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Long-term outcomes for Advanced Colorectal Polyps in the BowelScreen Programme

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Abstract

Aims

Colonoscopies performed as part of a colorectal cancer screening programmes regularly identify large non-pedunculated colorectal polyps (LNPCPs). Endoscopic Mucosal Resection (EMR) is a minimally invasive endoscopic resection strategy, for effective management of LNPCPs. There is limited published data on clinical outcomes for EMR carried out within screening programmes.

Methods

A retrospective analysis of a prospectively-maintained EMR database of BowelScreen patients in a single centre over a 5 year period.

Results

Fifty-two polyps in 50 patients underwent EMR in the study period. Median polyp size was 25mm (range 20-70mm). Adenocarcinoma was identified in 7.8% of resection specimens (n 4/51). Complications were recorded in 5.7% of EMRs (n 3/52). Surveillance was completed for 87.8% (n=36/41) of eligible patients with a site-check recurrence rate of 8.3% (n 3/36). Recurrence was successfully managed endoscopically through the surveillance programme with an 18 month recurrence rate of 2.7% (n 1/36). Surgery was avoided in 92% (n 46/50) of patients undergoing EMR.

Discussion

Complex polyps identified in the colorectal cancer screening programme are effectively and definitively managed by minimally invasive endoscopic resection.. Low recurrence and complication rates underscore the value of EMR as part of a screening programme. Post-EMR surveillance identifies a small number of endoscopically manageable recurrences, with encouragingly high levels of compliance.

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Introduction

The National Colorectal Cancer Screening service (NCSS, BowelScreen) was introduced in May 2012 to proactively identify both premalignant polyps and early colorectal cancers and initiate appropriate management. All adults, between the age of 60 and 69 are invited to participate on a 2 yearly basis[1]. Eligible adults are provided with a faecal immunohistochemistry test (FIT) test to assess for the presence of faecal haemoglobin (f-Hb). Patients with f-Hb levels over 45µg/g are invited for a screening colonoscopy in one of 17 accredited participating endoscopy units.

Adenomas are detected in up to 50% of bowel screening enrolled patients[2, 3]. The majority of adenomas are small and suitable for endoscopic resection (polypectomy) at the time of screening colonoscopy. Larger adenomas, >20mm in size, or with other concerning features, may require advanced endoscopic techniques to safely complete resection (Large Non-Pedunculated Colorectal Polyps, LNPCPs). LNPCPs are detected in 7.7-8% of screening colonoscopies[4, 5].

Previously, LNPCPs necessitated surgical resections to be safely removed. However, non-invasive approaches such as Endoscopic Mucosal Resection (EMR) can now safely resect LNPCPs as day case procedures, for both screening and symptomatic patient groups, preventing the need for hospital admissions and surgical resections in the majority of patients[6, 7]. Validated scoring systems such as the Size-Morphology-Site-Access score (SMSA) can be used to objectively assess polyp complexity to aid the EMR decision process[8]. Providing a high quality EMR service requires additional planning, time considerations and ensuring patient understanding of the higher rates of potential complications versus standard polypectomy[9].

Post-EMR, patients require surveillance of the resection site to ensure no residual or recurrent adenoma (RRA) is present. As EMR techniques result in different rates of RRA [10], BowelScreen recommends surveillance intervals according to the index EMR technique [11, 12]. Piecemeal EMRs (pEMR) undergo site-check colonoscopy (SC) at 4-6 months and 18 month intervals post resection[11]. En-Bloc EMRs do not require a site check and require surveillance at 3 years post resection[11].

Methods

A retrospective analysis of outcomes for BowelScreen patients undergoing Endoscopic Mucosal Resection of LNPCPs over a 5 year period (2019-2023) was completed. Data was identified via the Mater Polyp Registry, a prospective record of all EMR procedures in both screening and symptomatic services. This registry was established in 2019, with ethical approval from the Mater Misericordiae University Hospital (MMUH) Institutional Review Board for the data collection and analysis of all EMR procedures completed (IRB reference 1/378/2270). BowelScreen EMR procedures were completed by 3 consultant

gastroenterologists during the study period. Annual EMR volume in MMUH (including symptomatic and screening services) exceeds 150 EMRs per year.

Patients with positive f-Hb results >45µg/g were invited for colonoscopy completed by an accredited BowelScreen consultant endoscopist. All BowelScreen patients are consented for potential EMR of LNPCPs during index procedures as standard, including a discussion of the additional risks of EMR over standard colonoscopy. LNPCPs identified during BowelScreen colonoscopy either underwent EMR on the date of index procedure or were deferred for a dedicated EMR at a later date within 4 weeks. LNPCPs for deferred EMR were not routinely biopsied during index colonoscopy to preserve resectability at deferred EMR dates.

Data was collected on dedicated software on a secure centralized institutional server. Patient characteristics (age, sex) were recorded at time of enrolment in the database. Procedural information (EMR technique, sedation use, polyp characteristics (size, location, SMSA score) and complication incidence) was recorded by the endoscopist immediately post procedure. For a cohort of procedures with incomplete SMSA data, retrospective scores were applied. Histopathological data was obtained from histology reports. Adverse events were identified based on subsequent attendance or admissions at local or secondary institutions. Site check information was input by the endoscopist post subsequent site check procedures.

Data analysis and interpretation was completed using IBM SPSS statistics Version 29.0. Categorical variables were described using frequencies and percentages. Mean, median and interquartile ranges (IQR) were calculated for continuous data. A p value of <0.05 was considered significant. Comparisons between cohorts and outcomes were completed using $\chi 2$ (Chi-Square) or Fisher's exact test. The SQUIRE checklist was used to aid writing this report[13].

Results

Fifty-two LNPCPs, in 50 BowelScreen enrolled patients, underwent EMR between 2019 and 2023. 71% (n=37/52) of EMRs were completed on the date of BowelScreen appointment vs 29% (n=15/52) were completed as a deferred EMR procedure for a BowelScreen detected polyp. One endoscopist accounted for 48% of BowelScreen EMRs (n=25/52), with the remaining 2 endoscopists accounting for 29% (15/52) and 23% (12/52) respectively.

Males accounted for 53.8% (n=28/52) of EMRs. Median age was 65.4 years range (60.3-75.6). Median polyp size was 25mm (range 20-70mm). Right sided polyps (proximal to the splenic flexure) accounted for 51.9% (n=27/52) (*Table 1).* Piecemeal EMR (pEMR) was the most common technique (85%, n=44/52), followed by en-bloc EMR (10%, n=5/52) and cold piecemeal EMR (6%, n=3/52). SMSA scores were available for 71% of polyps (n=37)* with a median SMSA score was 10 (range 8-17).

Intra-procedural bleeding (IPB), defined as bleeding lasting >60 seconds, occurred in 23.1% (n=12/52). Snare-tip soft coagulation (STSC) was the most common margin thermal ablation

(MTA) therapy and was used in 73.1% (n=38/52) of EMRs. There was no significant variation in STSC use by year over the study period (p=0.802). Endoclips were deployed in 51.9% of all EMRs (n=27/52); 44.4% (n=12/27) of right sided EMRs and 60% (n=15/25) of left sided EMRs, p=0.283.

Specimen histology was available for 98.1% of EMRs (n=51/52). Tubulovillous adenomas were the most common histology (58.8%, n=30/51). Adenocarcinoma was identified in 7.8% of resection specimens (n=4/51) *(Table 2)*. Cancerous LNPCPs were significantly larger than non-cancerous LNPCPs (median size; 31 vs 25mm, p=0.035). All cancerous polyps occurred in left sided EMRs.

Complications were recorded in 5.7% of EMRs (n=3/52). Grade 1 Deep Mural Injury (DMI)[14] was identified at the time of resection in 2 patients. Both episodes of DMI were successfully managed with endoclip application and did not require admission. There was a single episode of post-polypectomy bleeding (PPB) which occurred 10 days post EMR and required re-admission, transfusion and repeat endoscopy. There were no cases of perforation or post-polypectomy syndrome.

Site check procedures were completed for 87.8% of eligible patients (n=36/41), *(Figure 1)*. Median interval to SC1 was 181 days (range 77-452) for pEMRs. RRA was detected at 8.3% (n=3/36) of first site checks (SC1). All cases of recurrence occurred post pEMR resections. There was no significant difference in recurrence rates for MTA (9.7%, n=3/31) vs non-MTA cases (0%, n=0/5) p=1.000.

Endoscopic recurrence resection (ERR) was attempted in all cases of recurrence. ERR included both thermal resection strategies (hot snare) and thermal ablative strategies (APC or STSC). Subsequent site check 2 (SC2) data was available for 66.6% (n=2/3) of recurrence cases. No RRA was detected in 1 case, with further RRA detected in the other case. Repeat ERR was attempted at SC2, resulting in clear EMR scar at SC3 (*Figure 2*).

All 4 patients with malignant histology were appropriately referred for surgical management. Three of these patients proceeded to surgical resection while 1 patient declined resection and elected to undergo surveillance with CT and MRI.

Median polyp size was larger for deferred EMRs vs index EMRs (30mm vs 25mm, p=0.010). Complication rates were not significantly different between the groups (13.3% vs 2.7%, p=0.079). Recurrence rates were similar in both groups (7.1% vs 10%, p=1.00).

Discussion

Endoscopic resection was successful in avoiding surgical intervention in 92% of BowelScreen patients who previously would have required surgery. This is consistent with international studies comparing EMR and surgical outcomes[6]. The use of EMR in LNPCP resections has also reduced the demand for inpatient admissions and operating theatre time necessary to

accommodate surgical resections. Both EMR recurrence and complication rates are acceptably low and are similar to international EMR centres[15].

Stratifying EMR complexity using the SMSA score, allows selected EMRs to be completed safely on the day of index BowelScreen procedure, or at a deferred procedure within 4-6 weeks, without compromising patient outcomes. The integration EMRs within the BowelScreen programme facilitates rapid access to EMR for patients with large or complex polyps. Despite deferred EMRs constituting an objectively more complex polyp population, as confirmed by SMSA scores, recurrence and complication outcomes appear similar to index EMRs.

Adherence to surveillance post-EMR is excellent, with 87.8% of patients completing appropriate post resection colonoscopies in line with BowelScreen guidelines. This surveillance programme has successfully identified early cases of recurrence, facilitating timely endoscopic management and achieved an ultimate recurrence rates of 2.7% (n=1/36) at 18 months. Endoscopic resection strategies, including combination of both thermal resection and thermal ablative strategies have proved effective in treating recurrence.

Cancerous polyps were significantly larger than non-cancerous polyps, consistent with the adenoma-carcinoma pathway of colorectal cancer[7, 16, 17] and were appropriately managed surgically. Although the cancer rate was reasonably high (7.8%), it is consistent with literature on submucosal invasive carcinoma (SMIC) in EMR specimens[18].

Some limitations of this analysis are the small sample size, and retrospective, single centre nature. Additionally, colorectal screening services were also paused during the initial phase of the COVID-19 pandemic, reducing procedural volumes[19]. A similar limitation is the retrospective allocation of a cohort of SMSA scores for polyps with incomplete data, which may be confounded by observer bias. Non-standardised reporting techniques resulted in varying descriptions of EMR procedures by participating endoscopists. Standardised reporting for EMR procedures may reduce inter-operator report variability in future.

In conclusion, the integration of an endoscopic resection service into the national BowelScreen programme is safe and effective with robust long-term clinical outcomes. Polyps can be safely resected either during the index colonoscopy or at a deferred procedure, depending on lesion complexity.. The BowelScreen surveillance programme ensures timely site check procedures are completed and recurrence is managed effectively.Tables

Table 1. – Polyp Characteristics

Characteristic	Frequency	%
Colonic Location	n=/52	
Ileocaecal Valve	1	1.9
Caecum	6	11.5
Ascending Colon	16	30.8
Transverse Colon	4	7.7

Descending Colon	4	7.7
Sigmoid Colon	11	21.2
Rectosigmoid	2	3.8
Rectum	5	9.6
Anorectal Junction	3	5.8
EMR Technique		
pEMR	44	84.6
Cold pEMR	3	5.7
En Bloc EMR	5	9.6
Histology	n=/51†	%
Adenoma	**39**	**76.4**
Tubulovillous Adenoma	*30*	*58.8*
Tubular Adenoma	*9*	*17.6*
Non-Adenomatous Polyp	**8**	**15.7**
Sessile Serrated Lesion	*7*	*13.7*
Traditional Serrated Lesion	*1*	*2.0*
Cancer	**4**	**7.8**

Abbreviations; pEMR; Piecemeal EMR
†One EMR specimen was not retrieved and thus excluded from histological analysis.

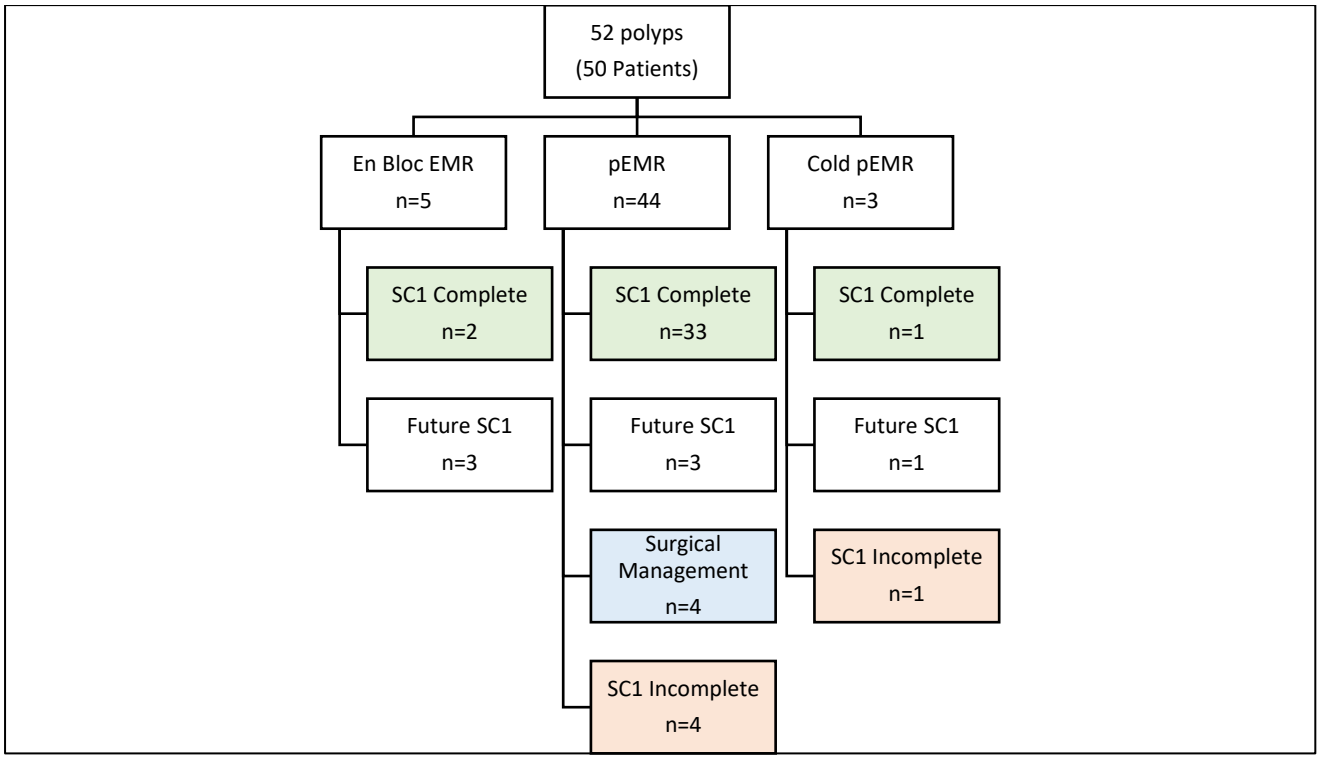
Table 2. – Demographics and Polyp Characteristics by Histology

	Cancer (n=4)	Non Cancer (n=48)	P value
Male Sex (n)	50% (2)	50% (2)	0.760
Median Age (Range)	66 (60-69)	65 (60-75)	0.546
Median Size (Range)	31mm (20-50)	25mm (20-70)	**0.035**
Right Sided Location	0%	56.3% (27)	**0.047**
Technique			1.000
pEMR	100% (4)	83.3% (40)	
IPB	50% (2)	20.8% 10)	0.224
Complications	0%	6.2% (3)	1.000

Abbreviations; pEMR; Piecemeal EMR, IPB; Intra-procedural Bleeding

Figures

Figure 1 - Surveillance Adherence by Technique



Abbreviations: pEMR; Piecemeal EMR, SC1; 1st Site Check

Figure 2 - Outcomes for BowelScreen EMR patients

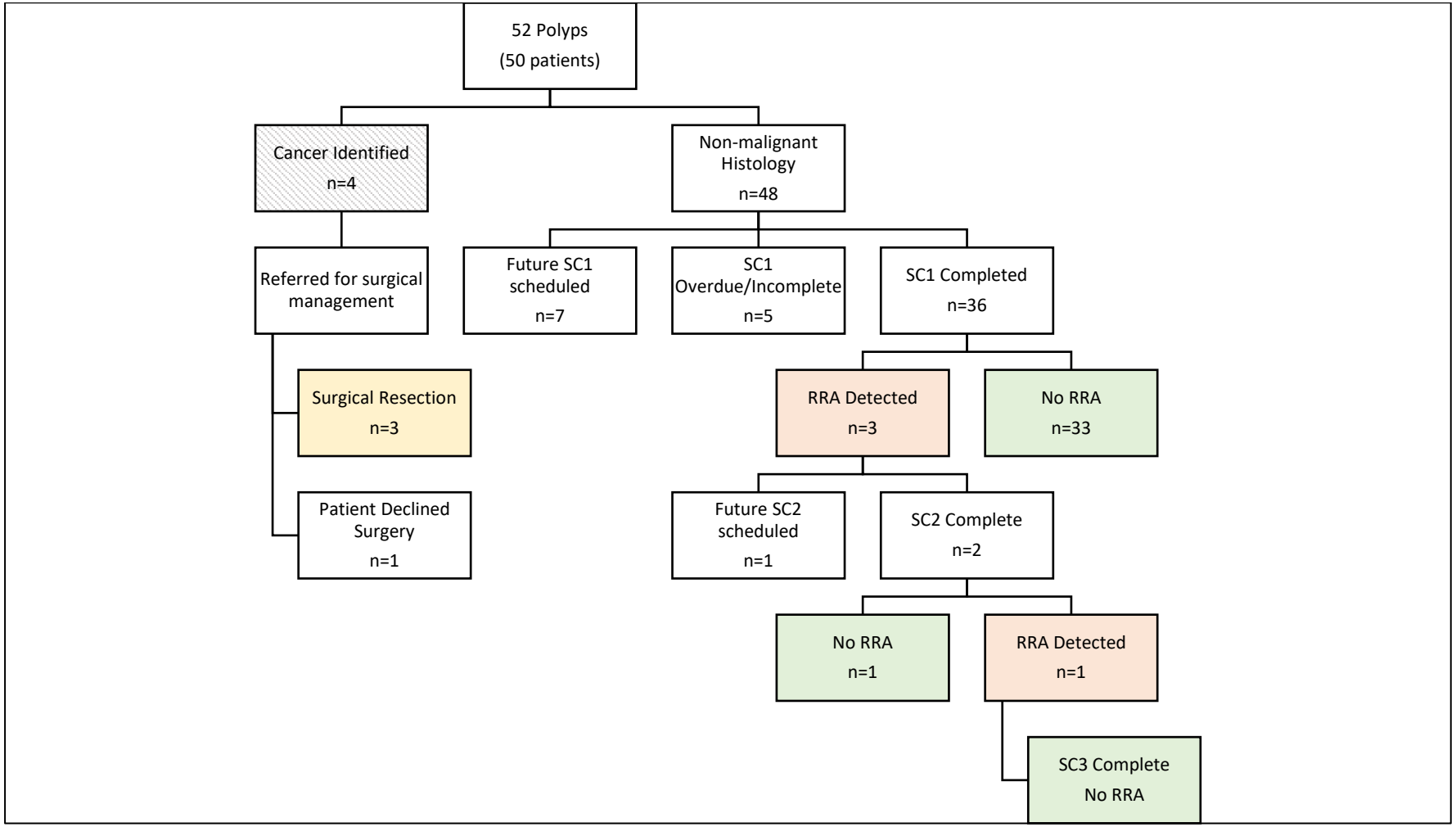


Figure Legend: SC1; 1st Site Check, SC2; 2nd Site Check, RRA; Recurrence or Residual Adenoma

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Declarations of Conflict of Interest:

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