

Gastric polypoid lesions detected on magnetic resonance cholangiopancreatography

Mitsuru Matsuki (✉ rad053@jichi.ac.jp)

Kindai University Hospital

Isao Numoto

Kindai University Hospital

Takefumi Hamakawa

Kindai University Hospital

Kazunari Ishii

Kindai University Hospital

Tomoyuki Otani

Kindai University Hospital

Research Article

Keywords: Magnetic resonance cholangiopancreatography, Negative oral contrast agent, Gastric polypoid lesion, Fundic gland polyp, Hyperplastic polyp

Posted Date: May 21st, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-493398/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: On *magnetic resonance cholangiopancreatography (MRCP)* using a negative oral contrast agent, the gastric lumen appear dark, and gastric polypoid lesions can be seen. To our knowledge, there are no reports examining gastric polypoid lesions detected on *MRCP*. We examined the characteristics of gastric polypoid lesions detected on *MRCP* and discussed the management of the lesions.

Material and Methods: *MRCP* images using a negative oral contrast agent were retrospectively evaluated in 1128 cases, and gastric polypoid lesions detected were investigated.

Results: Gastric polypoid lesions were detected in 17 of the 1128 cases (1.5%) on *MRCP*. The mean patient age and gender were 66.7 years (range: 48-85 years) and 7 males / 10 females. A single lesion was detected in 4 cases, 2 to 4 lesions were detected in 6 cases, 5 to 10 lesions in 3 cases, and 11 or more in 4 cases. In 4 cases, the upper, middle, and lower portions of the stomach were occupied with polypoid lesions, in 4 cases, the upper and middle portions were occupied, in 1 case, the middle and lower portions were occupied, and in 8 cases, only the upper portion was occupied. One lesion was detected in 4 cases, 2 to 4 lesions were detected in 6 cases, 5 to 10 lesions in 3 cases, and 11 or more in 4 cases. The mean maximum diameter of the polypoid lesions was 7.8 mm (range: 4-16 mm). An upper endoscopy and forceps biopsy were performed in 9 of the 17 cases. The histological diagnosis was fundic gland polyps in 6 cases and hyperplastic polyps in 3 cases.

Conclusion: Gastric polypoid lesions can rarely be detected on *MRCP*. The polypoid lesions were histologically fundic gland polyps or hyperplastic polyps. In the future, we will prospectively review more cases and examine indication of *upper gastrointestinal endoscopy* to gastric polypoid lesions detected on *MRCP*.

Background

Magnetic resonance cholangiopancreatography (*MRCP*) is a non-invasive magnetic resonance imaging used to visualize the biliary and pancreatic ducts.^{1,2} This procedure exploits the water content in the relevant structures, while reducing the background signal from adjacent soft tissues by using a heavily T2-weighted sequence.^{1,2} Negative oral contrast agents are administered prior to the examination, which shortens the T2 relaxation time and results in a reduced signal intensity from the fluids in the upper gastrointestinal tract.¹⁻³ The negative oral contrast agents cause the gastric lumen to appear dark and can demonstrate gastric polypoid lesions on *MRCP*.⁴ In the present study, we investigate the characteristics of gastric polypoid lesions detected on *MRCP*.

Material And Methods

Patient Population

We retrospectively reviewed MRCP images obtained at our radiology department between January 1 and August 31, 2020 after obtaining approval from the ethical review board. A total of 1158 cases were examined, 18 cases who had undergone a gastrectomy and 12 cases with an insufficient negative contrast effect caused by gastric residuals, fluid, and other secretions, were excluded from the study. Therefore, a total of 1128 cases were included in the study.

Imaging

MRI scanning was conducted using 1.5-T MR scanners (Signa HD xt, GE Healthcare, Milwaukee, WI, USA or Ingenia Prodiva, Philips Healthcare, Best, Netherlands) or a 3.0-T MR scanner (Intera Achieva, Philips Healthcare, Best, Netherlands)). MRCP was performed with heavily T2-weighted sequences and a torso phased-array coil. Imaging took place after a 6-hour fasting period and immediately after the oral ingestion of manganese chloride tetrahydrate (Bothdel®, Kyowa Hakko Kirin, Chiyoda, Tokyo, Japan). Axial and coronal T2-weighted single-shot turbo or fast spin-echo (SSTSE or SSFSE) images with respiratory triggering were examined using the following parameters: repetition time (TR), 1615–3953 ms; time to echo (TE), 100–102 ms; matrix, 224x352-512x512; number of slices, 24–38; slice thickness, 5 mm; field of view (FOV), 320-400mm; SENSE factor, 2–4; and the number of signal averages (NSA), 1. All 360-degrees of the 2D thick-slab SSFSE or SSTSE breath-hold sequences were examined. Six planes were examined using the following parameters: TR, 2025–3026 ms; TE, 800–998 ms; matrix, 256x256-512x512; thick slab, 60–90 mm; FOV, 350–460 mm; SENSE factor, 1; NSA, 1.

Evaluation of the images

Two experienced abdominal radiologists (with 9- and 28-years of experience) reviewed the MRCP images that were retrieved from the picture archiving and communication system at our hospital. Discordant interpretations were subsequently resolved by consensus between the two radiologists. Gastric polypoid lesions were defined as nodules in the stomach, which demonstrated a high intensity with internal low intensity on 2D thick slab MRCP, in reference to axial and coronal T2-weighted SSTSE or SSFSE images (Fig. 1).

The examination items were as follows:

1. The cases with gastric polypoid lesions were counted and the incidence rate was calculated.
2. The age and gender of these cases were investigated.
3. The portion of the stomach occupied by the polypoid lesions were investigated. The stomach was divided into three parts: upper, middle, and lower, which were divided according to the lines connecting the trisected points on the lesser and greater curvatures.
4. The number of the lesions were divided into the following ranges: a) 1 lesion, b) 2 to 4 lesions, c) 5 to 10 lesions, and d) 11 lesions or more.
5. The maximum diameter of the polypoid lesions in each case was measured.

6. The cases with an upper endoscopy performed within 3 months of MRCP were examined. Histological results obtained through a forceps biopsy or resection were investigated. Helicobacter pylori was investigated in samples of gastric biopsy specimens. Use of proton pump inhibitors was examined in the cases with fundic gland polyps.

Results

Characteristics of gastric polypoid lesions detected on MRCP are summarized in Table 1.

Table 1
Characteristics of gastric polypoid lesions detected on MRCP

Number of cases	17
Incidence rate (%)	1.5
Age (years)	mean 66.7 (range: 48–85)
Gender Male/Female	7 / 10
Occupied portion in the stomach	
Upper, middle, and lower portions	4
Upper and middle portions	4
Middle and lower portions	1
Upper portion	8
Number of the lesions	
1	4
2 to 4	6
5 to 10	3
11 or more	4
Maximum diameter (mm)	mean 7.8 (range: 4–16)
Histological results (Total nine cases)	
Fundic gland polyps	6
Hyperplastic polyps	3

1. Polypoid lesions were detected in 17 of the 1128 examined cases, with an incidence rate of 1.5%.
2. The mean patient age and gender were 66.7 years (range: 48–85 years) and 7 males / 10 females.
3. In 4 cases, the upper, middle, and lower portions of the stomach were occupied with polypoid lesions, in 4 cases, the upper and middle portions were occupied, in 1 case, the middle and lower portions

were occupied, and in 8 cases, only the upper portion was occupied.

4. One lesion was detected in 4 cases, 2 to 4 lesions were detected in 6 cases, 5 to 10 lesions in 3 cases, and 11 or more in 4 cases.
5. The mean maximum diameter of the polypoid lesions was 7.8 mm (range: 4–16 mm).
6. An upper endoscopy was performed in 9 cases for evaluating causes of upper gastrointestinal symptoms (n = 4) and examining gastric polypoid lesions detected on MRCP (n = 5). In the remaining 8 cases, gastric polypoid lesions were not detected on MRCP in the initial radiology report. The mean interval between MRCP and endoscopy was 29 days (range; 0–91 days). The upper endoscopies showed gastric polyps in all cases and forceps biopsies were performed during this procedure. In 1 case, an endoscopic mucosal resection was performed. Histological results showed that the lesions were fundic gland polyps (Fig. 2) in 6 cases and hyperplastic polyps (Fig. 3) in 3 cases. Samples of gastric biopsy specimens were *Helicobacter pylori* negative in all of 9 cases. Two cases of the 6 cases with fundic gland polyps used proton pump inhibitors for 18 and 34 months.

Discussion

MRCP is widely used to investigate pancreatobiliary disorders and serves as a non-invasive alternative to endoscopic retrograde cholangiopancreatography.^{1,2} MRCP makes use of heavily T2-weighted sequences, thus exploiting the inherent differences in the T2-weighted contrast between stationary fluid-filled structures with a long T2-relaxation time and the adjacent soft tissue which with much shorter T2-relaxation time in the abdomen.^{1,2} A half-Fourier single-shot echo train spin sequence is utilized because of a higher signal-to-noise ratio and contrast-to-noise ratio, and a lower sensitivity to motion and susceptibility to artefacts.^{1,2} Commonly, breath-hold 2D single-shot thick slab imaging and respiratory-triggered 3D imaging are utilized.^{1,2}

The quality of MRCP is frequently degraded by superimposed high signal intensities of the fluids in the upper gastrointestinal tract. Therefore, negative oral contrast agents are administered prior to the examination to reduce the superimposed fluid signal.^{1–3} The negative contrast effect is strong T2-shortening caused by high concentrations of manganese or iron in the agents.^{1–3} Negative oral contrast agents cause the gastric lumen to appear dark, and can show gastric polypoid lesions as high signal on MRCP.⁴

The majority of gastric polyps are fundic gland polyps (FGPs) and HPs (HPs), and are often incidentally found during endoscopies. FGPs are the most common polyps found in the stomach, which were observed in 0.8–23% of all endoscopies.^{5–7} They are associated with familial adenomatous polyposis and proton pump inhibitor use.^{7,8} They usually present as multiple small polypoid nodules in the gastric fundus and body. These lesions vary in size from 1 mm to 8 mm.^{8,9} Endoscopically, they are typically sessile, shiny, translucent, and pale to pinkish in color, resembling the surrounding mucosa.^{9,10} Histologically, they contain dilated oxyntic glands lined by flattened parietal and mucous cells.^{8,9} In the

management, polypectomy is recommended to confirm the diagnosis and to rule out dysplasia or adenocarcinoma in FGPs measuring > 1 cm in diameter and polyps that are ulcerated or located in the antrum.^{8,9}

HPs are the second most common type of gastric polyp after FGPs.⁷⁻⁹ They are strongly associated with a chronic inflammatory trigger such as chronic gastritis from a *Helicobacter pylori* infection.⁸⁻¹⁰ Most HPs are solitary, but occasionally there may be more than one. They most commonly occur in the antrum but can develop anywhere in the stomach.⁸⁻¹⁰ Endoscopically, HPs are typically red in color, sessile or pedunculated, and less than 2 cm in diameter.⁸⁻¹⁰ Histologically, they are characterized by dilated, elongated, and tortuous foveolae lined by hyperplastic gastric mucin-containing epithelial cells.⁸⁻¹⁰ They are reported to be found in 0.6 to 2.1% of patients with gastric cancer.¹¹⁻¹⁴ And, HPs also denote an increased risk of neoplasia in the surrounding abnormal gastric mucosa and are associated with the occurrence of synchronous cancer elsewhere in the gastric mucosa. In the management, the size cutoff for resection is debatable as well, with some authors recommending a 2-cm minimum for polypectomy, while others recommend resection of all polyps greater than 0.5 cm.

In the present study, gastric polypoid lesions were identified on MRCP in 1.5% of cases. MRCP demonstrated gastric polypoid lesions with a high intensity with internal low intensity on MRCP. It was considered that the high intensity correlates with secretion in the dilated glands and foveolae, and the internal low intensity correlates with the stroma in the polyps.

The limitations of this study are: (i) it is a retrospective study; (ii) the cohort is large (1128 cases), but gastric polypoid lesions were detected in only 17 cases, of which 8 cases were not pathologically diagnosed. (iii) gastric adenomas which are precursors to gastric cancer and well differentiated tubular adenocarcinomas were not included in the present study. We consider that they can be shown as gastric polypoid lesions with a high intensity on MRCP due to internal tubular structure [9].

Conclusion

Gastric polypoid lesions can rarely be detected on MRCP. The polypoid lesions were histologically fundic gland polyps or hyperplastic polyps. In the future, we will prospectively review more cases and examine indication of upper gastrointestinal endoscopy to gastric polypoid lesions detected on MRCP.

Declarations

Ethics approval and consent to participate

All methods were carried out in accordance with relevant guidelines and regulations/Declaration of Helsinki. The study was approved by the ethics committee of Kindai University Faculty of Medicine. The need for individual informed consent was waived by the same ethics committee.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

No Funding received.

Acknowledgments

Not applicable.

Author Contribution

MM conceived and designed this study, and drafted the original and revised manuscripts. MM, IN and TH participated in data acquisition and analysis. KI evaluated the results and carried out a critical revision of the manuscript for important.

References

1. Sandrasegaran K, Lin C, Akisik FM, Tann M: *State-of-the-art pancreatic MRI*. Am J Roentgenol. 2010;195:42–53.
2. Griffin N, Charles-Edwards G, Grant LA: Magnetic resonance cholangiopancreatography: the ABC of MRCP. Insights Imaging. 2012;3:11–21.
3. Morita S, Ueno E, Masukawa A, Suzuki K, Fujimura M, Hirabayashi N, et al: Prospective comparative study of negative oral contrast agents for magnetic resonance cholangiopancreatography. Jpn J Radiol. 2010;28:117–
4. *Sheybani*A, Menias CO, Luna A, Fowler KJ, Hara AK, Silva AC, et al. MRI of the stomach: a pictorial review with a focus on oncological applications and gastric motility. Abdom Imaging. 2015;40:907-930.
5. Weston BR, Helper DJ, Rex DK. Positive predictive value of endoscopic features deemed typical of gastric fundic gland polyps. J Clin Gastroenterol. 2003;36:399-402.
6. Abraham SC, Nobukawa B, Giardiello FM, Hamilton SR, Wu TT. Fundic gland polyps in familial adenomatous polyposis: neoplasms with frequent somatic adenomatous polyposis coli gene alterations. Am J Pathol. 2000;157:747-754.

7. Jalving M, Koornstra JJ, Wesseling J, Boezen HM, Jong SDE, Kleibeuker JH. Increased risk of fundic gland polyps during long-term proton pump inhibitor therapy. *Aliment Pharmacol Ther.* 2006;24:1341-1348.
8. Islam RS, Patel NC, Lam-Himlin D, Nguyen CC. *Gastric polyps: a review of clinical, endoscopic, and histopathologic features and management decisions.* *Gastroenterol Hepatol.* 2013;9:640-651.
9. Shaib YH, Rugge M, Graham DY, Genta RM. Management of gastric polyps: an endoscopy-based approach. *Clin Gastroenterol Hepatol.* 2013;11:1374-1384.
10. Jain R, Chetty R. Gastric hyperplastic polyps: a review. *Dig Dis Sci.* 2009;54:1839–1846.
11. Ueno K, Oshiba S, Yamagata S, Mochizuki F, Kitagawa M. Histo-clinical classification and follow-up study of gastric polyp. *Tohoku J Exp Med.* 1976;118:23-38.
12. Kozuka S, Masamoto K, Suzuki S, Kubota K, Yokoyama Y. Histogenetic types and size of polypoid lesions in the stomach, with special reference to cancerous change. *Gan.* 1977;68:267-274.
13. Laxén F, Sipponen P, Ihamäki T, Hakkiluoto A, Dortscheva Z. Gastric polyps; their morphological and endoscopical characteristics and relation to gastric carcinoma. *Acta Pathol Microbiol Immunol Scand A.* 1982;90:221-228.
14. Hattori T. Morphological range of hyperplastic polyps and carcinomas arising in hyperplastic polyps of the stomach. *J Clin Pathol.* 1985;38:622-630.

Figures

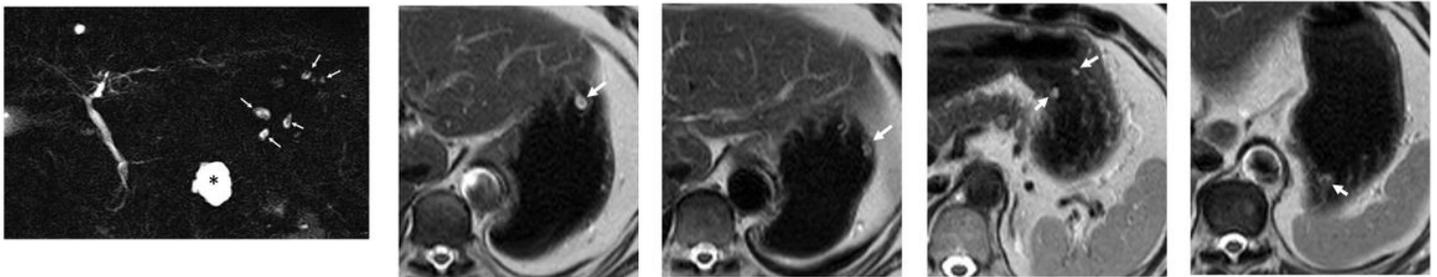


Figure 1

A 57-year-old female with gastric polypoid lesions on magnetic resonance cholangiopancreatography (MRCP) was performed as a follow-up for an asymptomatic intraductal papillary mucinous neoplasm (IPMN) of the pancreas. a: 2D Thick-Slab single-shot turbo spin echo (SSTSE) demonstrates 5 nodules (arrows) showing a high intensity with internal low intensity in the area corresponding to the stomach. The IPMN (asterisk) is shown. b-e: Axial T2- weighted SSTSE images show the 5 nodules on the upper and middle part of the gastric wall. Thereby, the nodules are diagnosed as gastric polypoid lesions.

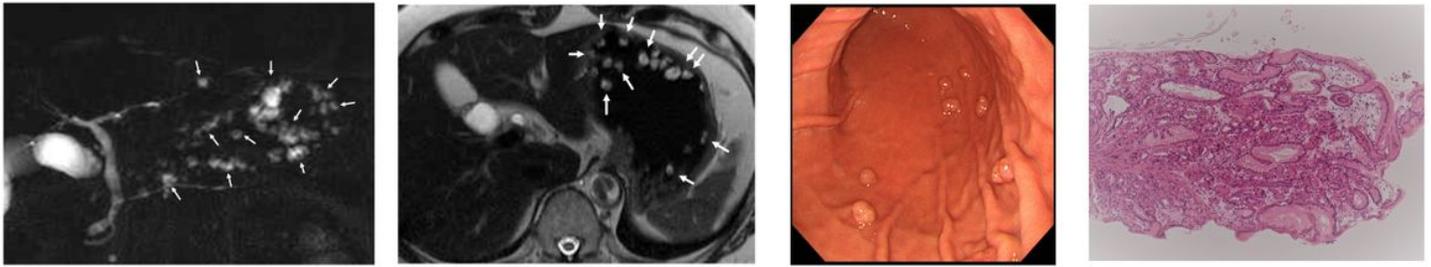


Figure 2

A 56-year-old female with gastric fundic gland polyps. Diffuse thickening of the gallbladder wall was detected on a screening ultrasound, therefore, a magnetic resonance cholangiopancreatography (MRCP) was subsequently performed. She used lansoprazole in the treatment of gastroesophageal reflux disease for 34 months. a: 2D Thick-Slab single-shot turbo spin echo (SSTSE) demonstrates multiple nodules (arrows) showing a high intensity with internal low intensity in the area corresponding to the stomach. b: Axial T2- weighted SSTSE image demonstrates multiple nodules on the gastric wall,. c: Upper endoscopy reveals multiple polyps similar in color to the surrounding mucosa in the body of the stomach. A forceps biopsy was performed. d: Histological examination reveals a polypoid lesion consisting of packed oxyntic glands, some of which were cystically dilated (hematoxylin-eosin, X100). It is diagnosed as a fundic gland polyp.

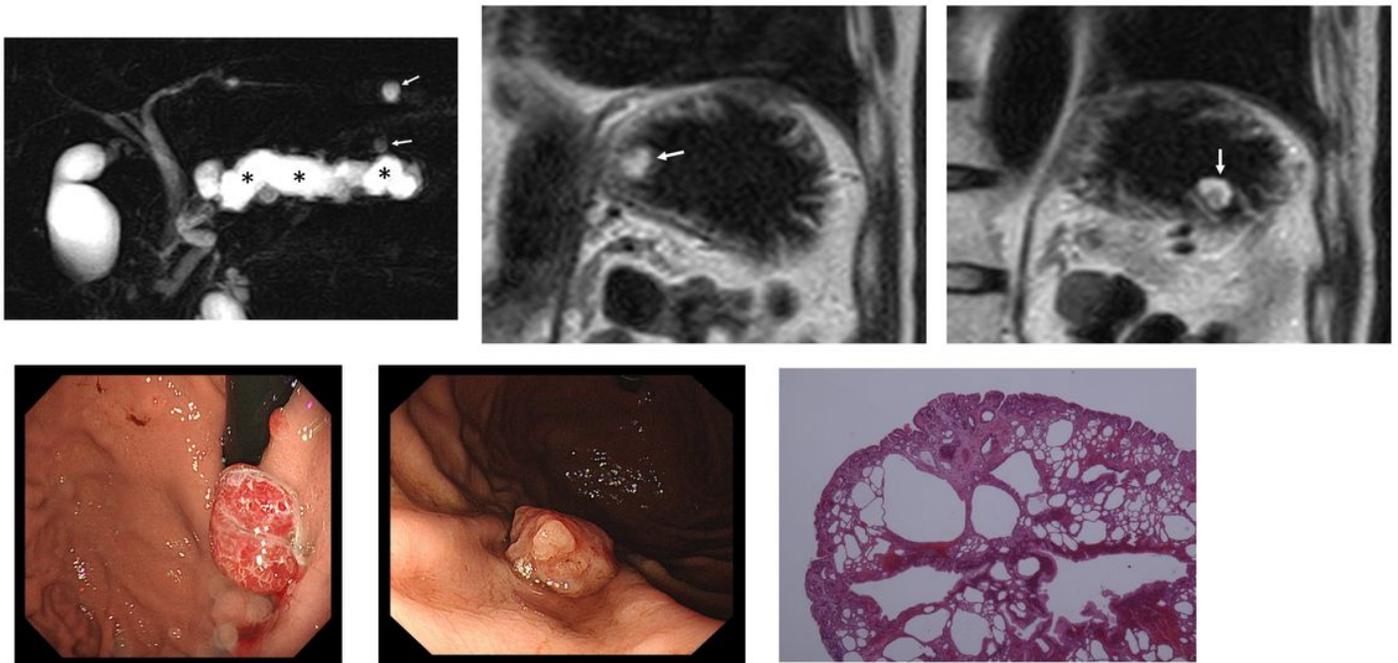


Figure 3

A 85-year-old female with gastric hyperplastic polyps. Dilation of the main pancreatic duct was detected during a screening ultrasound, therefore, a magnetic resonance cholangiopancreatography (MRCP) was

subsequently performed. a: 2D Thick-Slab single-shot fast spin echo (SSFSE) demonstrates two nodules (arrows) showing a high intensity with internal low intensity in the area corresponding to the stomach. The main pancreatic duct dilatation (asterisks) is shown. b,c: Coronal T2- weighted single-shot turbo spin echo (SSTSE) images demonstrate two nodules (arrows) on the upper and middle part of the gastric wall.. d,e: Upper endoscopy reveals a reddish pedunculated polyp with a rough surface on the gastric cardia (D) and a greater curvature of the gastric body (E). Endoscopic mucosal resection (EMR) is performed. f: Histological examination reveals a polypoid lesion with a dilated hyperplastic foveolae and edematous stroma (hematoxylin-eosin, X20). It is diagnosed as a hyperplastic polyp.