

# A Review of Gastric Polyps

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## Abstract

### Keywords

- ▶ gastric polyp
- ▶ fundic gland polyps (FGP)
- ▶ hyperplastic polyps
- ▶ inflammatory fibroid polyps
- ▶ gastric neuroendocrine tumors (NETs)
- ▶ granular cell tumor (GCT)
- ▶ gastrointestinal stromal tumors (GISTs)
- ▶ ectopic pancreas

Gastric lesions presenting as polyps becomes common these days. Many different underlying causes have been suspected with the origin of gastric polyps. Generally, a gastric polyp is considered as benign in the first impression unless proven otherwise. Though, they show a vast variety of malignant potentials. This literature is intended to describe and evaluate the variations, presentations, features, and potentials of gastric polypoid lesions.

## Introduction

Gastric polyps are epithelial or sub-epithelial protruding lesions often encountered by the endoscopist while upper esophagogastroduodenoscopy (EGD). They can be malignant or benign according to their presenting features and underlying histopathology. A gastric polyp can be of epithelial or nonepithelial origin. Such lesions are evaluated by magnifying endoscopy or narrow band imaging (NBI) and endoscopic ultrasound.

## Gastric Neoplasm and Polyps

A polyp is an elevated tumor or mass which is usually epithelial and often neoplastic. They are commonly seen in all through the gastrointestinal tract. Stomach neoplasms are classified in various ways, among them WHO histological classification of the gastric tumor is universally accepted. Gastric polyp is a growth or development in the stomach

mucosa. Usually, they are benign in character (unless proven otherwise) but they carry malignant potential in various occasions.

Such polyps show two different patterns of growth:

- Sessile polyps are wide and flat, grow with the mucosal surface.
- Pedunculated polyps grow out of the mucosal surface. Similar to mushrooms like structure with a head and a stalk.

The development of polypoid lesions depend on the underlying disorder. Mutations in the  $\beta$ -catenin gene play an important role in the development of fundic gland polyps. In familial adenomatous polyposis (FAP), the abnormality is a mutation in the APC gene. FAP has also shown a characteristic in mutations of the APC gene, causes a phenotype with a smaller number of colonic polyps.  $\beta$ -catenin and the APC gene both show the involvement of the similar cellular growth pattern along with the signaling pathway. Though,

APC gene was found associated with colorectal tumor development. Besides this, benign gastric polyps have been identified to bear a correlation with metabolic syndrome like hyperlipidaemia.<sup>1</sup>

## Signs and Symptoms

Usually gastric polyps are asymptomatic, but occasionally they produce signs and symptoms. Small lesions are mostly discovered during an upper gastrointestinal endoscopy for other reasons. Following symptoms may appear in patients of gastric polyp:

- Nonspecific abdominal discomfort associated with the vague stomach.
- Hematoma or melena, which might lead to anemia in chronic cases.
- A large polyp might block the pylorus of the stomach and cause gastric outlet obstruction.

Other associated digestive symptoms are:

- Anorexia or loss of appetite.
- Nausea.
- Reflux esophagitis or heartburn.
- Bloating or heaviness of stomach.
- Dysphagia or difficulty in swallowing.
- Vomiting.

## Diagnosis

Investigations include upper gastrointestinal endoscopy, endoscopic biopsy, and ultrasound (both endoscopic and per-abdominal). They all have a crucial role in both diagnosis and treatment approach.

View it in a separate window

Benign gastric polyps are of different types. They are characterized as benign but there are literatures describing occasions of malignancy and other associations. They are described as following.

## Fundic Gland Polyps

Fundic gland polyps (FGPs; ► Fig. 1A, B) were first described by Elster in 1976.<sup>2</sup> These are the most common type of gastric polyp, found in the fundus and the upper part of the body. Histologically they are glands with cystic dilatation lined with fundic epithelium composed of the chief cell and the parietal cell admixed with existing glandular tissue (► Fig. 1B). Potent genetic alterations in patients with inherited conditions like FAP strongly suggest the neoplastic origin of FGP.<sup>3</sup> Sessile FGPs of less than 1cm size are considered as benign in patients without FAP, unless proven histologically. A malignant transformation (adenocarcinoma) has been reported in patients of FGPs associated with FAP.<sup>4,5</sup> They are known to be an effect related to long-standing proton pump inhibitor (PPI) therapy due to hypertrophy and hyperplastic change in the parietal cells. A long time PPI intake can cause up to four-fold increase in the risk of FGPs formation while compared with control.<sup>6</sup> Though there is no specific duration but FGPs are found to be associated with a continuous intake of PPI of 6 months or more; some relative dietary factors were also identified.<sup>7</sup>

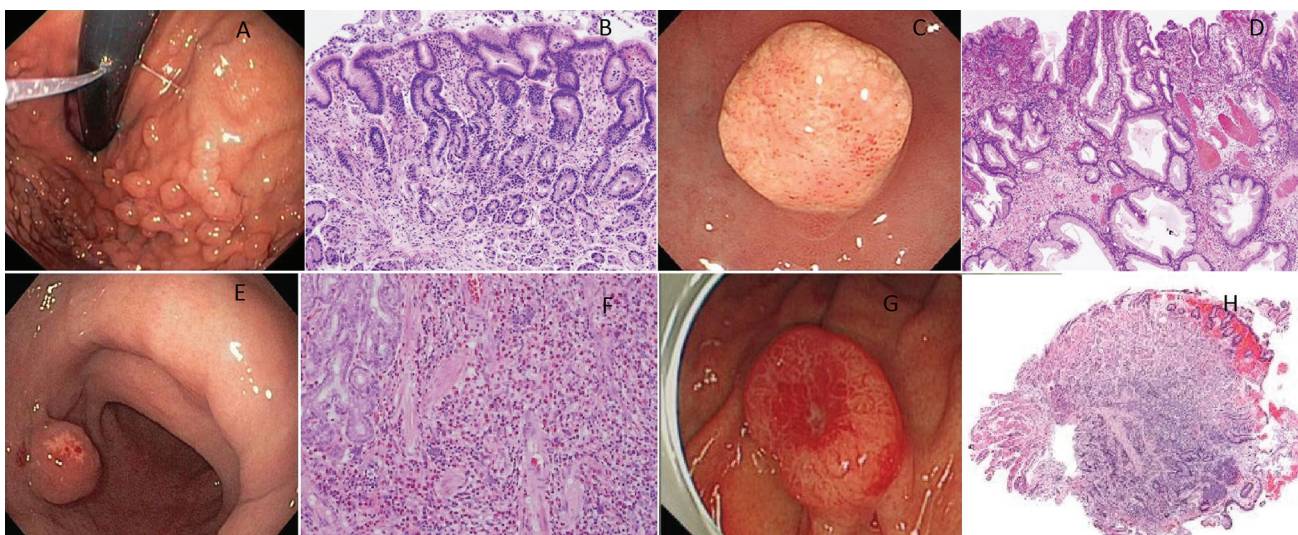
## Hyperplastic Polyps

Hyperplastic polyps (► Fig. 1C) are the second most common type of gastric polyp.<sup>8</sup> Histologically, they are the changes in gastric mucosa with abundant and unrestricted growth of tissues (► Fig. 1D).

Their etiology is associated with focal inflammatory reactions and mucosal damage due to:

- Gastroesophageal reflux disease (GERD).
- *Helicobacter pylori*-induced gastritis.
- Pernicious anemia.
- Gastric erosions and ulcers.
- Previous stomach surgery.

Endoscopically, they are found as an elevation in the gastric mucosal layer with focal inflammatory changes. Erosions,



**Fig. 1** Fundic gland polyps of the stomach (A) and histopathology (B). Hyperplastic polyp of the stomach (C) and histopathology (D). Inflammatory fibroid polyp (E) and histopathology (F). Gastric neuroendocrine tumor (G) and histopathology (H).

ulcerations, or plaques are commonly seen on the surface of the hyperplastic polyps which might be associated with contact bleeding. These lesions are increasingly seen in elderly and are slightly more common in females than in men.<sup>9</sup>

Around two third of the gastric hyperplastic polyps are found to be single and of less than 1 cm in size. A lesion larger than 2 cm in size may show dysplastic changes that might carry malignant potentials.<sup>8</sup> In general, gastric hyperplastic polyps are considered as benign but malignant transformations of such lesions have been reported in different kinds of literature, the incidence of malignant transformation of such lesions varies around 1.5 to 2.1%.<sup>10-16</sup> The underline mechanism of carcinogenesis of hyperplastic polyps is still not identified. In most observed cases, the cancerous lesions were identified either adjacent or in the dysplastic lesions. Therefore, the malignant transformations of such lesions are suggested to be of dysplastic origin rather than from hyperplastic epithelium. A gastric hyperplastic polyp of larger than 2 cm should be removed, either by endoscopy or surgically.<sup>10,11,16</sup> Hyperplastic polyps were described for association with *helicobacter pylori* and there is evidence of spontaneous regression following successful *H. pylori* eradication.<sup>17</sup>

### Inflammatory Fibroid Polyps

Inflammatory fibroid polyps (►Fig. 1E) are rare among all types of gastric polyps. They were first described by Vanek in 1949, as gastric submucosal granulomatous lesion with eosinophilic infiltration.<sup>18</sup> Histologically they are composed of spindle cell proliferation with numerous microvasculatures and infiltration of inflammatory cells, especially eosinophils (►Fig. 1F). They are also known as Vanek's tumor or eosinophilic granuloma of the stomach. Morphologically, they are solitary lesion, sessile, or pedunculated and might be of 4 cm in size with no gender variation. The lower part of the body of the stomach is the common site (80%) for such lesions and might be presented with ulcerations and erosions. Often they are found to be associated with achlorhydria or hypochlorhydria. Besides this, role of focal allergic reactions has also been suggested as a cause, but no specific etiology has been identified till now.

In most patients, inflammatory polyps are asymptomatic and endoscopic polypectomy is the ultimate treatment of choice. Following polypectomy, there is no evidence of recurrence.

### Polyposis Syndromes

Polyposis syndromes are characterized as inherited or genetic conditions where a huge number of polypoid lesions develop throughout the gastrointestinal tract. The colon and the small intestine are the mostly affected. However, benign gastric polyps can also occur in polyposis syndromes; described as following:

- Peutz-Jeghers syndrome:  
this is associated with polyps developed from overgrowing tissues or cells which are normally found in that particular area. Hamartomatous polyps are a good example of such lesions.

- Juvenile polyposis:  
in this kind, large numbers of polyps develop in the first 20 years of patients' life. It has a high incidence of development of gastric as well as colon cancer.
- Cowden disease:  
syndrome characterized as the development of multiple tumors or cysts in the various organs like gastrointestinal mucosa, skin and in the breasts.
- Cronkhite-Canada syndrome:  
extremely rare conditions, where polypoid lesions occur in the stomach as well as another part of GIT along with other findings like loss of hair, thinning of nails and change in skin color.

### Gastric Neuroendocrinal Tumor (NET)

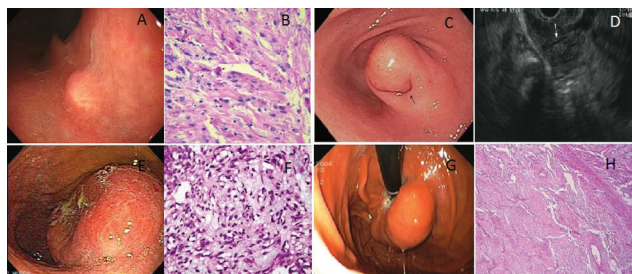
Gastric neuroendocrine tumors (NETs; ►Fig. 1G, H) are relatively rare and were known as carcinoid. They are three types; type I, II, and III.<sup>19</sup> Type I and II gastric NETs are relatively asymptomatic small (2–10 mm) sessile lesions. Type III lesions are large, isolated, and often causes abdominal symptoms. Type I tumors represents approximately 80% of all gastric NETs. They are associated with achlorhydria and hypergastrinemia. An elevated gastrin level causes dysplasia by stimulation of enterochromaffin like cells leading to development of NET. In 2010, WHO refers all NETs as neoplasms with malignant potential and recommended as neuroendocrine neoplasia.

NETs are slow growing tumor and able to secrete a variety of amines and peptide hormones.<sup>20</sup> They are predominate in the pancreas and the gastrointestinal tract but can be originate from any organ including lungs, prostate, breast, and ovary.<sup>21</sup> Gastric NETs account for 5% of all NETs and usually do not produce peptide hormones. NETs are also found in patients with chronic atrophic gastritis and the diagnosis is based on biopsy specimens.<sup>22</sup> Histologically, they are well differentiated lesion with low Ki67. Metastasis through the muscular layer is rare and only occurs in case of relatively larger lesions. Therefore before polypectomy, evaluation by endoscopic ultrasound is necessary to assess the invasion; this should follow with an annual surveillance advice.<sup>19,22</sup> Type II tumors are morphologically similar to type I (1–2 cm in size) and accounts 5 to 6% of all gastric NETs. These lesions are associated with multiple endocrine neoplasia types I syndrome and to Zollinger–Ellison syndrome.<sup>22</sup> They are more infiltrative in growth and metastatic spread than type I, therefore, an excision by endoscopy or surgically are the treatment of choice.<sup>22</sup> Type III tumors are sporadic tumors and account for 15 to 25% of all gastric NETs. Type III tumors are solitary lesions, they are capable of rapid invasive growth and metastatic spread. Mortality rate for such cases is approximately 50%.<sup>22</sup> They are often found as an associated finding of iron deficiency anemia or even abdominal pain. Total gastrectomy with lymph node excision is the treatment of choice.<sup>22,23</sup>

### Granular Cell Tumor

Granular cell tumor (GCT; ►Fig. 2A, B) is an unusual neoplasm characterized by the presence of neoplastic large





**Fig. 2** Granular cell tumor of the stomach (A) and histopathology (B). Ectopic pancreas of the stomach (C) and its ultrasonographic appearance (D); note: the arrow indicate dimpling (C) and anechoic tubular structure (D) represent pancreatic duct. Gastrointestinal stromal tumor of the stomach (E) and histopathology (F). Gastric leiomyoma (G) and histopathology (H).

polygonal cells with granular-eosinophilic cytoplasm which contains abundant lysosomes. Gastric GCTs can be solitary or, more frequently associated with other gastrointestinal localization. GCTs are usually benign noncapsulated submucosal mass; vary from few millimeters to centimeter. They can arise in any site of the body as a solitary mass. Women are more often affected than men.<sup>24</sup> Their histological appearance shows polygonal and fusiform cells arranged as compact “nests” possibly originated from Schwann’s cells, this was supported by immunohistochemical staining for S-100 protein of the tumor.<sup>25</sup> Although GCTs are thought as clinically benign lesion but there are reported cases of malignant GCTs. The first documented case of a malignant GCT of the stomach was reported in 1996 by Matsumoto et al.<sup>26,27</sup> Features associated with malignancy include local recurrence, rapid growth to a size greater than 4 cm, cell necrosis, spindling of tumor cells, cytologic atypia and high mitotic activity, large vesicular nuclei, and a high nuclear-to-cytoplasm ratio.<sup>27,28</sup> Immunohistochemical staining shows more than 50% positivity rate for p53 and more than 10% for the K<sub>i</sub>-67 index respectively.<sup>28-30</sup> Prominent tumor micro vessels or focal pleomorphism suggest malignant potential of such tumor.<sup>29,31</sup> Clinically, these tumors are often asymptomatic or a small presymptomatic lesion found during upper GI endoscopy, X-ray, or ultrasound examination performed for dyspepsia.<sup>32</sup> Large gastric GCTs may present with complications as gastric outlet obstruction or massive upper GI hemorrhage.<sup>33,34</sup>

The first definitive description of granular cell myoblastoma was given by Abrikossoff in 1926.<sup>35,36</sup> There are three types of granular cell tumors: the first and most common type is a small single submucosal tumor nodule containing many large cells with small nuclei, the second is a malignant variant of the tumor, and the last type is a pedunculated epulis-like growth attached to the anterior gums of newborn infants.

### Ectopic Pancreas

Ectopic pancreas (→Fig. 2C) can represent with any of the component of a normal pancreas including islets of Langerhans, ducts, and even acini.<sup>37</sup> A 28 to 36% of the ectopic pancreas is located in stomach, same are in duodenum, and 16% are in jejunum.<sup>37</sup> Antrum is the common site for such gastric lesion. Their presence has also been reported in the

colon, spleen, liver, Meckel’s diverticulum, gallbladder, bile ducts, and in fallopian tubes.<sup>38</sup> Morphologically, they are round-firm subepithelial lesion with central dimpling or umbilication (34.6–90.0% of such lesion) caused by the opening of a duct.<sup>39-41</sup> Patients with ectopic pancreas are usually asymptomatic. But they occasionally produce symptoms due to the irritating effect of the exocrine and endocrine secretion from the pancreatic tissue. Rarely, large lesions causing complications like obstructive jaundice, gastric outlet obstruction, intestinal obstruction, and intussusceptions were also reported.<sup>42</sup> Besides central dimpling or umbilication, an anechoic cystic or tubular structure in endoscopic ultrasonography (EUS; →Fig. 2D) represent pancreatic duct is a specific diagnostic feature of ectopic pancreas.<sup>43,44</sup> They might be located in mucosa to muscle layer and extended in the subserosa or serosa. Differential diagnosis of such lesion includes neuroendocrine tumors (NETs).<sup>45</sup> The diagnosis and treatment strategy of ectopic pancreas is mostly based on EUS findings rather than the pathological appearance. Conventional endoscopic biopsy is insufficient for an accurate histopathological diagnosis, therefore, a EUS-guided or combined strip biopsy and bite-on-bite biopsy is necessary.<sup>46-48</sup> On the occasion of EUS guided aspiration, partial mucosal resection or endoscopic submucosal dissection (ESD) might require. Because of the risk of the lymphatic metastasis, endoscopic resection is the treatment of choice for lesions < 10 mm.<sup>23,49-51</sup> Asymptomatic cases can be monitored with options reserved for symptomatic patients. There are few case reports explaining endoscopic mucosal resection (EMR), strip biopsy, cap-assisted EMR, or ligation-assisted EMR for removal of ectopic pancreas.<sup>52-55</sup> Based on histology (Heinrich, 1909), ectopic pancreas has three sub types.<sup>56</sup> Type I lesions contains acini, islets of Langerhans, and ducts; type II has deficiency of endocrine tissue and shows incomplete or lobular presentations; type III contains mixed ectopic tissue of proliferating ducts. Sonographically (according to layer of origin), ectopic pancreas is further classified into two types by Park et al: the superficial and deep type. Endoscopic resection is the treatment of choice for symptomatic case of superficial type lesion; however, surgical approach might necessary for a deep type lesion.<sup>39</sup>

### Gastrointestinal Stromal Cell Tumor (GIST)

Histologically, gastrointestinal stromal tumors (GISTs; →Fig. 2E, F) composed of spindle cells, epithelioid tissues, and in few occasion mesenchymal pleomorphic cells. Typically, they are located in the submucosal layer of the stomach, small and even large intestines. These lesions express a high association with stem cell factor receptor protein like CD117 and originate from the gastrointestinal interstitial cells of Cajal of the submucosal and myenteric plexus.<sup>57</sup>

Morphologically, they are sharply demarcated round mass of variable sizes from few millimeters to large lesions as well as 40 cm.<sup>58</sup> In 1983, Mazur and Clark classified such lesions as “gastric stromal tumors” because of the lack of evidence in favor of Schwann cell and absence of differentiations of smooth muscle cells.<sup>59,60</sup> Clinically GISTs are silent lesion and

an incidental finding. But severe intraperitoneal hemorrhage can be caused by rupture or formation of deep ulceration. Patients might present with features intestinal obstruction or with nonspecific symptoms like fatigue, long-standing history of abdominal pain, nausea, dyspepsia, anorexia, fever, loss of weight, and other associated symptoms of chronic GI hemorrhage. Though such lesions are incidental but a large lesion might present as an external palpable mass.<sup>61,62</sup> A total of 80% of the GIST are found in the gastrointestinal tract and almost 60% are seen in the stomach along the fundus.<sup>63-67</sup> Histologically GISTs are of three main subtypes. These are spindle cell type 70%, epithelioid type 20 to 25%, and mixed type.<sup>60</sup> Among them, epithelioid subtypes shows a high incidence of gastric GISTs.<sup>62</sup> Gastric GISTs carries a better prognosis than that of the extragastric lesions. Stomach GISTs of > 10 cm and ≤5 mitoses per 50 HPF bears a low risk of metastasis in the distant tissue than those of the (< 5%) of the small and large intestine.<sup>58</sup> Gastric GISTs in between 2 to ≤5 cm in size and > 5 mitoses per 50 HPF under microscopy show a prognostic rate of 10 to 15%, this is similar to those lesions of > 10 cm although they show a less mitotic rate, ≤5/50 HPF.<sup>68</sup> GISTs show an aggressive malignant character of distant metastasis in abdominal organs including liver and a low incidence lymphatic spread.<sup>65</sup> A distant metastasis to lung and bone,<sup>69</sup> even delayed metastasis after 10 to 15 years following the surgical excision of the primary lesion has been reported.<sup>65</sup> Extragastric GISTs are truly rare, <1% of all the lesions, most of such lesions are the metastatic foci of the primary GI lesion.<sup>69</sup>

## Gastric Leiomyoma

Morgani (1762) and Virchow (1867) were the first to described gastric leiomyoma. They are usually small solitary growth; can be of 6 cm in size and accounts approximately 2.5% of all gastric neoplasms.<sup>70-72</sup> Endo gastric leiomyomas are slow growing, noncapsulated, morphologically well-defined, and smooth and round tumor (→Fig. 2G, H) Gastric leiomyoma shows two patterns of developmental variations, endo- and exogastric lesions. Clinical manifestations mostly depend on type, development, location, and size of the tumor. Endoscopically, a large tumor appears as submucosal lesions (Schindler's sign) and in the contrast study they visualize as a filling defect. Symptomatic lesions usually present with upper gastrointestinal hemorrhage, nonspecific pain especially in the epigastric region with or without dyspepsia; intraperitoneal or acute bleeding episode is rare.<sup>73-76</sup> For diagnosis, surface endoscopic biopsies are not effective as they are unable to obtain tissue from the depth. Endoscopic submucosal resection (EMR) or surgery is the preferred treatment in most cases.

## Conclusion

Gastric polyps are lesions with various types in their morphology, presentations, and potentials. Accurate diagnosis of the type of gastric polyp is highly important for the treatment success. This depends on clinical judgments as well

as endoscopic and histopathological evaluation. It is vital to include a differential diagnosis and malignant potential for lesions of this kind; even if they seem benign.

### Authors' contributions

A.T.M.M.C. contributed in the concept of the research, data collection, article writing and editing.

W.R.H., D.G., and Y.R.L. contributed in the collection of data.

H.S.X. provided overall supervision.

### Conflict of Interest

None declared.

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