British Journal of Medicine & Medical Research
9(6): 1-6, 2015, Article no.BJMMR.19247
ISSN: 2231-0614

SCIENCEDOMAIN *international*
www.sciencedomain.org

Perioperative Care Related Events are Different Following Elective and Emergency Right Hemicolectomy

Arkadiusz Peter Wysocki[1*], Jennifer Allen[1], Therese Rey-Conde[1] and John B. North[1]

[1]Queensland Audit of Surgical Mortality, Royal Australasian College of Surgeons, P.O.Box 7476, East Brisbane, Queensland 4169, Australia.

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2015/19247
Editor(s):
(1) Salomone Di Saverio, Emergency Surgery Unit, Department of General and Transplant Surgery, S. Orsola Malpighi University Hospital, Bologna, Italy.
Reviewers:
(1) Wagih Mommtaz Ghannam, General Surgery Department, Mansoura University, Egypt.
(2) Einar Arnbjörnsson, Department of Pediatric Surgery, Skåne University Hospital, Sweden.
Complete Peer review History: http://sciencedomain.org/review-history/9979

Original Research Article

Received 31st May 2015
Accepted 19th June 2015
Published 29th June 2015

ABSTRACT

Introduction: Right hemicolectomy is frequently performed for malignancy but emergency surgery is associated with double the mortality rate of elective colonic resection. The study was designed to compare perioperative clinical incidents patients who died following elective and emergency right hemicolectomy.
Methods: Adult patients who died under the care of a surgeon following elective and emergency right hemicolectomy in Queensland, Australia were identified from the Australian and New Zealand Audit of Surgical Mortality (ANZASM) database. Demographic data, free text entries and surgeon reviewer conclusions were analysed.
Results: The two groups had different indications for surgery but were of similar age and gender. Surgeon reviewers (first and second line) identified similar rates of untoward perioperative events in both groups however post operative events tended towards being more frequent after elective surgery while pre operative events were more frequent in the emergency group. Almost half of the incidents occurred post operatively and often related to delayed diagnosis and management of

**Corresponding author: Email: arek_p@ecn.net.au;*

anastomotic leak.
Conclusion: This analysis suggests more thorough pre operative medical work up may be required prior to right hemicolectomy and that greater attention should be focused on recognizing intra-abdominal sepsis - predominantly following emergency surgery.

Keywords: Mortality; audit; colectomy; laparoscopy; failure to rescue.

1. INTRODUCTION

Elective and emergency right hemicolectomy are frequently performed general surgical operations for benign and malignant conditions. Results from the Dutch Surgical Colorectal Audit demonstrate that emergency colectomy is associated with double the mortality rate of elective colonic resection (7.2% vs 3.4% $p<0.001$) [1]. In that series, anastomotic leak was diagnosed in one third of patients who died, was more common following emergency colonic resection and especially after right hemicolectomy [1]. The Large Bowel Cancer Project has demonstrated that in patients aged over 70 years of age, 55% of deaths are cardiorespiratory, 19% due to intra-abdominal sepsis and the remainder due to malignancy [2].

We aimed to identify areas of care which could be improved by analysing data about patients who died following elective and emergency right hemicolectomy in Queensland, Australia. We considered the retrospective views of peer surgeon reviewers recorded in the Australian and New Zealand Audit of Surgical Mortality (ANZASM) database. This bi-national mortality database contains demographic data, clinical details and several sections allowing the entry of free text.

2. METHODS

The Australian and New Zealand Audit of Surgical Mortality retrospectively collects surgical mortality data. Hospitals report deaths to ANZASM when an inpatient under the care of a surgeon dies, whether or not a surgical procedure had been performed. Ethical approval was not required as ANZASM is a protected quality assurance activity in Australia under Part VC of the Health Insurance Act 1973 (gazetted August 2011). According to policy this work meets criteria for operational improvement activity. Hospital approval was not required either.

The functioning, governance and objectives of ANZASM have been outlined previously [3]. Briefly, the treating surgeon provides the clinical data to ANZASM using a standard surgical case form (SCF). The de-identified SCF is sent for first line assessment to an assessor surgeon from a different hospital but of the same specialty. Based on clinical judgment the assessor surgeon determines if there were any adverse events and whether deficiencies in care arose. The case may then be closed or may proceed to a non-deidentified second line assessment where a different assessor surgeon has access to the medical progress notes for that admission.

For this study, we included patients who were 17 years or older that died in a Queensland hospital following right hemicolectomy (elective, emergency, open, laparoscopic, converted, extended or limited) between September 2007 and November 2013. Not all hospitals participated from the beginning of the audit but no hospital withdrew from the audit. Baseline patient population data was not available for patients who had undergone right hemicolectomy and had been discharged from hospital alive.

We extracted the data from the ANZASM database and analysed it using IBM SPSS Statistics 19 (Armonk, NY: IBM Corporation, 2010) and Microsoft Excel (Redmond, Washington: Microsoft, 2010). We could not do any chart reviews. We present continuous variables as medians, with the interquartile range (IQR) in brackets. We present categorical variables as frequencies, with the percentages in brackets.

3. RESULTS

One hundred and four deaths were reported to ANZASM over 6 years and 2 months following right hemicolectomy in Queensland. The number of included cases ranged from 3 to 26 per calendar year. Demographics are presented in Table 1. Three quarters underwent emergency surgery. Most were males aged over 79 years.

The indication for elective surgery was usually colonic malignancy (23) while for emergency surgery it was most often obstruction (52).

Colonic malignancy was present in equal frequencies in the two groups (p = 0.174). Elective and emergency patients both underwent surgery on median day 1 (p = 0.440). All 12 patients with a stoma underwent emergency open colectomy. Indications and surgical technique are outlined in Table 2. Table 3 shows the initial postoperative deterioration (as stated by the treating surgeon) was the same when stratified by admission status (respiratory, cardiac, abdominal and other). In 40 patients (38.5%) the initial deterioration occurred under circumstances where the family and treating teams felt further aggressive management would be futile. This also did not differ when stratified by admission status (9 elective and 31 emergency patients; p = 0.715).

Surgeon reviewers (first and second line) identified similar rates of untoward perioperative events in both elective and emergency groups: events occurred in 14 patients who died following elective right hemicolectomy (53.8%) and in 33 patients after emergency right hemicolectomy (42.3%) but this difference was not statistically significant (p=0.100). Out of the 9 patients whose care was actively limited following elective resection, surgeon reviewers identified a perioperative event in 5 (55.6%). Of the 31 patients whose care was actively limited following emergency surgery, a perioperative event was identified in 14 (45.2%) but this difference was not statistically significant (p = 0.690).

Half of the peri operative events (53.2%) occurred post operatively (with a trend towards being more frequent after elective surgery p = 0.116); 26.0% occurred pre operatively (more frequent in the emergency group p = 0.050); while 20.8% occurred intra operatively (same for elective and emergency surgery p=0.742). The details of peri operative events are outlined in Table 4. The most frequently identified issue was delay to diagnose ongoing sepsis or to reoperate. Table 5 illustrates that the causes and timing of death in the two groups were similar. The post operative length of stay was the same for both groups overall and when assessed by the cause of death.

Table 1. Demographics

Type of admission	Elective	Emergency	P value
Number	26 (25.0%)	78 (75.0%)	N / A
Male gender	16	44	0.766
Age in years	79.5 (IQR 76–85.5)	78.0 (IQR 71–83)	0.150
ASA	3 (IQR 2–3)	4 (IQR 3 – 4)	<0.001

ASA (American Society of Anesthesiologists); IQR: Inter Quartile Range

Table 2. Indications for right hemicolectomy and surgical technique used

Indication for surgery	Completed laparoscopically	Open restorative resection (including conversion and extended resection)	Open resection with ileostomy formation
Malignant obstruction (n = 38)	1	35	2
Elective, malignancy (n = 23)	8	15	0
Caecal volvulus (n = 10)	0	10	0
Malignant perforation (n = 7)	0	6	1
Ischaemia (n = 7)	0	3	4
Abscess (n = 4)	1	2	1
Malignant bleeding (n = 3)	0	3	0
Elective, polyp (n = 3)	2	1	0
Benign obstruction (n = 2)	0	1	1
Intussusception (n = 2)	0	1	1
Pseudo obstruction with perforation (n = 2)	0	0	2
Other emergency (n = 3)	1	2	0
Total (n = 104)	13	79	12

n = number

Table 3. Initial post operative deterioration and whether subsequent care was limited due to futility

Initial post operative deterioration	Elective right hemicolectomy n = 26	Emergency right hemicolectomy n = 78	P value
Respiratory	2 / 8 (25.0%)	6 / 21 (28.6%)	0.866
Abdominal	1 / 5 (20.0%)	6 / 18 (33.3%)	0.603
Cardiac	1 / 3 (33.3%)	6 / 14 (42.9%)	0.603
Neurological	2 / 2 (100%)	5 / 6 (83.3%)	0.700
Sepsis	0	2 / 5 (40.0%)	0.718
Other	2 / 6 (33.3%)	5 / 11 (45.5%)	0.188
Not stated	1 / 2 (50.0%)	1 / 3 (33.3%)	0.352
Total	9 / 26 (34.6%)	31 / 78 (39.7%)	0.715

Table 4. Peri operative events noted by surgeon reviewers

		Elective right hemicolectomy n = 26	Emergency right hemicolectomy n = 78	Overall incidence	P value
Pre operative					0.050
	Delay in diagnosis	1	5	7.8%	
	Unfit for surgery	1	3	5.2%	
	Endoscopic management preferred	1	3	5.2%	
	Medical events	1	5	7.8%	
Intra operative					0.742
	Grade of surgeon operating	2	0	2.6%	
	Stoma or bypass preferred	1	5	7.8%	
	Prophylactic antibiotics not given	1	1	2.6%	
	Issues of technique	2	4	7.8%	
Post operative					0.116
	Delay in diagnosis of sepsis	6	6	15.6%	
	Delay in reoperation	0	2	2.6%	
	Overall management	5	0	6.5%	
	Failure to admit to ICU or early ICU discharge	2	4	7.8%	
	Fluid overload	1	2	3.9%	
	Failure to leave NGT	2	3	6.5%	
	Various issues	6	2	10.4%	

ICU: Intensive Care Unit; NGT: Naso Gastric Tube

4. DISCUSSION

Having analysed deaths following right hemicolectomy (elective, emergency, open, laparoscopic, extended) we demonstrate those who died following elective or emergency surgery did not differ with respect to gender, delay to diagnosis, length of stay, frequency of malignancy, organ system of initial deterioration, cause of death or frequency of limiting care due to futility. Not surprisingly the elective patients had a lower ASA (American Society of Anesthesiologists) class than those who died following emergency surgery. However, untoward events overall were similar in both groups but preoperative events were more frequent in the emergency group while post operative events tended towards being more frequent in the elective group.

Table 5. Cause of death and post operative length of stay

Cause of death	Elective right hemicolectomy		Emergency right hemicolectomy		P values	
	Number (%)	Post operative length of stay (IQR)	Number (%)	Post operative length of stay (IQR)	Number	Post operative length of stay
Respiratory (n = 36)	10 (38.5%)	15 (11 – 26)	26 (33.3%)	10 (4 – 20)	0.700	0.981
Myocardial infarction (n = 19)	7 (26.9%)	3 (3 – 4)	12 (15.4%)	6 (3 – 10)	0.233	0.504
Abdominal sepsis (n = 18)	4 (15.4%)	10 (6 – 16)	14 (17.9%)	7 (3 – 14)	0.785	0.988
Other (n = 31)	5 (19.2%)	22 (17 – 30)	26 (33.3%)	13 (4 – 17)	0.254	0.210
Total (n = 104)	26	11 (4 – 23)	78	9 (3 – 16)	N / A	0.647

n: number; IQR: Interquartile range; N / A: Not applicable

Increasing patient age probably does not significantly increase the risk of surgical complications but patients aged over 80 years certainly have an increased rate of systemic (non surgical) complications [4]. Several elective patients were felt to have been inadequately worked up suggesting surgeons should refer more patients for a geriatric or gastroenterology assessment. Patients aged over 80 years of age, those with a Charlson comorbidity index of ≥ 2 and ASA class of ≥ 3 have only mildly increased rates of anastomotic leak but a dramatically higher risk of dying as a result of this. The QASM dataset does not contain the 22 variables required to calculate the Charlson comorbidity index. The surgeon also needs to be aware that polyps not suitable for traditional snare polypectomy will often be suitable for Endoscopic Mucosal Resection i.e. over 90% of complex polyps (over 2 cm) are suitable for resection with this technique with a perforation rate of less than 5% and recurrence rate of less than 15% [5].

A trend towards more post operative events was seen in the elective group. The most significant issues identified were delay in diagnosing intra abdominal sepsis or re operating, generally in the setting of an anastomotic leak. The definition and diagnosis of an anastomotic leak are difficult. Most patients have an insidious clinical course, with low-grade fever, prolonged ileus or failure to thrive [6]. Pathology results and imaging may be confusing. The positive predictive value of any aberrant vital sign (Temperature >38ºC, systolic blood pressure ≤80 mmHg, pulse ≥ 100 beats per minute, respiratory rate ≥ 20 breaths per minute) or white blood cell count ≥ 12,000 cells/uL is typically less than 10% [7]. A C-Reactive Protein concentration on postoperative day 3 which is less than 172 mg/L has a negative predictive value for anastomotic leak of 97% but a higher CRP has a positive predictive value of no more than 20% [8]. The overall accuracy of Computed Tomography (CT) scanning in assessing anastomotic integrity is only 74% but importantly delayed reoperation for anastomotic leakage due to a false negative CT is associated with a very high mortality (62.5% in one study [9]). As such, a low threshold for re-exploration is indicated if the clinical scenario is suspicious [10].

In the stable patient, the leaking ileocolic anastomosis should be resected and a new anastomosis fashioned [10]. Otherwise, an Abcarian end-loop ileostomy [11] is safer and preferable as it obviates the need for a formal laparotomy at time of reversal [10]. While the role of omental wrapping is unproven, direct suture of the defect is not advised as it only serves to make the disruption larger [10].

This study's greatest strength is the fact that it includes all adults who died following emergency right hemicolectomy in Queensland, Australia and were subject to at least a double blinded First Line Assessment by a peer surgeon. ANZASM data is systematically collected by surgeons using a standard self-reporting tool and is thus clinically sound. The study's greatest limitation is that it does not include mortality rates, as baseline data on those who did not die after right hemicolectomy could not be obtained. Other limitations of the study included possible self reporting bias, slight denominator variation due to not all questions having been answered and including only in hospital deaths while under

the care of a surgeon. The study does not include patients who underwent an ileocolonic bypass without resection or a defunctioning ileostomy. The study covers only one Australian state, and while frequencies of events may change, the findings should be generalizable and therefore applicable across the wider surgical population.

5. CONCLUSION

This analysis of deaths following emergency and elective right hemicolectomy suggests more thorough work up may be required in the elective setting and that recognizing postoperative intra-abdominal sepsis continues to be challenging.

CONSENT

It is not applicable.

ACKNOWLEDGEMENTS

The authors acknowledge: the Queensland Department of Health's ongoing support of the audit, the Patient Safety Units' Senior Director, Kirstine Sketcher-Baker and Assistant Director, Erin Finn and the surgeons of Queensland. We appreciate the dedication to the audit by: Professor Guy Maddern, Associate/Professor Wendy Babidge, Mr Gordon Guy, Ms Sonya Faint and Ms Kyrsty Webb, and all participating hospitals and their staff.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bakker IS, et al. Risk factors for anastomotic leakage and leak-related mortality after colonic cancer surgery in a nationwide audit. Br J Surg. 2014;101(4): 424-32. Discussion 432.
2. Fielding LP, Phillips RK, Hittinger R. Factors influencing mortality after curative resection for large bowel cancer in elderly patients. Lancet. 1989;1(8638):595-7.
3. Raju RS, et al. The Australian and New Zealand Audit of surgical mortality-birth, deaths, and carriage. Ann Surg; 2014.
4. Bircan HY, et al. Are there any differences between age groups regarding colorectal surgery in elderly patients? BMC Surg. 2014;14:44.
5. Kedia P, Waye JD. Routine and advanced polypectomy techniques. Curr Gastroenterol Rep. 2011;13(5):506-11.
6. Doeksen A, et al. Radiological evaluation of colorectal anastomoses. Int J Colorectal Dis. 2008;23(9):863-8.
7. Erb L, Hyman NH, Osler T. Abnormal vital signs are common after bowel resection and do not predict anastomotic leak. J Am Coll Surg; 2014.
8. Singh PP, et al. Systematic review and meta-analysis of use of serum C-reactive protein levels to predict anastomotic leak after colorectal surgery. Br J Surg. 2014; 101(4):339-46.
9. Kornmann VN, et al. Beware of false-negative CT scan for anastomotic leakage after colonic surgery. Int J Colorectal Dis. 2014;29(4):445-51.
10. Hyman NH. Managing anastomotic leaks from intestinal anastomoses. Surgeon. 2009;7(1):31-5.
11. Prasad ML, et al. End-loop ileocolostomy for massive trauma to the right side of the colon. Arch Surg. 1984;119(8):975-6.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/9979