On-line Case Report

Splenic injury following colonoscopy – an underdiagnosed, but soon to increase, phenomenon?

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ABSTRACT

INTRODUCTION We present a case of splenic rupture in a 71-year-old woman admitted 6 days following a diagnostic colonoscopy. She underwent an open splenectomy and made a delayed, but complete, recovery. We proceeded to perform a retrospective review of all relevant literature to assess the frequency of similar post-colonoscopy complications.

MATERIALS AND METHODS Using relevant keywords, we identified 63 further PubMed reports of splenic injury associated with colonoscopy that were reported in English.

FINDINGS We have described only the fourth report of splenic injury secondary to colonoscopy from a UK centre. Literature review reveals a mean age of 63 years and a female preponderance for this complication. Most patients present on the day of their colonoscopy with abdominal pain, anaemia, elevated white cell count and Kehr's sign. CT is the investigation of choice and splenectomy the definitive management of choice. Most patients make a routine recovery, with mortality rates of approximately 8%. There is likely to be an under-reporting of this complication from UK-based centres, with the majority of reports originating from Europe and US. This points to a possible under-diagnosis or under-recognition of this potentially fatal complication. The incidence of such post-colonoscopy complications may increase with the forthcoming introduction of the National Bowel Cancer Screening Programme.

Keywords: Colonoscopy – Splenectomy – Splenic rupture – Complications

Case Report

A 71-year-old woman presented to the emergency department, 6 days following a diagnostic colonoscopy (arranged following a routine-surveillance, positive, faecal occult blood test). She complained of lower abdominal pain and left-sided chest and shoulder pain, beginning on the first day following colonoscopy, associated with looking pale

and feeling lethargic. Her general practitioner (GP) had prescribed oral antibiotics for a presumed lower respiratory tract infection.

Her past medical history included atrial fibrillation, treated with sotalol and warfarin; a monitored abdominal aortic aneurysm (AAA); and treated hypothyroidism and hypercholesterolaemia. Her warfarin prescription had been ceased 5 days prior to colonoscopy (although her

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Figure 1 Emergency computed tomography scanning of this 71-year-old woman revealed a small rim of normally enhancing spleen, surrounded by haematoma, with associated haemoperitoneum.

international normalised ratio (INR) was not measured on the day of procedure) and had only been re-instituted 2 days prior to presentation.

Examination revealed a well-looking, Caucasian female with blood pressure 140/80 mmHg and heart rate 82 bpm. She was clinically anaemic and abdominal palpation revealed mild lower abdominal tenderness and a palpable,

small AAA, but no guarding or signs of peritonism. Blood results demonstrated a normal leukocyte count (WCC), haemoglobin of 7.1 g/dl and INR of 1.65. Plain chest radiography revealed a raised left hemidiaphragm. Her computerised notes illustrated that the colonoscopy had been performed with no inherent difficulty, revealing mild diverticulosis and a 2-mm polyp, 20 cm from the rectum, which had been snared and completely excised.

An urgent computed tomography (CT) scan revealed a 4.1 cm, non-leaking AAA, but an abnormal spleen with only a small amount of normal, enhancing splenic tissue (Fig. 1). A collection of high-density fluid, in keeping with blood, was seen around the spleen, with similar fluid within the pelvis. The radiologists concluded that the CT features were in keeping with a ruptured spleen and haemoperitoneum.

Due to her clinically stable status, she was resuscitated with packed red cells, administered intravenous vitamin K for reversal of anti-coagulation and taken to the operating theatre on a semi-elective basis. Laparotomy revealed a shattered spleen, surrounded by haematoma (Fig. 2). Free blood and clots were noted throughout the peritoneal cavity, and particularly within the pelvis. An uncomplicated open splenectomy was performed and the patient made a delayed (due to postoperative atelectasis and ileus), but successful, recovery. Histopathological examination of her splenic remnant revealed no abnormalities.

Figure 2 Intra-operative images, taken during open splenectomy of this 71-year-old woman, reveal marked haemoperitoneum and splenic haematoma.

Review

Methods

We performed a PubMed search for all reports of splenic injury following colonoscopy, utilising the key-words: splenic injury; splenic rupture; splenectomy; colonoscopy; endoscopy. All reports written in English, or with an English abstract that contained pertinent information, were included.

This approach led to the review of 63 reports of splenic injury associated with colonoscopy from 52 published articles (Tables 1 and 2); this represents the largest published literature review to date on this unusual complication. Furthermore, we have described only the fourth report of splenic injury secondary to colonoscopy from a UK-based centre.²⁻⁴ Most reports originate from US and Europe, thus raising the possibility of under-reporting or under-diagnosing in the UK.²

Findings

Patient factors

Patients affected by this unusual complication display a female preponderance (F 75.4%; M 24.6%) and a mean patient age of 63.0 years (range, 29–90 years). 59.1% of the patients had undergone previous abdominal surgery and only a small minority (9.1%) were taking systemic anticoagulation (warfarin).

Colonoscopic factors

Of studies indicating a complexity level associated with the procedure, 72.7% ($n = 11$) reported that splenic injury had occurred in association with no particular endoscopic difficulty. Over one-third of patients suffering splenic injury underwent colonoscopy for routine/surveillance purposes, representing a well, out-patient cohort. However, over half

Table 1 Factors associated with the presentation of patients with splenic injury secondary to colonoscopy (in the literature published to date)

Factor associated with presentation	Cases reporting presence / absence of factor	Cases where factor associated with presentation
Age	57 / 63 (90.5%)	Mean 63.0 years (range 29–90 years)
Female gender	57 / 63 (90.5%)	43 / 57 (75.4%)
Previous abdominal surgery	22 / 63 (34.9%)	13 / 22 (59.1%)
Warfarin prescription	22 / 63 (34.9%)	2 / 22 (9.1%)
Presentation on day of colonoscopy	55 / 63 (87.3%)	44 / 55 (80.0%)
Colonoscopy for routine / surveillance	29 / 63 (46.0%)	11 / 29 (37.9%)
Colonoscopy reported as difficult	11 / 63 (17.5%)	3 / 11 (27.3%)
Polypectomy / biopsy performed	27 / 63 (42.9%)	15 / 27 (55.6%)
Presence of abdominal pain	32 / 63 (50.8%)	29 / 32 (90.6%)
Presence of Kehr's sign	44 / 63 (69.8%)	26 / 44 (59.1%)
Cardiovascularly unstable (tachycardia and / or hypotension)	37 / 63 (58.7%)	17 / 37 (45.9%)
Anaemia (Hb below reference value of centre)	49 / 63 (77.8%)	41 / 49 (83.7%)
Elevated white cell count (WCC above reference value of centre)	25 / 63 (39.7%)	18 / 25 (72.0%)
Abnormality on plain radiology	14 / 63 (22.2%)	3 / 14 (21.4%)

Table 2 Methods of diagnosis and management of, and outcome from, splenic injury secondary to colonoscopy (in the literature published to date)

Diagnosis / treatment / outcome	Cases reporting utilisation of diagnosis / treatment method or outcome	Cases where diagnosis / treatment method utilised or outcome occurred
Diagnosis via CT	58 / 63 (92.1%)	34 / 58 (58.6%)
Diagnosis via ultrasonography	58 / 63 (92.1%)	7 / 58 (12.1%)
Diagnosis via angiography	58 / 63 (92.1%)	1 / 58 (1.7%)
Diagnosis via laparotomy	58 / 63 (92.1%)	15 / 58 (25.9%)
Diagnosis at post-mortem	58 / 63 (92.1%)	1 / 58 (1.7%)
Treatment by splenectomy	59 / 63 (93.6%)	38 / 59 (64.4%)
Treatment by other operative intervention	59 / 63 (93.6%)	1 / 59 (1.7%)
Treatment by angiographic embolisation	59 / 63 (93.6%)	2 / 59 (3.4%)
Treatment by conservative methods	59 / 63 (93.6%)	17 / 59 (28.8%)
Treatment by advanced life support	59 / 63 (93.6%)	1 / 59 (1.7%)
Outcome – mortality	63 / 63 (100%)	5 / 63 (7.9%)
Outcome – abnormal splenic histopathology	10 / 63 (15.9%)	1 / 10 (0.1%)

of the incident cases were associated with biopsy or polypectomy. Only one case was associated with recognised colonoscopic perforation.⁵

Presentation

The majority of patients presented with abdominal pain (90.6%), anaemia (83.7%) and elevated white cell count (72.0%) on the same day as their colonoscopic procedure (80.0%). However, delayed presentation can occur, with our reported case being the latest, at 6 days. One patient was completely asymptomatic.⁶ Left shoulder tip pain (Kehr's sign) was present in 59.1% and over half (54.1%) remained cardiovascularly stable.

Radiological investigations

Plain radiological abnormalities were reported in 21.4% and included raised left hemidiaphragm, left-sided pleural effusion and blunting/abnormality of the left costophrenic angle. CT was the diagnostic method of choice in 58.6%, with the majority of the remaining cases diagnosed at laparotomy (25.9%). Ultrasound was utilised as the initial route of imaging in 12.1%, but most of these were subsequently further evaluated by CT. In one instance,⁷ angiography was utilised for diagnostic purposes and in one case splenic injury was diagnosed at post mortem.⁸

Management

Overall, 64.4% underwent splenectomy as definitive treatment, and one team, in Germany, successfully employed a vicryl net to wrap the spleen as an alternative operative intervention.⁹ Two patients (3.4%) were treated by angiographic embolisation,^{10,11} whereas conservative treatment was possible in 28.8%.

Outcome

Mortality occurred in 7.9% of cases,^{8,12–14} with most patients making an uneventful recovery. Histopathological examination of splenic tissue revealed abnormalities (chronic, hypertensive changes) in only one patient's spleen.¹⁵

Discussion

Frequency of post-colonoscopy complications

Colonoscopy is utilised for diagnosis and treatment of a multitude of gastrointestinal and surgical conditions. Levin *et al.*¹⁶ reported 16,318 colonoscopies (overall complication rate 0.5%, perforation rate 0.09%, post-biopsy/polypectomy bleeding rate 0.48%) and Sieg *et al.*¹⁷ reported 82,416 out-

patient colonoscopies (overall complication rate 0.02%, significant haemorrhage rate 0.001%), but neither series gives any information regarding the incidence of splenic injury. Smith *et al.*¹³ (overall complication rate 0.4% for diagnostic colonoscopy, 1.8% for colonoscopy with polypectomy), reported only one incident case of splenic injury in a series of 20,139 surgeon-performed colonoscopies. Ong *et al.*¹⁸ similarly reported one case of splenic injury in 6387 colonoscopies, whereas Jentschura *et al.*¹⁹ reported (overall complication rate of 0.4%; 0.83% after polypectomy) no splenic injuries in 29,695 cases. Therefore, serious complications following colonoscopy are rare, but the true incidence of splenic injury following colonoscopy remains unknown.

The UK National Health Service Bowel Cancer Screening Programme (NHS BCSP) is being introduced in the UK over the next 3 years, utilising the faecal occult blood test (FOB) as a screening tool. In our report, a colonoscopy was arranged following a positive FOB test; however, in an asymptomatic female on warfarin, this test is rendered unreliable. With the forthcoming introduction of the nation-wide screening programme, post-colonoscopy complications are likely to increase. Thus, a key strategy for the minimisation of complications is to ensure that all indications for endoscopic examination are robust and standardised.

Identification of patients at risk of post-colonoscopy complications

The mean age of serious complication was 63 years in the series of Smith *et al.*,¹³ reflecting the cohort of patients undergoing colonoscopy. A female preponderance for splenic injury following colonoscopy (> 75% in our series were female) was noted and in our and other large series, polypectomy was associated with a significantly elevated complication rate.^{13,16,17} Thus polypectomy/biopsy is not a specific risk factor for splenic injury *per se*, but for any serious complication following colonoscopy.

Investigation of patients presenting post colonoscopy

Some patients will suffer low-grade splenic injuries following colonoscopy, manifesting as mild and delayed²⁰ symptoms (one patient was asymptomatic⁶). Thus, many splenic injuries may remain undiagnosed or be misdiagnosed as post-colonoscopy discomfort. One of the features of this complication is that, despite published reports, splenic injury following colonoscopy remains a widely unknown complication and, therefore, is often not considered as a potential diagnosis when patients present. This is well-illustrated by our case report, in which the patient was treated for a lower respiratory tract infection upon presenting to the GP. Any patient presenting with

abdominal and shoulder–tip pain following colonoscopy, particularly if anaemic, mandates thorough investigation to exclude perforation, haemorrhage, or splenic injury.

Mechanism of splenic injury following colonoscopy

There are three proposed mechanisms for injury to the spleen during colonoscopy:

1. Excess traction upon the splenocolic ligament, leading to partial capsular avulsion or splenic tears.^{2,21–23}
2. Excess traction upon splenocolic adhesions, secondary to previous abdominal surgery or intra-abdominal inflammatory processes²² (or any other cause leading to a decrease in the relative mobility between spleen and colon²³) leading to partial capsular avulsion or splenic tears. This proposed mechanism explains why this complication is more common in patients that have undergone previous abdominopelvic surgery, and particularly in those found to have splenocolic adhesions at operation.²⁴
3. Acute splenic trauma associated with endoscopic navigation of the splenic flexure.^{2,23}

Minimising splenic injury during colonoscopy

Certain endoscopic techniques can be utilised to minimise the risk of splenic injury during colonoscopy. Employment of the left lateral position ensures that the spleen and splenic flexure descend to the left side, slackening any adhesions between them.²⁵ Patients placed in the supine position, however, have an elevated risk of splenic injury as the spleen falls posteriorly, away from the splenic flexure.²⁵ Negotiation of the colonoscope through the splenic flexure in the supine position tightens splenocolic adhesive bands, and attempts to straighten the endoscope with its tip hooked around the splenic flexure can result in capsular tears.²³ The supine position should, therefore, be avoided in anyone that has undergone previous abdominal surgery or is likely to have intra-abdominal adhesions.²⁵ External pressure to attempt to aid navigation of the splenic flexure should also be avoided.^{26,27} Operator inexperience and technically difficult colonoscopy may also predispose to splenic injury.²⁷

Management of splenic injury following colonoscopy

CT with intravenous contrast may aid in the identification of ongoing haemorrhage, as well as provide detailed information concerning the degree of splenic injury,²⁷ but should not be utilised in the unstable patient requiring urgent operative intervention. As technological and surgical

practice evolve, newer methods of management may become commonplace (e.g. wrapping the spleen in a vicryl net⁹); however, splenectomy currently remains the definitive therapeutic procedure for splenic injury following colonoscopy. On occasion, stable patients can be managed via angiographic embolisation or purely conservative methods.

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