DOI: 10.7860/JCDR/2024/69851.19685

Case Report

Anatomy Section

A Rare Case of Tubular Stomach in an 80-year-old Female Cadaver

MONALISA MANDAL[1], UMA SHIVANAL[2], VIDYA CHIKKARAHALLI SRIKANTAIAH[3], MANJUNATHA HANASOGE NARAYANA GOWDA[4], SURABHI MOHAN[5]

ABSTRACT

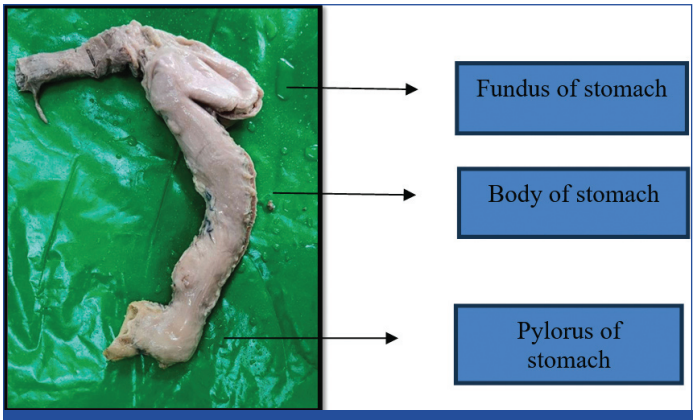
The stomach is a muscular bag that forms the most dilated part of the gastrointestinal tract. It serves as a reservoir for food and aids in the conversion of food into chyme under the influence of hydrochloric acid. The stomach is prone to conditions such as peptic ulcers, Gastroesophageal Reflux Disease (GERD), birth defects like Infantile Hypertrophic Pyloric Stenosis (IHPS) and stomach carcinoma. Surgical manipulation of the stomach is performed by bariatric surgeons for treating obesity. A comprehensive understanding of stomach variations helps clinicians identify developmental defects during disease diagnosis and prevents inadvertent damage during surgeries. In a recent case involving a specimen obtained for studying anatomical stomach variations and histological alterations, an unusual tubular stomach was discovered in an 80-year-old female cadaver during routine dissection by medical students in the Department of Anatomy. The stomach was dissected by cutting through the oesophagus superiorly and the pyloric duodenal junction inferiorly, and then removed from the abdominal cavity. An incision was made along the greater curvature of the stomach for internal examination. This tubular-shaped stomach had a smaller number of rugae and measured 28 cm in length. Tissue samples were collected for histopathological examination using Haematoxylin and Eosin (H&E) stain. Different stomach shapes are closely linked to organogenesis. Various acquired stomach variations are clinically significant, such as those occurring in oesophagectomy, which involves the surgical division of the vagal nerve and vagal sparing oesophagectomy, a procedure for weight loss.

Keywords: Congenital anomalies, Gastric variation, Peptic ulcers, Surgical modification, Vagotomy

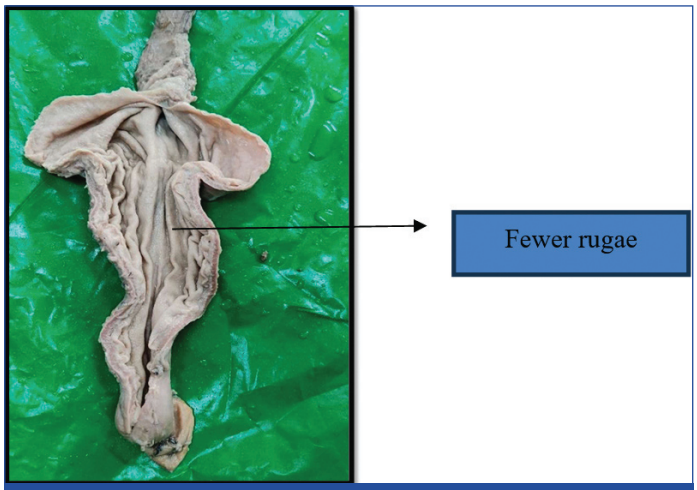
CASE REPORT

During a routine dissection for MBBS students at the Department of Anatomy, a unique tubular stomach was observed in an 80-year-old female cadaver. The dissection followed the Cunningham Manual of Dissection. The stomach was dissected by cutting through the oesophagus superiorly and the pyloric duodenal junction inferiorly and then removed from the abdominal cavity. Once removed, the stomach was thoroughly cleaned with running tap water [1].

Measurements of the stomach were taken using a measuring tape and thread. The length of the stomach was measured along the lesser curvature from the gastroesophageal junction to the gastroduodenal junction. Another length of the stomach was measured along the greater curvature from the gastroesophageal junction to the gastroduodenal junction. The width of the stomach was measured in three regions: cardiac, body and pylorus. The length along the fundus was also measured. Subsequently, an incision was made along the greater curvature from the gastroesophageal junction to the gastroduodenal junction for the interior examination of the stomach. stomach. The gross appearance of the dissected stomach externally and the interior aspect are shown in [Table/Fig-1,2].



[Table/Fig-1]: Gross appearance of the dissected stomach externally.



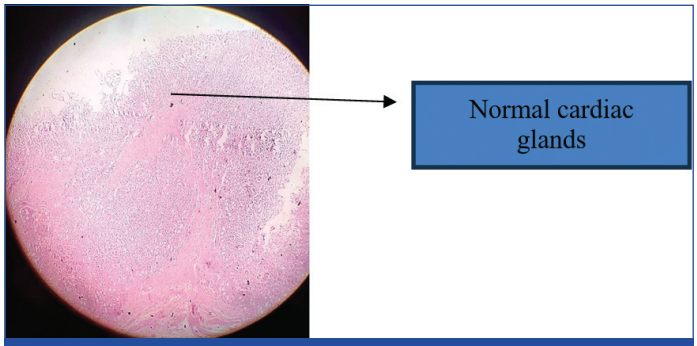
[Table/Fig-2]: Gross appearance of the interior of stomach.

The measurements of the tubular stomach were as follows: the length of the stomach was 28 cm, 28 cm along the greater curvature, and 15.5 cm along the lesser curvature. The width was 8.5 cm along the fundus, 3.5 cm at the pyloric end and 3.5 cm at the cardiac end, with a smaller number of rugae [Table/Fig-3]. Tissue was taken for histopathology examination (H&E) stain. The

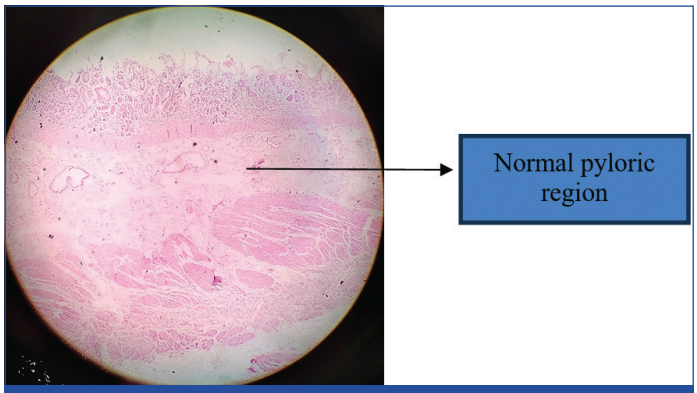
Length	Measurements
Along lesser curvature	15.5 cm
Along greater curvature	28 cm
Width	**Measurements**
Along cardiac region	3.5 cm
Along the fundus	8.5 cm
Along the body	3.5 cm
Along pyloric region	3.5 cm
Rugae	Few are present

[Table/Fig-3]: Measurements of tubular stomach.

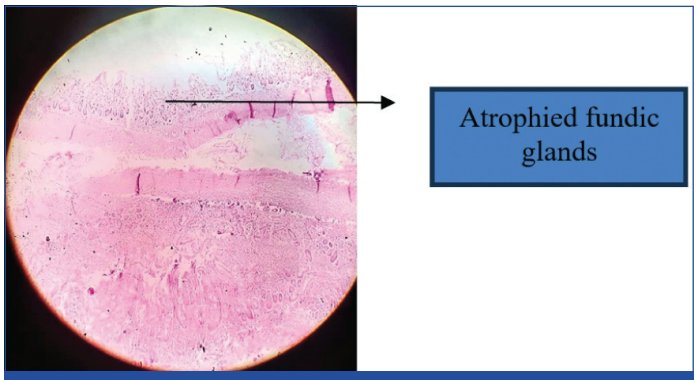
cardiac end and pylorus showed normal glands [Table/Fig-4,5]. The fundus and body showed atrophied glands [Table/Fig-6].



[Table/Fig-4]: Histology of the cardiac region of the stomach (H&E, 10x).



[Table/Fig-5]: Histology of the pyloric region (H&E, 10x).



[Table/Fig-6]: Histology of the fundus and body of stomach with atrophied glands (H&E, 10x).

DISCUSSION

The stomach is a J-shaped muscular, bag-like organ that lies between the oesophagus above and the small intestine below. It is situated in the left hypochondriac and epigastric area of the abdominal cavity beneath the diaphragm [2]. Any developmental aberration of the organ, or of the viscera and peritoneum surrounding it, as well as, their blood vessels and nerves, may have an impact on the morphology of the stomach [2]. Initially appearing as a modest fusiform dilatation in the median plane, the stomach forms the distal portion of the foregut [3].

Surgery typically modifies the stomach's natural shape [2]. Numerous medical disorders, including GERD, peptic ulcer, congenital hypertrophic pyloric stenosis and stomach carcinoma, can develop in the stomach. A bariatric surgeon performs surgical modifications of the stomach to address obesity. A thorough understanding of the stomach aids in identifying developmental anomalies, preoperative planning and minimising iatrogenic injury during procedures.

The stomach is a distensible organ that receives food from the oesophagus. It may hold onto food for up to two hours. Food is mechanically and chemically broken down in the stomach, where it is then converted to chyme. The stomach mucosa's glands secrete gastric juices, breaking down food chemically by a powerful muscular churning action [4]. In the supine position, the stomach is situated more obliquely, with the axis facing forward. Food preferences, growth, build and posture all affect the location of the stomach [3].

During the fourth week of development, the foregut expands as the stomach develops. Due to the varied rates of development in various parts of its wall and the shifting positions of neighbouring organs, the organ's appearance and orientation significantly change throughout the ensuing weeks. The stomach's positional variations are best understood by supposing that it rotates along a longitudinal and anteroposterior axis. Due to the stomach's 90° clockwise rotation around its longitudinal axis, the left and right-sides of the stomach face anteriorly and posteriorly, respectively. This rotation creates the larger and lesser curvatures as the stomach's initial rear wall expands more quickly than its anterior part. With its axis going upward from the top left to below right, the stomach assumes its ultimate position [5]. Its rotation and disproportionate growth can cause abnormalities in its shape and location.

Histologically, the stomach is composed of four layers: mucosa, submucosa, muscularis externa and serosa. The gastric glands consist of different types of cells such as parietal cells, chief cells, enteroendocrine cells, mucous neck cells and undifferentiated adult stem cells [6]. Enterochromaffin cells can give rise to tumours called carcinoids. Damage to parietal cells can lead to pernicious anaemia [7].

The present case shows atrophied glands at the fundus and body of the stomach. The present case appears to be a rare stomach condition in which the stomach shapes into a tubular form, with only a few similar cases reported. An H et al., reported a rare case in a Korean population where the stomach was a small tube-shaped bodily component, with a total length of 19.97 cm and a diameter across the body region of 2.98 cm [8]. In the current case, the length of the stomach along the greater and lesser curvatures is 28 cm and 15.5 cm, respectively, with a diameter of 3.5 cm along the body region. The surface epithelial and secretory gland distribution in the body and pylorus of the stomach matched the tissue features seen in a healthy stomach [7].

Karnul AM and Murthy CK reported in an Indian population that the maximum length along the greater curvature was approximately 42-43 cm, with the minimum length ranging from 28-29 cm. The maximum length along the lesser curvature measured between 34 cm and 37 cm, while the minimum ranged between 10 cm and 13 cm. The morphological variations of the stomach concerning size and shape are important for surgeons, gastroenterologists and radiologists, as these parameters help in observing linear growth of the stomach in embryos and diagnosing Intrauterine Growth Retardation (IUGR) and congenital anomalies at an early stage [3].

The maximum and minimum lengths along the greater and lesser curvatures may also be influenced by factors such as obesity, regional differences, short stature, nutritional status, food habits and frequency of food intake.

Surgically modified shapes of the stomach can be seen as elongated and gastrectatic forms with signs of pylorostenosis in patients treated by vagotomy. Vagotomy is a surgical acid-reducing procedure that does not require resections [9].

In the banding technique, also known as slim surgery, the body of the stomach forms an hourglass shape at the level of the artificial adjustable band, typically used in the surgical treatment of obesity [2]. Yesupadam K et al., studied 70 adult cadavers to analyse the different shapes of the stomach and reported the most common form as J-shaped in 71.4% of cases, with others showing a reverse L shape in 14.2%, crescentic shape in 7.2% and cylindrical shapes in 7.2% of the specimens studied. The length is more in the "J" shaped specimens. The various morphological shapes of the stomach are important for the planning of clinical interventions such as GERD, which is very common nowadays due to eating habits, stress-related

jobs and consumption of junk foods, etc. Obesity is now considered the 2nd leading cause of death, which can be prevented by gastric reconstructive procedures, i.e., bariatric surgeries [10].

Burdan F et al., developed a morphological classification of the shape and topography of the unoperated stomach, describing abnormal positions along the longitudinal axis, various horizontal axes, abnormal shapes and abnormal stomach connections [2]. According to this classification, the present studied specimen falls under the category III of abnormal stomach shape with a short narrow body and the presence of a fundus [2].

These are a few cases that report different shapes of the stomach and variations associated with various diseases. Cortez N et al., reported a case of Collagenous Gastritis (CG) in a 71-year-old female, in which Oesophagogastroduodenoscopy (EGD) showed chronic gastritis. A tubular-shaped stomach was noted during further Magnetic Resonance Imaging (MRI) investigations. Endoscopic ultrasound revealed a tubular-shaped gastric body with diffuse atrophic mucosa and localised submucosal wall thickening in the entire body of the stomach [11].

CONCLUSION(S)

The different shapes of the stomach are strongly associated with organogenesis. Numerous acquired variations of the stomach are clinically important, such as in vagotomy and oesophagectomy.

REFERENCES

[1] Cunningham DJ, Romanes GJ. Cunningham's manual of practical anatomy. Thorax and Abdomen. 15th ed. Oxford: Oxford University Press; 1986.
[2] Burdan F, Rozylo-Kalinowska I, Szumilo J, Zinkiewicz K, Dworzanski W, Krupski W, et al. Anatomical classification of the shape and topography of the stomach. Surg Radiol Anat. 2012;34(2):171-78. Doi: 10.1007/s00276-011-0893-8.
[3] Karnul AM, Murthy CK. A study of variations of the stomach in adults and growth of the fetal stomach. Cureus. 2022;14(8):e28517. Doi: 10.7759/cureus.28517.
[4] Young B, O'Dowd G, Woodfort P. Wheater's functional histology. 6th ed. New York: Churchill Livingstone. 2000; 464.
[5] Sadler TW. Langman medical embryology. 13th ed. India: Wolters Kluwer; 2016.
[6] Eşrefoglu M, Taslidere E, Cetin A. Development of the oesophagus and stomach. Bezmialem Sci. 2017;5:175-82. Doi: 10.14235/bs.2017.811.
[7] Mescher AL. Junqueira's basic histology. 15th ed. United States of America: McGraw-Hill education; 2018.
[8] An H, Cho YS, Jung WH, Cho HJ, Nam KI. Congenital microgastria without concomitant anomalies in adults. Anat Biol Anthropol. 2021;34(4):147-50. Available from: https://doi.org/10.11637/aba.2021.34.4.147.
[9] Yamashita R, Naoto T, Tsuboi K, Mitsumori N, Kashiwagi H, Yanaga K. Impact of truncal vagotomy on complicated peptic ulcer after distal gastrectomy with reconstruction by jejunal pouch interposition. Surg Case Rep. 2020;6:123. Doi: 10.1186/s40792-020-00879-w.
[10] Yesupadam K, Devi GKVN, Lakshmi VVV. A cadaveric study for structural variations of the stomach. Int J Res Med Sci. 2016;4: 3473-78. Available from: https://dx.doi.org/10.18203/2320-6012.ijrms20162315.
[11] Cortez N, Berzosa M, Jacobs A, Bloom M. Collagenous gastritis: An unusual presentation with tubular shaped stomach. J Investig Med High Impact Case Rep. 2020;8:2324709620944695. Doi: 10.1177/2324709620944695.

PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Anatomy, Jagadguru Sri Shivarathreeshwara Medical College, Mysuru, Karnataka, India.
2. Senior Resident, Department of Anatomy, Jagadguru Sri Shivarathreeshwara Medical College, Mysuru, Karnataka, India.
3. Professor and Head, Department of Anatomy, Jagadguru Sri Shivarathreeshwara Medical College, Mysuru, Karnataka, India.
4. PhD Scholar, Department of Anatomy, Jagadguru Sri Shivarathreeshwara Medical College, Mysuru, Karnataka, India.
5. Senior Resident, Department of Pathology, Mysore Medical College and Research Institute, Mysuru, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Uma Shivanal,
Senior Resident, Department of Anatomy, Jagadguru Sri Shivarathreeshwara Medical College, Mysuru-570015, Karnataka, India.
E-mail: umavijay15@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Jan 30, 2024
- Manual Googling: Mar 14, 2024
- iThenticate Software: May 11, 2024 (20%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? No
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **Jan 30, 2024**
Date of Peer Review: **Mar 11, 2024**
Date of Acceptance: **May 13, 2024**
Date of Publishing: **Jul 01, 2024**