Rare but relevant: a systematic review of stercoral perforation

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Abstract

Background/Aims Knowledge of the aetiologies of large bowel perforation are fundamental to its management. Stercoral perforation is a rare cause associated with high mortality. Owing to the paucity of coverage of this condition in the literature, this review raises awareness of stercoral perforation among clinicians.

Method A literature search of PubMed, Embase, MEDLINE, CINAHL, Ovid and Cochrane was performed. Key search terms included 'stercoral, perforation', 'perforated', 'perforat*' and 'stercoral perforation'. Only literature published between December 2011 and July 2020 was included to avoid duplication.

Results Twenty-nine papers were obtained giving an overall cohort of 58 patients. The median age was 58 years (range 2–83 years) and 72.4% (*n*=42) were female. Constipation was reported in 69% (*n*=40) and 20.7% (*n*=12) reported chronic opioid use. A computed tomography scan was performed in 94.8% (*n*=55) of cases and typically a Hartmann's procedure (*n*=40, 72.2%) was performed. The mortality rate was 17.2% (*n*=10).

Conclusions The median age of patients with stercoral perforation has decreased from that found in previous studies and the mortality rate has improved. Chronic opioid users have also emerged as an important cohort. Early recognition, diligent decision making and focused perioperative care form the backbone of the definitive management of stercoral perforation.

Key words: Intestinal perforation; Perforation; Stercoral perforation

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Introduction

Large bowel perforation presenting as an acute abdomen is a true challenge for the surgeon. Mastery of this complex condition is a prerequisite for any surgical trainee and appreciation of aetiologies remains central to this. Stercoral perforation is a relatively rare cause of intestinal perforation with case reports numbering the hundreds, but mortality rates are high, with chronic constipation often cited as one of the most common risk factors. Within the UK, only 11% of cases are thought to have been correctly diagnosed before surgery (Kelley and Larson, 2019). Computed tomography is the cornerstone of early diagnosis. Surgical management remains the definitive treatment for stercoral perforation, but evidence for the superiority of resection with a stoma vs an anastomosis remains equivocally low (Kelley and Larson, 2019).

This literature review provides an update on the evidence base for stercoral perforation by identifying and collating international experiences and providing guidance to clinicians facing this uncommon and challenging condition. The article identifies risk factors, vulnerable cohorts of patients and effective preventive, diagnosing and management strategies in a critical condition with a high mortality.

Methods

A literature search was carried out using PubMed, Embase, MEDLINE, CINAHL, Ovid and Cochrane databases from 2011 to 2020 (Figure 1). The key words used included 'stercoral, perforation', 'perforated', 'perforat*' and 'stercoral perforation'. Only articles that specifically diagnosed a stercoral perforation were included in the study. A previous review included all the articles on stercoral perforation up to 2011 (Chakravartty et al,

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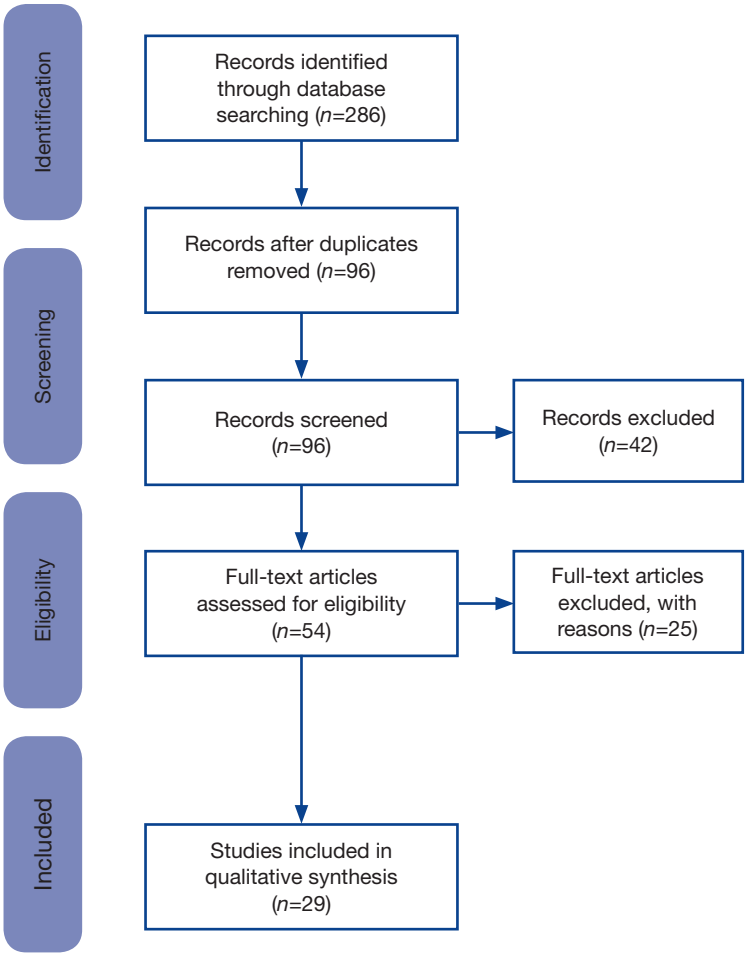

Figure 1. PRISMA (Liberati et al, 2009) flow diagram.

2013). Therefore, to prevent duplication, only articles published between December 2011 and July 2020 were included. Papers not written in English were excluded where a translation was not available. Articles without full text and poster presentations were also excluded. Neonatal and obstetric patients were excluded. The patient characteristics and predisposing factors for stercoral perforation were assessed. The clinical and radiological findings, subsequent management and mortality rates were determined. All articles that met the selection criteria were extracted by one reviewer (SF) and the full-text articles were obtained, and their references cross-checked. The cases were collated and reviewed independently by the senior author (DS). The type and quality of studies were noted. All the available data were pooled and analysed.

Statistical analysis

Continuous data was collated and represented appropriately as a median and range, with individual quantitative data from each article used in this calculation. Measures relating to radiology, site of perforation and presence of constipation were expressed as a percentage of the total number of cases included.

Results

A total of 29 articles were found from the literature search (**Appendix**), of which the majority were case reports (*n*=27, 93.1%) and the remainder were small scale case studies (*n*=2, 6.9%). Two new retrospective studies published in addition to case reports and series imply an increase in the strength of the evidence base of stercoral perforation relative to the previous review article (Chakravartty et al, 2013). The strength of a case report series is in the level of detail included in each case, but the level of detail in the

retrospective studies was thought to be appropriate for inclusion in this review. The 29 studies gave an overall yield of 58 individual cases.

The median age of patients was 58 years (range 2–83 years, standard deviation 22.3 years) with most patients being female (*n*=42, 72.4%) rather than male (*n*=16, 27.6%). Chronic constipation was reported in 33 patients (56.9%), acute constipation in seven patients (12.1%) and notably there was no reported constipation in 18 cases (31.0%). Of the stercoral perforation cohort, 20.7% (*n*=12) had a history of chronic opioid use.

Almost all patients (94.8%, *n*=55) had a computed tomography scan before surgery. Faecal impaction (*n*=26, 44.8%), extraluminal free fluid or faeces (*n*=24, 41.4%), extraluminal air (*n*=38, 65.5%) and subphrenic gas (*n*=14, 24.1%) were the most common radiological findings, and 94.8% (*n*=55) of all patients had some radiological evidence of stercoral perforation. There was a specified site of stercoral perforation in 44 patients, with 38 of these (86.3%) in patients with bowel that had not been previously operated on. Of cases with a documented site of perforation, 11% (*n*=4) occurred proximal to the sigmoid colon, 66% (*n*=25) occurred within the sigmoid colon, 16% (*n*=6) occurred at the rectosigmoid junction and 8% (*n*=3) occurred at the rectum. For those with previous operations, four perforations occurred at the site of anastomosis and two perforations occurred at the stoma site. These cases are isolated in nature and the authors suggest that these cases are better classified as anastomotic leaks and stomal necrosis rather than a true stercoral perforation. Although the surgical approach should vary based on the site of the perforation, the formation of a stoma was more commonly used (*n*=44, 83%) than a primary anastomosis (*n*=4, 17%). Hartmann's procedure was the most common operation performed (*n*=40, 72.2%). Of the 58 patients, 10 died, giving an overall mortality rate of 17.2%.

Discussion

This review highlights the changing nature of stercoral perforation over the last decade through largely descriptive data. The latest systematic review of stercoral perforation was published by Chakravartty et al (2013) who reported an increase in preoperative diagnosis and a subsequent 34% reduction in mortality.

There is a paucity of literature on the management and outcomes of stercoral perforation. Maurer et al (2000) are the only group to give a definitive list of diagnostic criteria for stercoral perforation:

1. The colonic perforation was round or ovoid, exceeded 1 cm in diameter, and lay antimesenteric
2. Fecalomas were present within the colon, protruding through the perforation site or lying within the abdominal cavity
3. Pressure necrosis or ulcer and a chronic inflammatory reaction around the perforation site were present microscopically.

Stercoral perforations arise from the formation of a faecaloma often as a result of a longstanding episode of chronic constipation (Maddu et al, 2014). Chronic constipation is defined as an infrequency of bowel movements or difficulty and straining in passing stools over a prolonged period, typically weeks (Kumar and Clark, 2012). Logically, those who are prone to chronic constipation are immediately at risk of stercoral perforation and have comorbidities including old age, neurological disease, endocrine disease and diseases of the colon (Forootan et al, 2018). However, this article demonstrates the variability of presentation and the difficulty of initial diagnosis owing to a 27.1% reduction in cases presenting as chronic constipation since 2012. Another notably growing population are opioid-dependent patients who represent a fifth of patients with stercoral perforation and are highly variable in age on presentation. The typical stercoral perforation patient remains elderly and a chronic opioid user.

Table 1 compares the authors' data to figures published by Chakravartty et al (2013). A larger number of cases were observed over the 8-year study period than the previous 14-year period observed by Chakravartty et al (2013). There is no statistical significance between the ages of the 2012–2020 and 1998–2012 patient cohorts but there was a notable increase in female representation. Only 55.4% of patients received a computed tomography scan during the 1998–2012 period, whereas 94.8% of patients received a computed tomography scan

Table 1. Comparison of patient characteristics for studies dated from 1998–2012 and 2012–2020

Characteristic		2012–2020	1998–2012
Number of cases		58	56
Median age (range; years)		58 (2–83)	73 (4–106)
Male:female		1:2.6	1:1.5
Chronic constipation		56.9%	84%
Mortality		17.2%	34%
Site of perforation	Caecum	0	0
	Ascending colon	1 (2.8%)	0
	Transverse colon	3 (8.3%)	0
	Descending colon	0	3 (5.5%)
	Sigmoid	25 (66%)	35 (63.6%)
	Rectosigmoid junction	6 (16%)	13 (23.6%)
	Rectum	3 (8%)	4 (7.3%)

in the 2012–2020 period. This increase reflects the advent of axial imaging as a diagnostic tool for stercoral perforation. The operation of choice remains a Hartmann's procedure with 69.6% of patients in the 1998–2012 period and 72.2% of patients in the 2012–2020 period undergoing this procedure. Any operative approach must work synergistically with appropriate perioperative standards as detailed by the National Emergency Laparotomy Audit (NELA Project Team, 2018). This highlights the importance of early escalation and diligent decision making in the definitive management of stercoral perforation. Both the sigmoid and rectosigmoid colon are most vulnerable as sites of significant faecal loading, although the true pathogenesis of stercoral perforation remains unclear.

The number of patients on regular and long-term analgesia (defined as more than 3 months duration in the form of opioids) for chronic illnesses is rapidly increasing, with mounting concerns around dependence and misuse. The younger median patient age may be the result of an increasing number of younger patients requiring long-term opioids (Calcaterra et al, 2016).

Although not included as part of the analysis because they occurred in excluded groups of patients, two cases were particularly notable for cases occurring in highly vulnerable and complex populations: Koo et al (2017) presented the first ever documented stercoral perforation in a low birthweight neonate and Costales et al (2015) presenting the fourth ever case of stercoral perforation in a pregnant woman. Both cases proved to be particularly challenging but reported positive outcomes following laparotomy and a Hartmann's procedure (for the pregnant patient) or segmental resection with end-to-end anastomosis (for the neonate).

Conclusions

Significant developments have been made in the management of stercoral perforation since 2012. Almost all patients are undergoing the appropriate diagnostic process with the overwhelming majority receiving a computed tomography scan. The halving of the mortality rate compared to that seen from 1998–2012 is further testament to the growing level of expertise within both emergency, surgical departments and perioperative care units. Large scale collaboratives such as the National Emergency Laparotomy Audit have highlighted the importance of early radiology, appropriate assessment and senior oversight in cases of emergency surgery. Although remarkably rare, publications have revealed the possibility for stercoral perforation to affect both obstetric and neonatal patients. This further highlights the developments made in the recognition and timely management of what remains a challenging condition.

Key points

- Stercoral perforation presents as a challenging and unusual case of bowel perforation, with an ever-changing demographic.
- There are increasing numbers of patients with opioid use.
- The authors advocate timely radiological investigation and early escalation.

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Conflict of interests

The authors declare that there are no conflicts of interest.

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Appendix. Studies of stercoral perforation since 2012

Reference	Cohort size	Mean age	Reported constipation	Surgery	Mortality	Computed tomography scan performed
Igawa et al (2020)	1	33	1	Total colectomy, end ileostomy	0	Yes
Segalini et al (2020)	1	46	1	Hartmann's procedure	0	Yes
Heimer et al (2020)	1	57	1	Not stated	1	Yes
Singh et al (2019)	1	37	1	Not stated	0	Yes
Zarog et al (2018)	1	31	1	Left hemicolectomy, end colostomy	0	Yes
Vijayakumar et al (2018)	1	80	1	Manual decompression, directing transverse colostomy	0	No
Turner and Woodfield (2018)	1	76	0	Blind end defect repair	0	Yes
Poitras et al (2018)	1	58	0	Hartmann's procedure	0	Yes
van Praagh et al (2018)	3	73	3	Not stated	1	Yes
Celayir et al (2017)	1	83	1	Hartmann's procedure	1	Yes
Tessier et al (2002)	1	27	1	Hartmann's procedure	0	Yes
Kanwal et al (2017)	1	79	0	Hartmann's procedure	0	Yes
Marget and Ammar (2017)	1	34	1	Hartmann's procedure	0	Yes
Ryu et al (2017)	12	73.8	12	Hartmann's procedure	0	Yes
Seligman et al (2016)	1	56	1	Proctocolectomy with end ileostomy	0	Yes
Linder et al (2016)	4	74.3	0	Hartmann's procedure	1	Yes
Canders et al (2015)	1	35	1	Subtotal colectomy, ileostomy	0	Yes
Davies and Webber (2015)	1	67	1	Transverse colon resection	1	No
Bunkar et al (2015)	1	45	1	Segmental resection of sigmoid colon, end to end anastomosis	1	Yes
Donnelly et al (2014)	1	72	0	Hartmann's procedure	0	No
Al Omran et al (2014)	1	2	1	Double-barrel colostomy	0	Yes
Bhatt et al (2014)	1	55	1	Hartmann's procedure	0	Yes
Kim et al (2013)	2	71	1	Segmental resection, stoma revision	0	Yes
Habeeb and Jeanmonod (2014)	1	73	1	Left hemicolectomy, end colostomy	0	Yes
Okullo et al (2013)	1	77	1	Wedge resection, primary repair	0	Yes
Kwag et al (2013)	1	83	1	Hartmann's procedure	0	Yes
Bradley et al (2017)	1	53	1	Hartmann's procedure	0	Yes
Rutkoski and Gittes (2015)	1	11	0	Hartmann's procedure	0	Yes
Sudlow et al (2014)	13	73	5	Not stated	4	Yes