Complication rates of colonic polypectomy in relation to polyp characteristics and techniques: a district hospital experience

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Abbreviations: PAS, Patient Administration System; EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection

Background: Colonic polypectomy reduces the subsequent rate of development of colonic cancer but is not without its risks. We aimed to examine our complication rates in relation to the characteristics of polyps and techniques employed.

Methods: A database for all colonic polypectomies performed over a 3½-year period between 2006 and 2009 was matched against all patients readmitted after an endoscopy. Serious complications post-polypectomy were defined as events leading to readmission within 14 days.

Results: We performed 2106 polypectomies on 1252 patients in this period. Fourteen patients or 24 (1.1%) polypectomies experienced complications. Two patients (0.09%) experienced perforation, 10 (0.47%) had bleeding and 3 (0.14%) had post-polypectomy syndromes. Our bleeding rate was 1:211, lower than the national standard of 1:100. No deaths were reported. Complication rates rose from 1% in the smallest group (1-10 mm) to 4.9% in the largest (>31 mm) but the difference was not statistically significant ($p=0.067$). Right-colon polypectomies had a higher tendency of developing post-polypectomy syndrome and bleeding ($p=0.002$). Complication rates in snare polypectomies were not significantly different from that of hot biopsies ($p=0.64$). However, endoscopic mucosal resections (EMR) had significantly more complications compared to snares ($p=0.045$) and hot biopsies ($p=0.026$).

Conclusion: We achieved lower bleeding rates than that published nationally. Hot biopsies did not carry a higher risk unlike EMRs. Although polyp size may be an important risk factor, statistical significance was not met. Ascending and transverse colon polypectomies carried the highest risks of complications.

Introduction

Colorectal carcinoma is one of the commonest cancers in the developed world. Most colorectal cancers are thought to arise from adenomatous polyps and it takes an average of 10 years for a less than 1cm polyp to transform into invasive colorectal carcinoma.^{1,2}

Colonoscopy, first introduced by Wolf and Shinya in 1960s, offers a way of screening for polyps and its subsequent surveillance.³ Colonic polypectomy by colonoscopy or flexible sigmoidoscopy reduces colorectal cancer incidence by 76-90%.⁴⁻⁶ Quoted rates of major complications in polypectomy are low, often around 1%.⁷

The aim of this retrospective observational study was to examine our complication rates in relation to the characteristics of polyps removed and techniques employed in a district hospital.

Methods

Patients

Over a 3½-year period from 2006-2009, 9500 patients underwent lower gastrointestinal endoscopy. We interrogated our endoscopy reporting database for all colonic polypectomies performed over this period. Those with macroscopically malignant lesions received conventional biopsies and were excluded from this study. We identified 2107 consecutive polypectomies in 1253 patients during this period. There were no failures or incomplete procedures. Data on polypectomy techniques and polyp morphology, site and size were collected.

Data on readmissions within 14 days following an endoscopy were obtained by a query on the Patient Administration System (PAS). A total of 441 episodes were recorded. This query was matched against the colonic polypectomy database using Microsoft Access (Microsoft Corporation, Redmond, Washington, USA) to identify cases of readmissions post-polypectomy. Serious complications were defined as events leading to readmission within a 14-day period. This timing was chosen to cover the risk period for late bleeding and late perforations following polypectomy.⁸ Readmissions for unrelated indications (i.e. elective surgery) were excluded.

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A separate log of events recorded prospectively by the endoscopy department was examined to ensure immediate complications treated within the initial admission were not missed. This study formed part of a service evaluation of our institution. All analyses were undertaken on an anonymized database and it was not possible to identify any study participants.

Polypectomy techniques

If polypectomy was contemplated then Warfarin was discontinued for 5 days and Clopidogrel 7 days prior to the procedure. If the patient could or did not discontinue the medication then only a diagnostic colonoscopy was performed. These were generally restarted the day after the procedure. Aspirin and Dipyridamole were continued without interruption.

The three techniques of polypectomy we employed were cold snare, hot biopsy and endoscopic mucosal resection (EMR). Within this period there were at least 12 colonoscopists. Three different electrosurgical units used were ERBE VIO 200D and ICC 200 (ERBE Electromedical, Tübingen, Germany) and CONMED Beamer System CE 600 (CONMED, Utica, NY, USA). Six types of snares were used. Three different sizes of the Olympus Endotherapy snares (Olympus Endotherapy, Hamburg, Germany) were used in simple snaring; 10 mm, 20 mm and 25 mm. Braided (20 mm) and Crescent (25 mm) snares were used for EMR. A larger Cook Medical Acusnare Soft Jumbo 30 mmx60 mm snare (Cook Medical, Bloomington, IN, USA) was used for large polyps. The EndoJaw Hot forceps (Olympus Endotherapy, Hamburg, Germany) were used for hot biopsies.

Minor non-procedural differences exist between different endoscopist. This reflects the eclectic nature of different clinical practice. EMR however was exclusively performed by a single endoscopist (Gastroenterologist), the vast majority by a lift and cut method. All polyps removed were sent for histological examination.

Statistical analyses

Continuous data are presented as mean $\pm$ SD. Categorical variables are expressed as frequencies and percentages, and comparison performed with χ^2 test and Fishers Exact Analysis. All p values are two-sided and a p of < 0.05 indicates statistical significance. Statistical analyses were performed with SPSS (SPSS Inc, Chicago, IL, USA).

Results

Baseline characteristics

Most polyps in our cohort were resected at colonoscopy (1978; 94%), while 129 (6%) were resected using flexible sigmoidoscopy. The mean age of all patients was 53.9 $\pm$ 10 years (range 17-89 years). Male patients formed 58% of our cohort. In total, 1620 lesions (76.9 %) were sessile and 484 (23.0 %) were pedunculated. Morphology of 3 polyps was not recorded.

Among the 2107 polyps resected, 266 (12.6%) were located in the right colon (caecum and ascending colon but excluding hepatic flexure), 370 (17.6%) in the transverse colon including hepatic and splenic flexures, 190 (9.0%) in the descending colon, 695 (33.0%) in the sigmoid colon and 578 (27.4%) in the rectum.

The locations of another 8 polyps were not recorded. Over 80% of polyps resected were 10mm or less. The number of polyps removed fell with increasing size. Only 2% of polyps removed were larger than 30mm, largest being 80 mm (2 polyps). The mean size of the polyps was 7.4 mm (range 1-80 mm). Baseline characteristics are shown together with complication rates in **Table 1**.

Overall complications rates

Fourteen patients (1.1%) or 24 (1.1%) polypectomies experienced complications within 14 days. There were 10 cases (0.47%) of bleeding, 2 cases (0.09%) of perforation and 3 (0.14%) post-polypectomy syndromes. **Table 2** presents complication rates per patient and per polyp. Examining complication per polyp is important because not all polyps in the same patient may give rise to complications when resected. On the other hand, examining complications per patient is also important as some complications might be influenced by patient factors.

Majority of our complications occurred with patients between 60 and 69 years of age but this age group constitutes the largest number of patients who received polypectomy treatment. We therefore found no influence of age on the complication rates. Despite the variability in operator experience, the incidence of complications was also not operator-dependent.

Our bleeding rate per polypectomy was 1:211, lower than the national target of less than 1:100. Our bleeding rate per patient was 1:250. All patients were managed conservatively except one patient whom required laparotomy. Our perforation rate per polyp was 1:1053, lower than the national target of less than 1:500. Our perforation rate per patient was 1:626. One patient required laparotomy and surgical cauterization as a result of perforation, the other was kept under observation and improved without intervention.

No deaths were reported within the study period. One patient suffered from myocardial infarction. Another six patients classed as 'others' in **Table 2** had chest infections or were readmitted with angina. These may be relevant as cardiopulmonary or sedation-related complications of the procedure.

Polyp characteristics

All of our complications occurred following colonoscopy and none after flexible sigmoidoscopy. Complication rates between sessile and pedunculated polypectomies were similar, approximately 1%. Although we performed more polypectomies in the descending colon, sigmoid colon and rectum (70%), we found fewer complications in these groups compared to ascending and transverse colon polypectomies (p=0.008). The latter groups had a higher tendency of developing post-polypectomy syndrome and bleeding. Complication rates rose from 1% in the smallest group (1-10 mm) to 4.9% in the largest (>31 mm) but the difference was not statistically significant (p=0.067).

Polypectomy techniques

We performed 1163 (55%) snare polypectomies, 783 (37%) hot biopsies and 161 (8%) endoscopic mucosal resections (EMR). The number of complications seen in snare polypectomies were not significantly different from that of hot biopsies (p=0.64). However, EMRs had significantly more complications compared

Table 1. Complications according to resection technique and polyp characteristics

	Snare	Hot biopsy	EMR	Total Complications and % of cohort	Cohort size (n)
No. of polyps resected	1163	783	161	-	-
Total complications and %	12 (1.0%)	6 (0.76%)	6 (3.72%)	-	-
Polyp morphology					
Sessile	6 (0.76%)	6 (0.91%)	6 (3.6%)	18 (1.1%)	1620
Pedunculated	6 (1.4%)	0	0	6 (1.2%)	484
Unknown	0	0	0	0	3
Polyp site					
Ascending	3 (1.8%)	1 (1.4%)	3 (11.5%)	7 (2.6%)	266
Transverse (inc flexures)	4 (2.3%)	3 (1.7%)	1 (4.3%)	8 (2.2%)	370
Descending, Sigmoid, Rectum	5 (0.58%)	2 (0.42%)	2 (1.7%)	9 (0.62%)	1463
Unknown	0	0	0	0	8
Polyp size					
1 to 10 mm	11 (0.012%)	6 (0.81%)	0	17 (1.0%)	1766
11 to 20 mm	1 (0.72%)	0	4 (4.3%)	5 (2.1%)	236
21 to 30 mm	0	0	0	0	60
>31 mm	0	0	2 (5.7%)	2 (4.9%)	41
Unknown	0	0	0	0	4

Table 2. Types of complications

	Complications per patient	Complications per polyp				
		Snare	Hot biopsy	EMR	Total complications	%
Bleed	5	4	4	2	10	42%
Perforation	2	0	0	2	2	8.2%
Polypectomy syndrome	1	3	0	0	3	12.5%
Ischaemic heart disease	1	1	0	0	1	4.1%
Others	4	3	2	1	6	25%
Unknown	1	1	0	1	2	8.2%
Total	14	12	6	6	24	100%

to snares ($p=0.006$) and hot biopsies ($p=0.002$), **Table 1**. This was reflected in an increase in both late bleeds and perforations although late bleeds alone did not meet statistical significance. More complications occurred with EMR in larger polyps since EMR is usually reserved for larger and more complicated polyps.

One third of our hot biopsies ($n=261$) were performed between caecum and the splenic flexure. Only three (1.15%) of these cases were complicated. The British Society of Gastroenterology does not advise hot biopsies in this region given its potential risks.⁸ A comparison of complication rates between hot biopsies and snare polypectomies on polyps less than 10 mm did not meet statistical significance (1.1% vs. 0.63%, $p=0.28$).

Discussion

Our low complication rates confirm the safety of polypectomy in a screening programme. We found that EMR and right-colon polypectomy carried a significantly higher risk.

The commonest complication post-polypectomy is bleeding. Haemorrhage usually occurs between 1 and 14 days after polypectomy although secondary haemorrhage has been reported up to 30 days after polypectomy.⁸ The incidence of post-polypectomy bleeding varies from 0.19%-24%.^{9,10} Our bleeding rate of 1:211 was lower than the < 1:100 standard recommended

by the United Kingdom National Health Service (NHS) Bowel Cancer Screening Programme (BCSP).

The risk of post-polypectomy bleeding is known to be higher in larger polyp in the proximal colon.¹¹ Our right and transverse colon polypectomies demonstrated a significantly higher risk of complications than that of left colon. This could be due to the thinner colon wall and more superficial submucosal arteries in proximal colon. Larger polyps could be excised by surgery although surgery has its risks with 2-4% chance of mortality and 10% morbidity.¹² In some cases, the abundance of small polyp could cause significant bleeding cumulatively.¹³ The incidence of bleeding is also influenced by the resection technique. Rate of bleeding after mucosectomy or piecemeal resection has been reported to be as high as 24%.¹⁴

The second commonest complication is perforation. Our perforation rate of 1:1053 was lower than the < 1:500 standard recommended by the NHS BCSP. Perforation could result from mechanical forces against the bowel wall, barotraumas, or as a direct result of therapeutic interventions. Perforation occurs more commonly in right colon and can occur in up to 14% after endoscopic submucosal dissection (ESD).⁹ Complication rates with endoscopic resection would undoubtedly be higher given the more aggressive nature of such technique compared to cold snare. Perforation increases with age and the presence of diverticular

disease. Delayed perforation is an indication for laparotomy.

Post-polypectomy syndrome occurs in 0.5%-2% of polypectomies and is common after the removal of large (>20 mm) sessile polyps.⁹ Transmural burn in this syndrome does not cause actual perforation but its symptoms can resemble localized perforation. All of our cases settled with bowel rest. The risks of transmural burns conventionally associated with hot biopsy were not supported by our findings since the incidence of complications with hot biopsy was not significantly different when compared to snares.

One limitation observed in this study is its non-randomized nature. However, the use of consecutive series of patients and an equally distributed baseline data in our cohort increases the reliability of this study. Given the size of our study population, definitive conclusions can be drawn. Secondly, the length of follow-up in this study is relatively short. A longer prospective study as recommended by BCSP may increase the strength of this study. Thirdly, although patients who experience complications may present to other regional hospitals, we feel this is very unlikely especially within 14 days of polypectomy due to low population mobility in our densely populated catchment area.

In conclusion, we achieved lower bleeding rates than that published nationally. Hot biopsies did not carry a higher risk unlike EMRs. Although polyp size may be an important risk factor, statistical significance was not met. Ascending and transverse colon polypectomies carried the highest risks of complications. Patients should be made aware of this risk prior to their procedure.

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