

Gastric polyps: a retrospective cohort analysis of 23,668 endoscopies indicates changing epidemiological and phenotypic characteristics

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Abstract

Introduction: Growing adoption of endoscopic procedures in clinical practice has gradually increase the detection rate of gastric polypoid lesions.

Aim: To identify the epidemiologic characteristics of gastric polyps as well as changes of these parameters during a 15-year period.

Material and methods: We reviewed all the upper endoscopies archived in our database reporting a polypoid lesion from 2003 to 2018. Demographic data, indication for endoscopy, morphological characteristics of polyps, histology, and presence of *Helicobacter pylori* were collected. We compared the abovementioned data between 2 periods: 2003–2010 and 2010–2018.

Results: A total of 989 (4.2%) patients from 23,668 reviewed were identified to harbour a polypoid lesion. Mean patient age was 63.2 years, with 58.8% being female. Most polyps (65.2%) were less than 5 mm in diameter and located in the fundus. Hyperplastic polyps (HPs) were the predominant type (28.6%) while fundic gland polyps (FGPs) were found in 24.1% of patients. Adenomas were the least common type (2.7%). Other pathology was identified in 43.3%. Comparison between the 2 periods revealed a rise of FGPs against HPs with a concomitant shift of location from antrum to fundus and an increase in the number of polyps per patient.

Conclusions: FGPs and HPs were the most common polyps found in our cohort, with a change of their pattern during the 15 years. It is imperative to acknowledge the distinct characteristics of gastric polyps so as to properly assess the malignant potential that some of them, or their surrounding gastric mucosa, harbour.

Introduction

The widespread use of endoscopy has altered the rate of detection of gastric polypoid lesions. Although usually infrequently found incidentally during upper gastrointestinal endoscopy, especially when large, they do produce symptoms such as anaemia, bleeding, or gastric outlet obstruction. They may originate from the gastric epithelium or submucosa and protrude into the stomach lumen. Based on most recent studies, their reported prevalence varies between 0.6 and 6.35% [1–9]. Although mostly benign, some of them may harbour malignant potential, while at the same time they can provide important clues as to abnormalities of the surrounding mucosa. *Helicobacter pylori* (*H. pylori*) and pro-

ton pump inhibitors (PPIs) are the 2 main factors that have been associated with different patterns of gastric lesions. The decreasing prevalence of *H. pylori* infection has accordingly diminished chronic gastritis, atrophy, and thus the frequency of hyperplastic polyps (HPs) and possibly adenomas, while PPIs, ascribed to play a role in funding development of gland polyps (FGPs), are increasingly being used.

In Greece only one study, performed more than 20 years ago, has searched for epidemiological characteristics of epithelial gastric polyps, and since then the data have not been re-evaluated [10]. We presumed that in the meantime several conditions may have altered their prevalence or characteristics.

Aim

The aim of our study was to depict the frequency, and the epidemiologic and histological characteristics, and assess the dynamic changes in patterns of gastric polyps in a large endoscopic database during the last 15 years.

Material and methods

All endoscopies performed from January 2003 to February 2018 in our hospital and archived in the endoscopic database were retrospectively reviewed. Gastroscopies reporting a polypoid lesion, mass, or nodule were manually identified. In patients with gastric polyps who had a subsequent follow-up endoscopy, only data from the initial endoscopy were considered. Demographic data (age, sex), indication for endoscopy, morphological characteristics of polyps (number, size, and location), histology by biopsy forceps, and presence of *H. pylori* were collected. Our analysis focused on epithelial gastric polyps (FGPs, HPs, and adenomas). Identification of *H. pylori* was done only by histology (haematoxylin-eosin stain). Medication history including use of PPIs, history of *H. pylori* treatment, social habits (smoking, alcohol), and body mass index were unavailable. For patients with more than one polyp, only the largest one was considered as the determinant in this classification. Written informed consent was not considered a prerequisite for inclusion in the study because the endoscopic reports were processed to be devoid of identifiable data.

To outline possible alterations in the epidemiology of epithelial polyps during the last 15 years, we analysed all the abovementioned collected characteristics in 2 periods: January 2003 to June 2010 (period A) and July 2010 to February 2018 (period B).

Statistical analysis

All tests were carried out with the commercially available Statistics/Data Analysis (Statacorp., College Station, TX, USA) software package. Medians, means, and SDs were calculated for continuous variables (age in years), and comparisons between groups were made using Student's *t*-test. The χ^2 was used for qualitative variables. When the normality check failed, the Mann-Whitney rank-sum test was used.

Results

Overall epidemiologic characteristics

In total, 23,668 patients undergoing a gastroscopy were included in the analysis. Of these, 989 patients, constituting 4.2% of the population, harboured at least one endoscopically detected polypoid lesion. The mean

patient age was 63.2 years (range: 15–92), and 58.8% were female. Almost half the patients (43.2%) had more than one polyp detected. An indication for endoscopy was reported in 99.2% of the reports, with the most common ones being anaemia (21.2%), dyspepsia (20.4%), and gastroesophageal reflux disease (GERD) (11.7%). Analysis of indications for endoscopy according to polyp type revealed that anaemia was significantly more common in patients with HPs compared to FGPs ($p < 0.0001$) while dyspepsia was significantly more common in patients with FGPs compared with HPs ($p = 0.01$). GERD was more common in FGPs, but the difference was not statistically significant.

The size of polypoid lesions was recorded in 90% of endoscopic reports. The majority of them (581, 65.2%) were diminutive, measuring less than 5 mm, 13.3% were larger than 10 mm, while only 4.1% were larger than 20 mm. The location of polyps was available in 97.3% of the endoscopic reports, with fundus being the most common site of polyp detection (428, 44.5%); body and antrum followed with 37.9% and 37.7%, respectively. Almost one in 5 patients (19.6%) had polypoid lesions detected in more than one site of the stomach. The number of polyps per patient was specified in 94% of endoscopies retrieved. 530 (56.8%) patients had a single polyp, 128 (13.7%) had 2 polyps, 206 (22.1) had 3–10 polyps, while 69 (7.4%) had more than 10 polyps. Dysplasia was detected in 56 polyps, with 20 being HPs, 18 adenomas, and none FGP.

Biopsies of endoscopically detected polypoid lesions were undertaken in 75% of patients; thus, a histological diagnosis was available in 742 out of 989 patients. Simultaneous samples of the surrounding mucosa were performed in 350 patients, while in 10 patients biopsies were taken only from the surrounding mucosa and not from the polyp itself. Accordingly, biopsies of the surrounding mucosa and histological assessment of *H. pylori* was conducted in 360 (48.5%) patients who were biopsied.

Among the 989 patients with an endoscopically detected polypoid lesion, documented true epithelial polyps by histology were detected in 411 (55.4%). Histological classification of polypoid lesions revealed hyperplastic polyps as the most common polyp type, detected in 212 (28.6%), with FGPs in 179 (24.1%), and adenomas in 20 (2.7%) patients. Other pathology including both other types of non-epithelial polyps (4.9%) as well as normal mucosa or chronic gastritis (39.7%) was detected in 331 patients (44.6%).

Taking into consideration the total amount of endoscopies included in the study, the fact that biopsies from endoscopically detected polypoid lesions were performed in 3 out of 4 patients, and that histology re-

vealed an epithelial gastric polyp in 55.4% of biopsies, the prevalence of epithelial polyps in our population during the study period was 1.7%. *Helicobacter pylori* was assessed in 360 patients and tested positive in 276 patients, i.e. in 27.9% of patients with an endoscopically detected polyp and 76.6% of those who were sampled.

Comparison of 2 periods

When comparing the epidemiological data reported above between the 2 periods of time (period A and B), no difference was detected in patients' demographics – age and sex (data not demonstrated). On the contrary, distinguishing features between the 2 periods were identified in the number of polyps per patient, size, location, histological type, and *H. pylori* presence.

Regarding the number of polyps per patient, a statistically significant difference was detected between the 2 periods with a rise in patients with multiple polyps in period B versus those with a single or 2 polyps. Regarding size, polyps greater than 2 cm were significantly reduced in period B in contrast to small polyps less than 5 mm. As far as location is concerned, a progressive shift towards corpus and fundus was demonstrated from period A to period B while antrum was the most common location of polyps in period A (Table I).

Histology of polyps was found to be statistically different between the 2 periods, with an increase of FGPs and a decrease of other pathology (Table I). Lastly, regarding *H. pylori*, there was a significant raise of its prevalence as well as its rate of assessment ($p < 0.0001$) in period B. Positive *H. pylori* was found significantly more commonly in the presence of HPs or other pathology in period B ($p = 0.014$ and $p < 0.0001$, respectively) while there was no difference between the 2 periods in the presence of FGPs or adenomas (Table II). No difference was detected in rates of dysplasia (data not shown).

Discussion

This is the first study that provides current information on the epidemiology of gastric epithelial polyps in Greece as well as changing patterns of their characteristics during a period of 15 years. The lack of a national endoscopic data repository and the large number of diverse practice sites lead to several limitations in estimating the total number of upper endoscopies performed every year and the frequency of gastric findings. The prevalence of 4.2% for polypoid lesions in our study is in accordance with other published series, with possible differentiations occurring due to different population characteristics or methodological issues [1–9].

Table I. Comparison of the phenotypic characteristics of gastric polyps between the 2 periods

Parameter	Period A, n (%)	Period B, n (%)	P-value
Polyps/patient:			
> 10	15 (3.83)	54 (9.98)	–
1	270 (68.88)	260 (48.06)	< 0.0001
2	54 (13.78)	74 (13.68)	0.005
3–10	53 (13.52)	153 (28.28)	0.5
Size [mm]:			
< 0.5	246 (64.23)	335 (65.94)	–
0.5–1	82 (21.41)	109 (21.46)	0.886
1–2	33 (8.62)	49 (9.65)	0.719
> 2	22 (5.74)	15 (2.95)	0.045
Location:			
Antrum	185	178	–
Corpus	145	220	0.002
Fundus	131	297	< 0.05
Anastomosis	8	7	0.85
Histology:			
HPs	65 (25.59)	140 (29.72)	–
FGPs	26 (10.24)	149 (31.63)	< 0.0001
Adenomas	10 (3.94)	10 (2.12)	0.1
Other	153 (60.24)	172 (36.52)	< 0.0001

HPs – hyperplastic polyps, FGPs – fundic gland polyps.

Table II. Comparison of *Helicobacter pylori* related parameters between the 2 periods

Variable	Period A, n (%)	Period B, n (%)	P-value
<i>Helicobacter pylori</i> prevalence:			
Negative	37 (52.11)	47 (16.26)	< 0.0001
Positive	34 (47.89)	242 (83.74)	
<i>Helicobacter pylori</i> assessment:			
Yes	71 (28)	279 (59.2)	< 0.0001
No	183 (72)	192 (40.8)	
<i>Helicobacter pylori</i> and HPs:			
<i>Helicobacter pylori</i> positive	7	48	0.014
<i>Helicobacter pylori</i> negative	10	18	

HPs – hyperplastic polyps.

Only one study has assessed the prevalence of gastric epithelial polyps, 24 years ago in Greece, in almost 13,000 endoscopies, reporting a rate of 1.2%, which is quite close to our reported rate of 1.7% in a little more than double the number of endoscopies [10]. HPs constituted the vast majority of polyps in this cohort, probably reflecting a higher incidence of *H. pylori* infection in an era when PPIs were not universally employed. It is not surprising that in period A of our cohort HPs were indeed the most common type of polyp detected, but in period B, the most recent one, FGPs were shown to have significantly increased, eventually surpassing HPs. Apart from changes in *H. pylori* prevalence and PPI use one should not discard a possible shift of endoscopists' habits after the release of the British Guidelines on Gastric polyps in 2010, suggesting all must be sampled in the initial endoscopy for histological assessment, which might explain the rise of the relative prevalence of FGPs [11].

Similar recent studies from Turkey, Spain, Brazil, the USA, and China have reported various results with the most common type of polyp being the most controversial one. All studies from Turkey do exhibit a remarkable accordance: HPs are the most commonly encountered type of polyp in their cohorts with rates ranging from 36.2 to 83.9% while FGPs range between 6.1 and 14.4% [2, 5, 8]. This finding may be interpreted when considering the high rates of *H. pylori* positivity in the Turkish population and possibly a lower use of PPIs than other countries [2]. HPs were also found to be the most common type of epithelial polyp in the studies from Spain and Brazil [1, 3]. Conversely, 2 large studies from China [4, 7] and the USA [6, 9], respectively, reported FGPs as the predominant histological type, with rates between 50.6 and 79.9%. We should nonetheless take into account that the largest percentages of 77% and 79.9% of the latter studies were from a private practices registry and a large pathology database, respectively, thus not representing real world FGPs prevalence. Furthermore,

the diversity of results could have emanated from the inclusion of different populations, methodology, and diagnostic tools used in each study as well as the time at which each study took place.

Even in studies with HPs being the most commonly detected type of polyp we should consider whether FGPs are actually being unanimously biopsied by endoscopists: newer high-definition endoscopes as well as magnification or chromoendoscopy may help in identification of a possible FGP with characteristic endoscopic features having been described even though no specific pattern has been officially established [12]; FGPs, if detected, do not commonly need resection due to their almost non-existent malignant potential; patients being prescribed PPIs suffer more commonly from comorbidities, including a condition needing anticoagulation or antiplatelet therapy, thus rendering endoscopists reluctant to take biopsies from possibly benign lesions.

It is noteworthy that in our study biopsies of polyps were undertaken only in every 3 out of 4 patients, while at the same time only in half of those cases did the endoscopist choose to sample the surrounding mucosa for underlying coexistent conditions, as guidelines recommend [11]. This is of particular significance in cases of HPs and adenomas because in the former an underlying premalignant condition such as atrophic gastritis and intestinal metaplasia may be revealed, while in the latter the risk of neoplasia in the surrounding mucosa is possibly greater than in the adenoma itself.

Regarding indication of endoscopies, the 3 most common indications: anaemia, dyspepsia, and GERD, are in total agreement with those reported in the largest retrospective study from the USA [6]. It is not surprising that anaemia was more common in patients eventually harbouring a HP because this kind of polyp is known to develop in the background of atrophic gastritis. It is also notable that dyspepsia, a common reason to be prescribed PPIs, was significantly more

prevalent in patients with FGPs. GERD as an indication for endoscopy and the association with FGPs could not reach significance, but this trend has been reproduced in previous studies as well [4, 6, 9]. As an aside, a possible correlation of PPI use and FGPs can be suspected but not definitely established.

Rates between 5 and 37.5% of cases, where despite the endoscopic appearance of a polyp histology only showed chronic gastritis or normal mucosa, have been reported in the literature. In fact, the percentage was greater with decreasing size of polypoid lesions [13]. This observation could explain the increased number of cases in our study (39.7%) where an endoscopically detected polyp was actually chronic gastritis or normal mucosa because 2 out of 3 lesions in total were smaller than 5 mm. Moreover, our study spans a considerable length of time, including a period when endoscopic tools and thus optical diagnosis were not ideal.

When comparing the 2 study periods we assessed for the first time in the Western literature the changing patterns of epithelial gastric polyps over a period of 15 years. The basic demographics remained similar, but our hypothesis that other morphological characteristics of polyps would have changed under the pressure of several altered epidemiological factors proved to be correct.

Specifically, the number of polyps per patient increased and the location of polyps gradually shifted from antrum to fundus and corpus, both of which are a consequence of the rise of FGPs, which tend to be numerous and located in the upper part of the stomach. In addition, the size of polyps tended to be smaller in period B, and this could be the result of either a more timely or detailed endoscopy, in an era when quality in endoscopy has become standard of care, or just the decrease of HPs, which tend to be larger than FGPs.

As mentioned before, in period B a significant increase of FGPs was detected in our cohort. Similar results were reported in 2 studies from China identifying a rise of FGPs and a decrease of HPs [4, 7] but this trend has also been underlined in Western registries [6, 9]. Plausible explanations of such a shift are that PPI use is increasing [14] and the prevalence of *H. pylori* is declining globally [15, 16]. Hence, the expansion and improvement of endoscopy, with GERD and dyspepsia as common indications, has revealed the current distribution of polyps and its dynamic change from HPs to FGPs.

Helicobacter pylori was tested for and found more commonly in period B than in period A. We assume that this finding does not contradict the abovementioned global decline of *H. pylori* prevalence but rather depicts an underestimation of its presence in period A, due to imperfect endoscopic or pathologic methods of identification, which later improved. Moreover, *H. pylori*

detection with pathology, used in this cohort, has low sensitivity; thus, an underestimation may have occurred throughout the duration of study.

This study had several limitations. We included data derived from a long period of time in our analysis, so an influence of amendments in clinical practice, management, *H. pylori* prevalence, and more importantly the release of new guidelines cannot be excluded. Also, during these years a variety of endoscopists with different professional experience and years of practice performed the exams, thus introducing different techniques and therapeutic plans. Conversely, pathologists remained rather stable; thus, the variability of findings may have been diminished. We should also take into consideration that this was a retrospective study thus intertwined with the bias and flaws of such research, although a prospective study in healthy a population to capture absolute rates of gastric lesions is unlikely to ever happen. The present investigation depicts a relative prevalence of polyps in a specific population of examined patients driven by the presence of a symptom. Nonetheless, selection bias may have been minimal because our hospital is not a tertiary centre and real-life unfiltered cases were the main subject of the study.

Conclusions

Our study included a large number of endoscopies with a considerable number of polypoid lesions, and thus consistently portrays the current pattern of epithelial gastric polyps as well as the timeline of their change during the last 15 years. Taking into account the high rates of failure to acknowledge a neoplastic lesion in upper endoscopy, the implications of such a shift in the epidemiology of gastric polypoid lesions along with the importance of mapping the surrounding mucosa are indisputably major [17]. We need to reconfigure our practice to incorporate these emerging epidemiological data of gastric lesions and provide better endoscopic diagnostic and surveillance programs for our patients.

Conflict of interest

The authors declare no conflict of interest.

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