


Imaging findings post colorectal endoscopic mucosal resection

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ABSTRACT

Endoscopic mucosal resection is commonly the treatment regime of choice for large sessile colonic polyps. We describe the computed tomography findings of a 51 year old female who presented with transient severe abdominal pain without systemic upset post endoscopic mucosal polyp resection, which resolved with conservative management. This is the second case in the literature that demonstrates 'normal' appearances post endoscopic mucosal resection. The clinical team and radiologist need to be aware of these findings when making management decisions in patients who present with acute pain post endoscopic mucosal resection.

CASE REPORT

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A 51 year old Caucasian female underwent routine day-case endoscopic mucosal resection (EMR) of a 30 mm sessile mid-descending colonic polyp. The patient had previously undergone an uneventful EMR for a histologically proven villous adenoma four years ago. She was otherwise fit and well with no significant past medical history, did not take any routine medications, had no known allergies and was a non-smoker. Four sachets of Kleen Prep® were administered over 24 hours prior to the procedure with a low residue diet for bowel cleansing.

The EMR was performed as a routine procedure after the lesion had been characterized during an earlier endoscopy using chromo-endoscopic techniques as a laterally spreading lesion with nodular components showing Kudo type 4 pit pattern throughout [suggestive of a tubulo-villous adenoma]. The procedure was carried out with an Olympus 212 CF240DL gastroscope as the lesion was wrapped around a fold. The lesion was raised with 35 mls of EMR solution via injection with small aliquots using a 10 ml syringe [8 Gelofusine, 1 ml 1/10000 Adrenaline and 1 ml 1% Indigocarmine]. The lesion lifted well and was removed

piecemeal with a good endoscopic result. The edges were treated prophylactically with Argon Plasma Coagulation. Histology confirmed a tubulo-villous adenoma (figure 1).

The patient developed severe left iliac fossa pain two hours post procedure. Basic physiological parameters were within normal limits - respiratory rate 14/min, heart rate 60/min, temperature 36.5°C, blood pressure 112/75 mmHg, oxygen saturations 98% on room air. On examination the abdomen was soft, however there was exquisite tenderness in the left iliac fossa. Haematological and biochemical investigations were within normal limits. The patient underwent an urgent portal-venous phase contrast enhanced abdominal and pelvic computed tomography scan (CT) - see figures 2 and 3. The imaging demonstrated a 'clean' right and transverse colon, which was distended with gas in keeping with the recent bowel preparation and colonoscopy. The descending colon from its origin at the splenic flexure showed diffuse circumferential transmural thickening and oedema, which was regular with a smooth pattern. There was evidence of intramural air bubbles - mid left colon, figure 2B - at the polypectomy site, however there was no evidence of any free air or free fluid. There was some stranding in the adjacent fat. Within the remaining abdomen the pancreas, spleen, both

kidneys and adrenals were normal. The liver exhibited minimal fatty change with a small simple cyst noted in segment 6.

As there was no evidence of perforation the patient was managed conservatively with bowel rest, intravenous fluids and analgesia. The pain settled after 4 hours and the patient was observed for a further 12 hours. At this point the patient remained pain free and clinically well. All observations were within normal limits. Repeat blood biochemical parameters remained within normal limits. Oral intake was recommenced and the patient was discharged 12 hours later - 24 hours after the onset of pain. The patient remained well. Histological assessment of the EMR specimen confirmed a villous adenoma.

DISCUSSION

Adenomatous colonic polyps take approximately 10 years to develop into invasive colorectal adenocarcinoma [1,2]. Colonic polypectomy has been shown to reduce the subsequent development of cancer by 76-90% and EMR is common practice [3]. EMR involves injection of a fluid with or without epinephrine and often with dye - submucosally under the polyp. This elevates the polyp and increases the depth between the mucosa and outer bowel wall allowing the polyp to be excised. The major complications include bleeding, perforation and post polypectomy electrocoagulation syndrome. Other complications include localised ischaemia of the colonic wall secondary to adrenaline injection and intramural haemorrhage, however these are rare [3, 4].

The commonest complication is haemorrhage with incidence rates from 0.19%-24% [5-6], however the United Kingdom National Health Service Bowel Cancer Screening Programme recommends a rate of <1% for all types of polypectomies [7]. Bleeding maybe immediate or delayed, with delayed haemorrhage commonly occurring within the first 14 days post polypectomy, however haemorrhage has been reported up to 30 days following the procedure [7]. It is more common with larger more proximal polyps (caecum and ascending colon) [8]. Radiological investigation of lower gastrointestinal bleeding post-polypectomy - arterial phase contrast enhanced CT - and interventional radiological treatment maybe required if bleeding does not settle with conservative and/or endoscopic management or the patient becomes unstable.

Perforation is the second commonest complication with accepted rates of <1:500 [7]. Perforation may result from mechanical forces against the bowel wall, barotrauma, or as a direct result of therapeutic interventions. The incidence of perforation is increased in right sided resections, increasing age group and presence of co-existing diverticular disease, perforation rates are also shown to increase as the lesion size increases [3]. Radiologically, a plain abdominal or erect chest radiograph may show evidence of pneumoperitoneum with evidence of subdiaphragmatic free gas, the "football sign" - large pneumoperitoneum outlining the entire abdominal cavity - or "Rigler sign" - gas outlining the luminal and serosal

surface of the bowel wall - if there is a significant amount of gas, 'Doges Cap sign' - free air in morrison's pouch or the 'Falciform ligament sign'. On CT there maybe frank pneumoperitonem or a localised collection of intra-peritoneal gas, which is often related to the point of perforation. There is also generally associated free fluid and inflammatory stranding in the surrounding mesentery/fat. Colonic perforation post-EMR must not be missed, as the patient will generally require urgent surgical intervention.

Post-polypectomy electrocoagulation syndrome - serositis, transmural burn, post polypectomy syndrome - is important to recognize as the vast majority of cases resolve with conservative treatment and bowel rest [9]. Post-polypectomy syndrome develops when electrical current applied during polypectomy extends past the mucosa into the muscularis propria and serosa, resulting in a transmural burn without perforation and historically occurred in approximately 1% of endoscopic polypectomies [9]. The adoption of submucosal saline injection to elevate the polyp prior to resection is thought to have reduced the incidence of post-polypectomy syndrome, however there are no large randomized studies. Serosal irritation leads to a localised inflammatory response, which manifests as local peritonism. It classically presents 6 hours to 5 days - with a mean of 2 days - post resection of a large - >2 cm - polyp with abdominal pain, leukocytosis, pyrexia and peritoneal inflammation [9]. Post polypectomy syndrome is generally treated conservatively [4, 9], however it is likely these patients will undergo cross sectional imaging and it is important that the radiologist identifies any further complications that would require more invasive treatment - such as perforation and bowel wall ischaemia. The CT findings of the colon in post-polypectomy electrocoagulation syndrome and 'normal' colonic appearances post-uncomplicated EMR are not dissimilar - see below -, in post-polypectomy electrocoagulation syndrome there will be a local inflammatory response, with imaging findings similar to that seen in appendicitis and diverticulitis. Clinicians and Radiologists should be alert to patients with polypectomy syndrome who deteriorate further after initial imaging which showed no evidence of free gas or perforation. A small subgroup may have through-and-through colonic burns, which initially have wall integrity, however the necrotic wall subsequently perforates.

The patient who develops severe pain post-polypectomy is likely to have CT imaging, thus it is imperative to be aware of the normal post-EMR appearances. These include colonic wall transmural thickening, with oedema and intramural gas - figure 1 and 2. Intramural gas - pneumatosis intestinalis - is rightly viewed as a significant finding and has numerous life threatening causes such bowel necrosis or gangrene with associated disruption of the bowel mucosa - associated with necrotizing enterocolitis, ischemia/infarction, neutropenic colitis, sepsis, volvulus - and subsequent entry of gas forming bacteria into the bowel wall. However, more benign causes of pneumatosis intestinalis are well recognized, such as post surgical jejunostomy insertion and COPD. We have shown that in the setting of a post-EMR patient correlation with the clinical findings is of paramount importance to discern which

patients require emergent intervention, as this may be a normal finding.

TEACHING POINT

CT is the pivotal tool in deciding whether a patient needs urgent surgical intervention for complications post colonic polyp EMR. The radiologist must be aware of the 'normal' colonic findings in a patient who has recently had an EMR, which include an extensive segment of circumferential transmural thickening of the colon wall in the resection region, with associated oedema and intramural gas - pneumatosis intestinalis.

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FIGURES

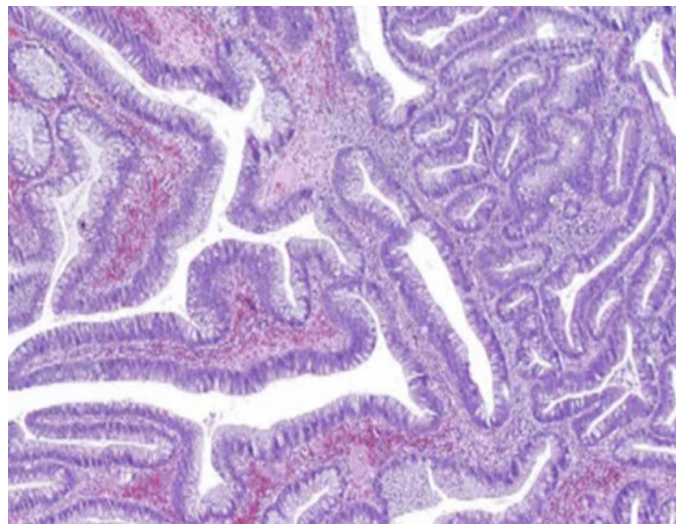


Figure 1: Histological section from the fragmented polyp showing an adenoma with a tubular and focally villous pattern, with atypical cells and large hyperchromatic nuclei. (H & E stain with x5 magnification)

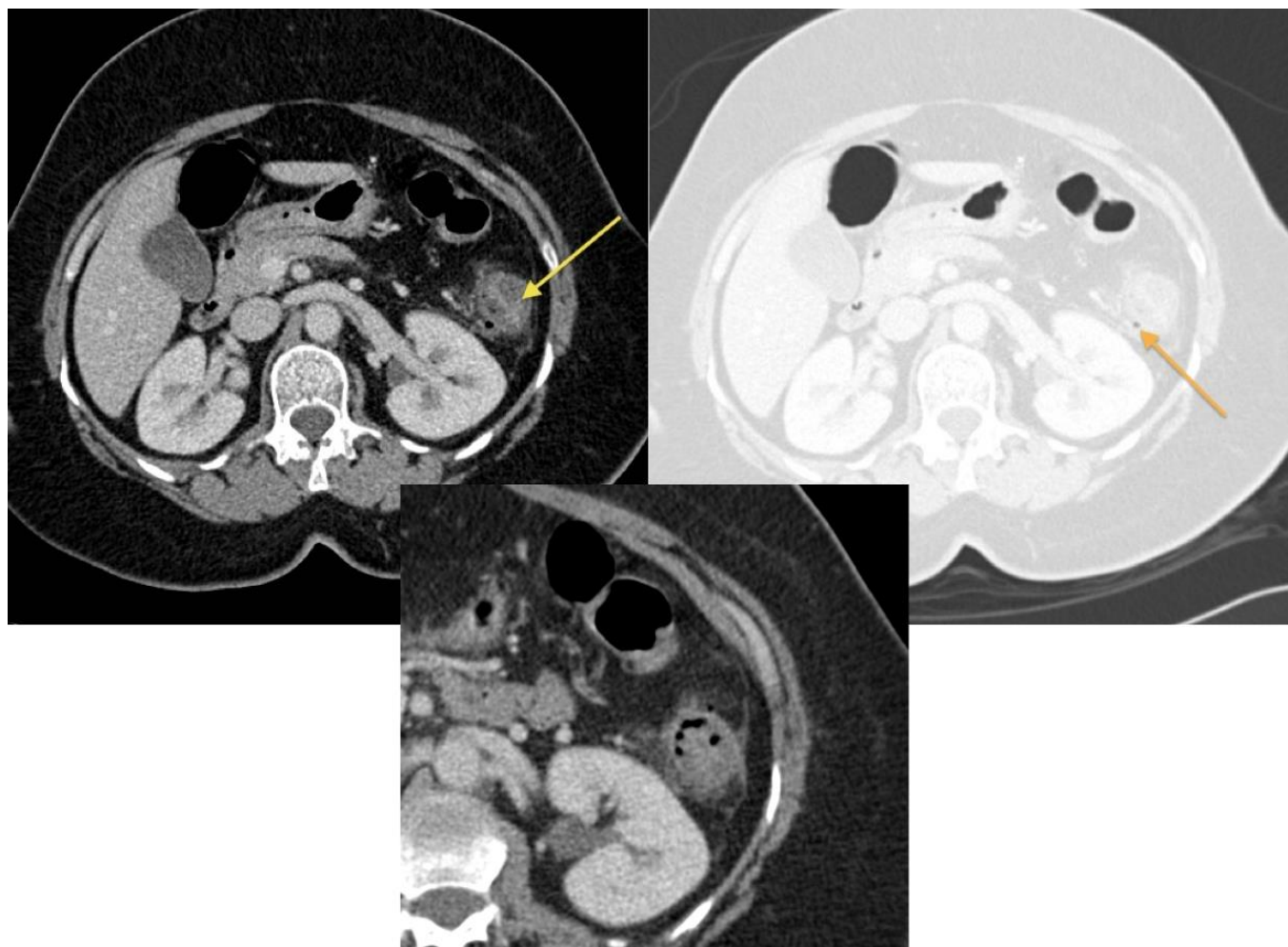


Figure 2: 51 year-old, female with normal MDCT findings post Endoscopic Mucosal Resection of a 30 mm sessile mid-descending colonic polyp. Axial contrast enhanced portal-venous phase in soft tissue (width 400 HU, level 40 HU) and lung windows (width 1500 HU, level -500 HU) with magnification, demonstrates circumferential transmural thickening and oedema of the descending colon (yellow arrow), evidence of intramural gas (orange arrow) and surrounding fat stranding. (Protocol: Portal-venous phase contrast enhanced axial MDCT using 100 ml of Imeron 350 (Bracco Imaging) contrast with an acquisition delay of 70 seconds acquired at 140kV, with a modulated mA and a total mAs of 4833 with a slice thickness of 2 mm acquired on a Siemens Somatom Sensation 16).

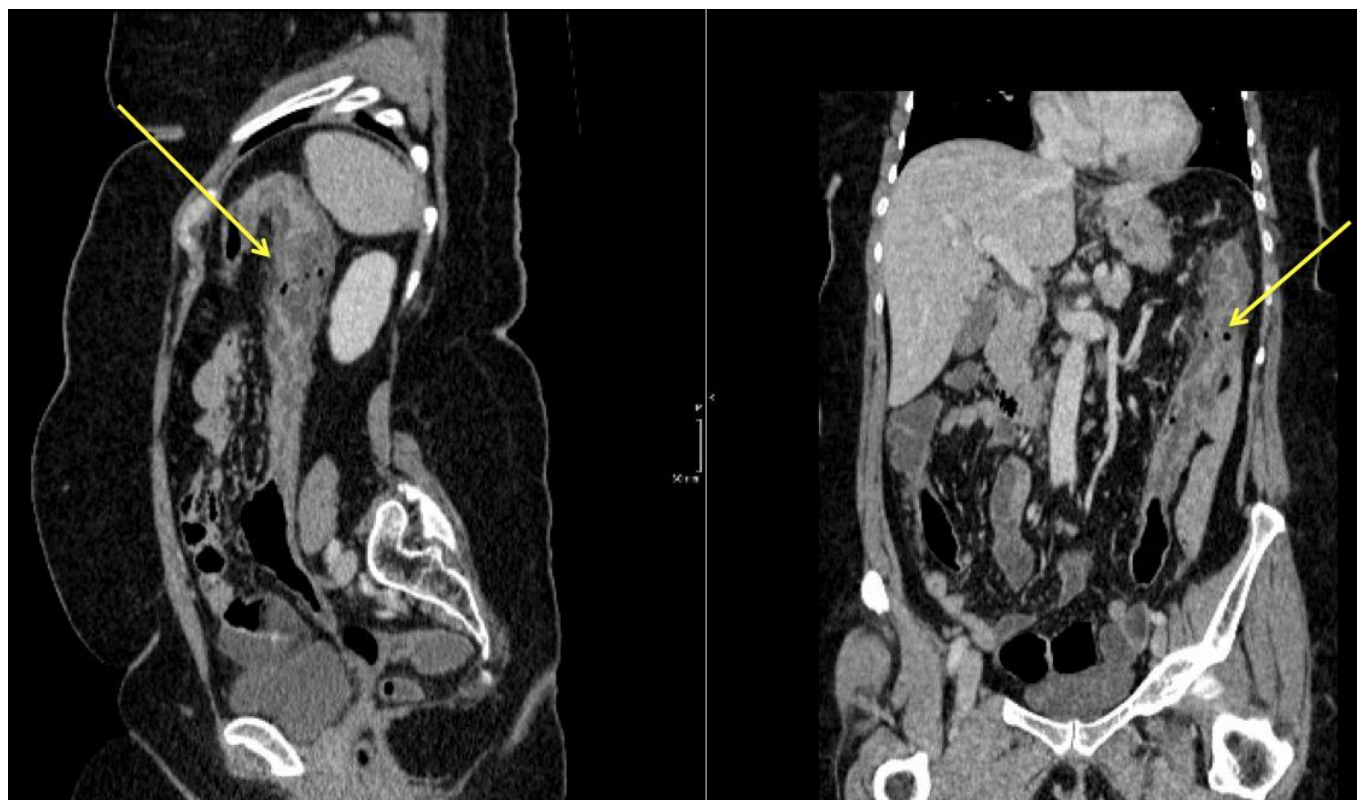


Figure 3: 51 year-old, female with normal MDCT findings post Endoscopic Mucosal Resection of a 30 mm sessile mid-descending colonic polyp. Coronal and sagittal reformatted images presented in soft tissue windows (width 400 HU, level 40 HU) demonstrate diffuse circumferential transmurial thickening and oedema of the descending colon, (arrow on sagittal image) with evidence of intramural gas (arrow on coronal image).

(Protocol: Portal-venous phase contrast enhanced axial MDCT using 100 ml of Imeron 350 (Bracco Imaging) contrast with an acquisition delay of 70 seconds acquired at 140kV, with a modulated mA and a total mAs of 4833 with a slice thickness of 2 mm acquired on a Siemens Somatom Sensation 16).

Incidence	Haemorrhage <1:100* Perforation <1:500* Post polypectomy syndrome <1%
Gender ratio	1:1, no reported difference [3,11]
Age predilection	The literature suggests as age increases risk increases, however a recent review of 2106 polypectomies showed no statistically significant age predilection [3].
Risk factors	Haemorrhage <ul style="list-style-type: none"> • Polyps > 2 cm • Right sided polyps • Bleeding diathesis • Piecemeal excision Perforation <ul style="list-style-type: none"> • Pre-existing Diverticulosis • Polyps >2 cm • Right sided polyps Post polypectomy syndrome <ul style="list-style-type: none"> • Polyps > 2 cm
Treatment	Haemorrhage <ul style="list-style-type: none"> • Conservative • Radiological intervention • Surgical intervention Perforation <ul style="list-style-type: none"> • Surgical intervention Post polypectomy syndrome <ul style="list-style-type: none"> • Conservative with bowel rest +/- antibiotics

Table 1: Summary table for complications post Endoscopic Mucosal Resection.

* = United Kingdom National Health Service Bowel Cancer Screening Programme recommendations.

	X-Ray Findings	US Findings	CT Findings
Normal appearances post- endoscopic mucosal resection	Nil specific	Oedematous bowel wall in region of resection	Circumferential transmural thickening of the colon wall in the resection region, with associated oedema, intramural and surrounding fat stranding gas. No pneumoperitoneum.
Haemorrhage	Nil specific	Nil specific. Normal appearances post- endoscopic mucosal resection	High attenuation within colonic lumen. Blush of contrast in arterial phase if active haemorrhage. Pooling of contrast in portal venous phase.
Perforation	Free gas/ pneumoperitoneum	Nil specific. Normal appearances post- endoscopic mucosal resection. Free fluid.	Free gas/ pneumoperitoneum. Free fluid. Mesenteric stranding in region of perforation.
EMR syndrome		Normal appearances post- endoscopic mucosal resection or oedematous/thickened non-peristaltic bowel wall in the region of the resection. Free fluid	Normal post-endoscopic mucosal resection appearances plus free fluid and peritoneal stranding localised to area of resection.
Localised ischaemia	No specific findings	Oedematous/thickened non-peristaltic bowel wall in the region of the ischaemia. Free fluid	Intestinal wall thickening. Pneumatosis intestinalis.
Intramural haemorrhage	Mechanical bowel obstruction	Submucosal haematoma, narrowed lumen	Submucosal haematoma, narrowed lumen

Table 2: Differential diagnosis table for post-endoscopic polypectomy complications and imaging findings.

ABBREVIATIONS

CT = Computed tomography
EMR = Endoscopic mucosal resection

KEYWORDS

Colorectal polyps; colorectal cancer; endoscopic mucosal resection; EMR; computed tomography; CT; complications

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