and reviewed 500 cases of the consecutive enema examinations carried out between July 1962 and June 1963 in patients 20 years or more of age.

Methods of Examination

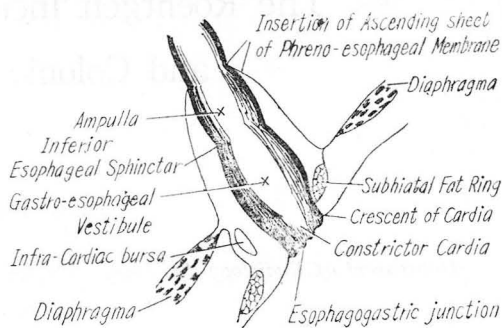
A number of papers have appeared in medical literature on the subject of hiatal hernia, and, the problem of roentgenological demonstration is well recognized. The difficulty lies in demonstrating of a small direct sliding hernia. Several authors^{3), 7), 12), 16), 29)} have suggested that the most important factor of demonstrating a hiatal hernia is to increase the intra-abdominal pressure while at the same time decreasing, or at least not changing intra-thoracic pressure. The manual pressure, bending, Trendelenburg position, Valsalva, maneuver, and pressure bags have been described for this purpose. In this study, our patients were placed in the prone right anterior oblique position, the left side elevated about 30—40 degrees and the left knee and hip slightly flexed for the study of the gastroesophageal region. To increase the intra-abdominal pressure, a radiolucent mat was placed underneath the upper abdomen. This method was first described by Wolf²⁹⁾ and has proved to be one of the simplest and most effective methods of demonstrating a hiatal hernia without producing false positive in normal persons.^{7), 16)} At the beginning of this study, we used the Trendelenburg position with a radiolucent mat but the tilting of the table was discontinued, because some of the patients experienced difficulty in swallowing. The radiolucent mat only usually produced some slight Trendelenburg position. One large table spoonful of barium emulsion was given to the patient and every effort was made to expose the spot films at the time the bolus of the contrast material passed through the gastroesophageal junction.

in various phases of respiration; One was taken on deep inspiration to take advantage of the pinchcock action of the hiatus(*this exposure can be confused with hiatal hernia*), the second exposure in expiration phase, and the third one in quiet normal breathing.

The patients usually took repeated barium swallows, and the examination consisted of three or more exposures of the gastroesophageal junction. The diagnostic criteria for hiatal hernia, especially a small sliding hernia, is controversial and one might not agree with another's criteria, due to our limited knowledge of physiology and anatomy in the gastroesophageal region. The difficulty of identifying the diaphragmatic hiatus and gastroesophageal junction is well recognised. Several authors^{9), 11), 20)} demonstrated the uncertainty of roentgen identification, and, that the relationship of the level of the constrictor cardiae to the mucosal junction must vary to a limited degree, depending upon the state of contraction, or, relaxation. In 1950, Lerche¹⁴⁾ described a segment two or three centimeters in length, located between the esophagus and stomach, and known as the gastroesophageal vestibule, which is located in and mostly below the diaphragm, only its proximal part is located above the diaphragm. A prominent gastroesophageal vestibule may appear to be a hernia. Wolf et al.^{28), 30)} stated that notches may be seen at the distal margin of the vestibule when it is herniated and distended(*which is indicative of minimal hiatal hernia*) and, other notches may also be seen at the proximal margin of the vestibule, corresponding to the inferior esophageal sphincter. Demonstration of these notches depends upon the distension of the gastroesophageal junction, and requires multiple exposures. Demonstration of regurgitation into the esophagus is a reliable sign of incompetence of the cardia⁴⁾ but, requires maximum patient's co-operation, persistence of the examiner, and many maneuvers. Occasionally, the patient shows free reflux into the esophagus without any demonstrable hernia.²⁸⁾

1) The demonstration of a wide hiatus and herniation of the gastroesophageal vestibule with distal notches above the diaphragm was defined as a minimal hiatal hernia. 2) The herniation of the gastroesophageal vestibule with distal notches located more than three centimeters above the diaphragm, indicating the herniation of the cardiac end of the stomach to be greater

than three centimeters, was defined as a moderate degree of hiatal hernia. Most radiologists will accept this configuration as a definite hiatal hernia.



[Esophagogastric Junction]

Results

The 1,000 cases of consecutive roentgen examinations of the gastroesophageal junction and 500 cases of barium enema examinations are analysed for the incidence of hiatal hernia and colonic diverticula. Their sex and age distributions are given on Tables I and II. Cases of malignant lesion of the stomach or of incomplete study of the lower esophagus were excluded from this analysis, but none of them indicated evidences of hiatal hernia. Fourteen cases (1.4%) of minimal hiatal hernia were noted and, most of them (11 cases) were over 50 years of age(Table III). All of them were direct sliding hiatal hernias and no case of paraesophageal hiatal hernia was encountered (Fig 1~3). The distances between the distal notches of the vestibule and the diaphragm were less than three centimeters.

During this period, four foreigners(*white people*) were examined, two of them showed hiatal hernia; one was minimal and the other was moderate in degree(Fig. 4). The incidence of esophageal diverticula was 0.8% and

[Table I] Age, Sex and No. of Patient who had Upper G.I. Study

Age	Male	Female	No. of Patient
20—29	87	83	170
30—39	130	128	258
40—49	117	132	249
50—59	104	115	219
60—69	48	53	101
Over 70	2	1	3
Total	488	512	1,000

(age over 40; 572 cases)

[Table II] Age, Sex and No. of Patient who had Barium Enema

Age	Male	Female	No. of Patient
20—29	23	15	38
30—39	78	68	146
40—49	102	60	162
50—59	55	47	102
Over 60	25	27	52
Total	283	217	500

(age over 40; 316 cases)

[Table III] Age and Sex Distribution of 14 Cases of Minimal Hiatal Hernia

Age	Male	Female	No. of patient
20—29	0	0	0
30—39	0	0	0
40—49	2	1	3
50—59	3	1	4
60—69	4	2	6
Over 70	1	0	1
Total	10	4	14

all of them were located in the lower half of the esophagus. The incidence of duodenal diverticula was 1.5%. 13 of them were located in the descending and two in the horizontal part of the duodenum. Diverticulosis of the colon was not found and only one case of a small, single diverticulum at the medial aspect of the proximal ascending colon was noted.

Comment

Patient with hiatal hernia usually fall in older age groups. The cause of hiatal hernia is generally attributed to insufficiency and laxity of the esophageal hiatus.²⁾ Schatzki.²²⁾ as quoted by Bockus, stated that small hiatal hernias are actually physiological in late life and attributed to loss of fat tissue and decreased elasticity and displacement of the muscular tissue of the hiatus. He²²⁾ also reported that hiatal hernia was demonstrable in 70% of patients over 60 years of age. Other than age, certain circumstances, producing increased intra-abdominal pressure such as pregnancy, ascitis, straining at stool and obesity are considered predisposing factors. However, Harrington⁸⁾ felt that most esoph-

ageal hiatal hernias are fundamentally congenital in origin with malformation of the esophageal hiatus, the attachment of the diaphragmaticoesophageal membrane to the lower part of the esophagus and the attachment of the gastrophrenic ligaments. The peptic ulcer, gall bladder disease and diverticula of the colon and duodenum are described as the most common conditions associated with hiatal hernia.^{2), 7)} However, none of our cases were associated with these conditions. Three cases of minimal hiatal hernia were found on routine general physical checks, and in the remaining cases, hiatal hernia was not suggested by the referring physician. The incidence of hiatal hernia in Korea is considerably low and all of them are minimal sliding direct hernias. Compared with the incidence reported in literatures, Hafter⁷⁾ stated the incidence of hiatal hernia in non-selected patients is estimated between 8—10% and considered as a third common cause of upper abdominal disease.

The highest incidence of hiatal hernia reported is 50%, by Stein,²⁴⁾ which included the prominent vestibule above the diaphragm as a first grade hernia and his second grade hernia consisting of herniation of the cardia 3 centimeters above the diaphragm, which is compatible with our minimal hernia, and its incidence was 21%. It is quite interesting to compare with Martin's report which indicated the incidence of 26% in his series of 100 consecutive patients, when the cushion method was used (*which was exactly the same methods the present author used*), and in 19 out of 100 patients a hiatal hernia, which could not have been discovered by ordinary method, was found by this cushion method.

The etiology of colonic diverticulosis is not clear. The high incidence in late middle life suggests an acquired factors and there has been no agreement regarding causative factors for their development except age. Obesity was considered a predisposing factor, but was not so regarded by Horner.¹⁰⁾ Morson¹⁸⁾ suggested that colonic diverticular disease is basically a disorder of muscle function, particularly of the sigmoid colon, with thickening of muscle. Bearse felt¹⁾ that congenital origin to be a predisposing factor in the development of diverticulum. With respect to increased intra-colonic pressure, constipation was considered but, there is no factual evidence to support this theory. However, predominating opinions seems to favor muscular weakness, whether conge-

nital or acquired, as the fundamental factor(*which may result from constitutional or enviromental causes*), and increased intracolonic pressure is perhaps the exciting cause in the production of colonic diverticula.^{2), 10), 18)} Horner,¹⁰⁾ stated that the incidence of hiatal hernia was much higher in patients with colonic diverticulosis than in those without. Increased intra-abdominal, or, intraluminal pressure, may have some effect on the development of hiatal hernia and colonic diverticula.^{2), 7), 10), 18)}

The sigmoid and the left colon are most common site of colonic diverticulosis, while the rest of colon are rarely involved. The author found only one case of a single diverticulum on the rigth colon. A single diverticulum of the cecum has been noted¹²⁾ but, no diverticulum of the left colon or sigmoid has been seen in Korea. As to the cause of solitary diverticulum of the right colon, congenital origin^{19), 26)} and, or, secondary to postoperative changes in the right lower quadrant or pelvis⁵⁾ has been suggested. If the single diverticulum were related with postsurgical changes, we would expect more frequent occurences of diverticulum on the right colon. Some²⁶⁾ stated that it has been the rule to find a single diverticulum and that diverticula in other parts of the colon are coincidently almost never found with diverticula of the cecum. But, other²¹⁾ felt that diverticula of the cecum and the right colon are of the same type as those commonly seen in the left colon. Our single case had no previous abdominal surgery, and the author feels that the diverticulum seen on the right colon is most likely related with congenital origin. The cause of the low incidence of hiatal hernia and non-existance of colonic diverticulosis in Korea is not clear. Constipation seems to be a relatively minor problem in Korea, because of our diet, and, Koreans are generally not obese. But, we have done a number

of barium enema studies on quite heavy Koreans during the past several years, and no colonic diverticulosis was found. The enviromental condition alone can not explain the low incidence of hiatal hernia and non-existance of colonic diverticulosis. Medical literature seems to fail to reveal the racial difference in the incidence of hiatal hernia and colonic diverticulosis. It would be interesting to know the incidence of these conditions among the Oriental population in the western hemisphere, since colonic diverticulosis is practically unknown in pure Indians of the Andes in Peru,²⁷⁾ and also rare in Japanese.²⁵⁾ The author would like to believe that the main factor is a racial difference rather than living or dietary habits. An appreciation of racial differences in pathological conditions can be a help in understanding the cause and natural history of these conditions.

Summary

In 1,000 consecutive roentgen examinations of the upper gastrointestinal tract with special attention to the gastroesophageal junction, and, 500 consecutive barium enemas in adult Korean, the roentgen incidence of hiatal hernia was 1.4%, and all of them were minimal sliding hiatal hernias. No colonic diverticulosis was encountered and only one case of a single diverticulum of the right colon was found. The etiology of hiatal hernia and colonic diverticula was reviewed and it is proposed that racial difference may strongly affect the incidence of hiatal hernia and colonic diverticula.

Acknowledgement

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韓國人에서의 食道裂孔「헤루니아」 및 大腸憩室의 X線像의 發生頻度

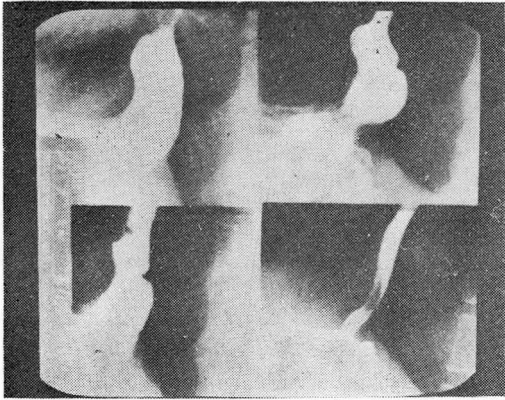
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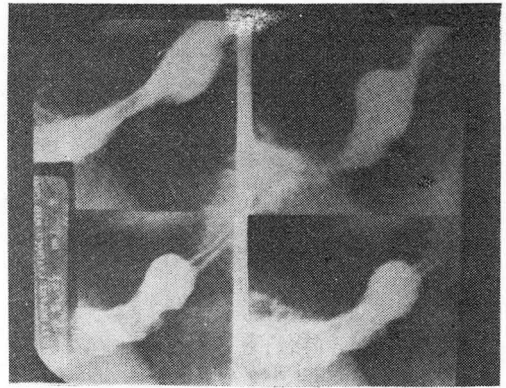
一般的으로 韓國成人의 食道裂孔「헤루니아」는 아주 稀有한 病으로 알려져 있음으로 本聖母病院 放射線科에서 韓國成人 1,000名에 對하여 食道裂孔「헤루니아」에 留意하여 胃食道境界部의 X線檢査를 施行하였다. 食道裂孔「헤루니아」의 診斷方法 및 X線像의 診斷基準에 對하여서는 여러 論議가 있으며 아직 學者들 間에 完全한 意見의 一致를 보지 못하고 있다. 그러나 一般的으로 腹腔內壓을 增加함으로써 食道裂孔「헤루니아」를 容易하게 發見할 수있다고 하며 著者는 Wolf 가 처음 1957年에 發表한 方法 即 右前斜位에서 壓迫枕을 患者의 上腹部下에 밀어 넣고 患者에게 Barium 投與를 한 后 여러 呼吸狀態에서 胃食道境界部의 여러 Spot Film 을 撮影하였다.

Gastroesophageal Vestibule 은 大部分의 橫隔膜下에 位置하고 있으며 單只 近位部만이 橫隔膜上에 있다. 그럼으로 食道裂孔「헤루니아」에서는 食道末端部가 Barium 으로 充滿되면 Constrictor Cardia 에 該當되는 部에 Notch 를 볼 수 있으며 間或 Vestibule 의 上端에 Inferior Esophageal Sphincter 에서 Notch 를 볼 수 있다. 그러나 이와 같은 Notch 는 Barium 의 充滿度 및 食道末端部의 擴張과 關係가 있으므로 여러 Spot Film 을 要하는 것이다.

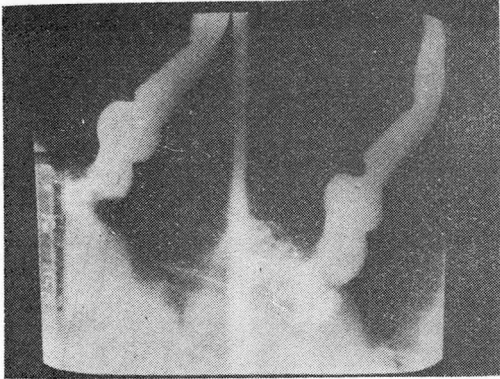
① Minimal Hiatal Hernia 는 넓은 食道裝孔 및 Vestibule 의 末端 Notch 를 橫隔膜上部에서 證明할 수 있는 경우. ② Moderate Hiatal Hernia 는 Distal Vestibular Notch 와 橫隔膜의 距離가 3cm 以上인 境遇로 定한다. 韓國成人의 食道裝孔「헤루니아」의 頻度は 1.4%이며 모두 Minimal Direct Sliding Hiatal Hernia 이다. 그리고 成人 500名의 Barium Enema Film 을 考察한 結果 多發性大腸憩室은 없으며 右側大腸에서 單發性憩室을 發見하였다. 即 韓國人에서도 낮은 頻度の Direct Sliding Hiatal Hernia 가 있으며 그 頻도가 아주 낮다는 事實과 多發性大腸憩室이 없다는 點은 가장 興味있는 問題이다. 食道裂孔「헤루니아」 및 大腸憩室發生機轉에 對하여는 先天的 및 後天的 要素를 考慮하는 여러 學說이 있다. 그러나 아직 文獻上 人種的 發生頻도에 對하여서는 아무 記錄을 볼 수 없으나 著者는 이와같은 差異가 人種的 特異性에 起因하는 것으로 생각한다.



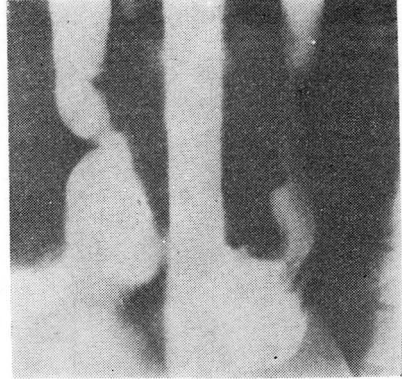
[Fig. 1] 45 year old Korean male with minimal hiatal hernia. The right lower spot film shows contracted state with the normal appearing esophagus. The right upper and left lower spot films show the distal notches of the vestibule. This shows the need for multiple spot films to demonstrate minimal hiatal hernia.



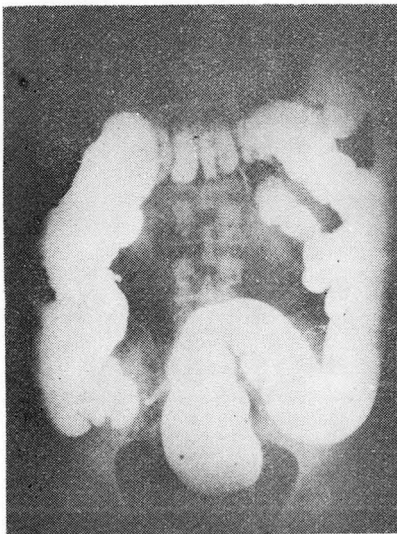
[Fig. 2] 66 year old Korean male with minimal hiatal hernia. The upper arrow indicates the proximal notch of the vestibule and the lower one indicates the distal notch of the vestibule.



[Fig. 3] 82 year old Korean male with minimal hiatal hernia and demonstrating upper and lower notches of the vestibule.



[Fig. 4] 35 year old Caucasian male with moderate hiatal hernia. The distal notch of the vestibule is well seen with herniation of the cardiac end of the stomach above the diaphragm for a distance of 7 centimeters.



[Fig. 5] 58 year old Korean male, barium enema study indicating a single solitary diverticulum on the medial aspect of the proximal right colon.

