Routine blood group and antibody screening prior to emergency laparoscopy

J Barrett-Lee, J Vatish, M Vazirian-Zadeh, P Waterland

Dudley Group NHS Foundation Trust, UK

ABSTRACT

INTRODUCTION Studies show that rates of blood transfusion associated with general surgical laparoscopy are low. Currently, there are no national guidelines in the UK regarding blood group and antibody screening (G&S) for patients undergoing emergency laparoscopy. The aim of this study was to assess whether using G&S before emergency laparoscopic general surgery routinely is worthwhile by identifying rates of perioperative transfusion.

METHODS Data were collected retrospectively on all emergency laparoscopic procedures at a single district general hospital between January 2014 and 31 December 2016. Emergency laparoscopic general surgical cases were included and gynaecological cases excluded. Records were reviewed to ascertain whether G&S was performed, whether antibodies were detected and whether patients were transfused.

RESULTS A total of 562 emergency laparoscopic cases were performed. The median age was 28 years (range: 6–95 years). Laparoscopic appendicectomy ($n=446$), diagnostic laparoscopy ($n=47$) and laparoscopic cholecystectomy ($n=25$) were the most common procedures. Of the total patient cohort, 514 (91.5%) and 349 (70.1%) had a first and second G&S respectively while 30 (5.3%) had no G&S. Four patients (0.71%) had antibodies detected. One patient (0.18%) received a transfusion. This patient had undergone laparoscopic repair of a perforated duodenal ulcer and there was no major intraoperative haemorrhage but he was transfused perioperatively for chronic anaemia.

CONCLUSIONS These results demonstrate a low rate of blood transfusion in emergency laparoscopic general surgery. The majority of these patients had a low risk of major intraoperative haemorrhage and we therefore argue that G&S was not warranted. We propose a more targeted approach to the requirement for preoperative G&S and the use of O negative blood in the event of acute haemorrhage from major vessel injury.

KEYWORDS

Laparoscopy – Emergency – Blood grouping and cross-matching

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CORRESPONDENCE TO

Joe Barrett-Lee, E: joejordanthomas.barrett-lee@nhs.net

Several studies have demonstrated that the rates of blood transfusion during laparoscopic general surgery are low^{1–3} and transfusion is usually attributable to major vascular injury. There are currently no national guidelines in the UK regarding the routine use of blood group and antibody screening (G&S) for patients undergoing emergency laparoscopic surgery. While many centres have individual, procedure specific guidelines for the requirement of G&S or cross-matching in the elective setting, there is often no distinction made for emergency cases. Is a routine G&S for all emergency surgical patients cost or time efficient if transfusion rates are low for certain laparoscopic procedures? The aim of our study was to answer this question by identifying the rates of blood transfusion for emergency laparoscopic general surgical cases in a single district general hospital.

Methods

Data were collected retrospectively on all patients who underwent an emergency laparoscopic procedure over a three-year period from 1 January 2014 to 31 December 2016. Only laparoscopic procedures performed by the general surgical department were included. Laparoscopic gynaecological procedures were excluded from the study. Electronic records were reviewed to obtain information on whether two valid G&S samples were sent for each patient, whether these were rejected by the blood bank and for what reason, and whether antibodies were detected on screening. Details of subsequent intra or postoperative transfusion of blood products were also recorded. This information was analysed to ascertain the rate of transfusion in this group of patients

and the likelihood of positivity for antibodies, which may complicate a transfusion of red cells. Cases of transfusion were further scrutinised to acquire the patient demographics, indications and timing of transfusion.

Results

During the study period, 562 emergency laparoscopic and laparoscopic assisted operations were performed at our trust. Three-quarters (72.1%) of patients were aged 18–50 years, with only 15.4% and 12.5% under 18 and over 50 years respectively (median age: 28 years, range: 6–95 years). The most frequently performed procedures were laparoscopic appendicectomy ($n=446$), diagnostic laparoscopy ($n=47$) and laparoscopic cholecystectomy ($n=25$) (Table 1). Of the 562 patients included in the study, 514 (91.5%) and 349 (70.1%) had a first and second valid G&S on their electronic record respectively while 30 (5.3%) had no G&S. Ninety-three samples were rejected by the blood bank; the reasons for rejection are shown in Table 2. Four patients (0.71%) had antibodies detected on screening. Table 3 shows the distribution of the ASA (American Society of Anesthesiologists) grades of the patients.

Only one patient received a transfusion of red cells during the study period, equating to an overall transfusion rate of 0.18%. This patient underwent laparoscopic repair of a perforated duodenal ulcer following a three-month history of excessive non-steroidal anti-inflammatory consumption. His preoperative haemoglobin level was 93g/dl (likely secondary to bleeding from a chronic ulcer). Prior to surgery, he was septic with metabolic acidosis. There was no major intraoperative blood loss but the patient was transfused in the perioperative period.

Discussion

There is currently no consensus or national guidance in the UK regarding routine G&S for patients undergoing emergency laparoscopy. The most recent guidelines published by the National Institute for Health and Care Excellence on pre-operative tests for elective surgery (2016) do not mention a role for routine G&S, even for major or complex surgery.⁴ The rationale for obtaining valid G&S samples prior to surgery is that type matched blood can be made available in the case of major intraoperative haemorrhage and the presence of antibodies that may complicate transfusion can be investigated in advance.

It is evident that many patients undergoing emergency general surgery will have underlying conditions or risk factors increasing the likelihood of requiring perioperative transfusion. The rates of blood transfusion for emergency laparotomy compared with elective colorectal surgery, for example, are 28% and 13.9% respectively.^{5,6} However, a distinction can be made between the operative severity and the likelihood of blood loss for patients undergoing certain emergency procedures. Patients undergoing laparoscopic procedures will often be relatively stable with a low risk of intraoperative blood loss and are therefore unlikely to need transfusion.

Table 1 Emergency laparoscopic procedures included in the study

Procedures	<i>n</i>
Diagnostic laparoscopy	47
Laparoscopic converted to open appendicectomy	22
Laparoscopic converted to open appendicectomy and ileocaecal resection	1
Laparoscopic converted to open cholecystectomy	2
Laparoscopic converted to open drainage of appendicular mass	1
Laparoscopic converted to open Hartmann's procedure	1
Laparoscopic converted to open right salpingo-oophorectomy	1
Laparoscopic assisted extended right hemicolectomy	1
Laparoscopic assisted right hemicolectomy	1
Laparoscopic assisted loop ileostomy	1
Laparoscopic appendicectomy	446
Laparoscopic cholecystectomy	25
Laparoscopic washout	2
Laparoscopic drainage of pelvic abscess	2
Laparoscopic drainage of tubo-ovarian cyst and appendicectomy	1
Laparoscopic repair of perforated duodenal ulcer	2
Laparoscopic extended right hemicolectomy	1
Laparoscopic right hemicolectomy	1
Laparoscopic diaphragmatic hernia repair	1
Laparoscopic left inguinal hernia repair	1
Laparoscopic subtotal colectomy and ileostomy	1
Laparoscopic excision of infected colonic epiploic appendix	1

Several studies have looked at the rates of blood transfusion for laparoscopic general surgical procedures. Usal *et al* found that 12 out of a total of 2,589 patients (0.46%) required a transfusion after laparoscopic cholecystectomy.² Ghirardo *et al* noted transfusion rates of 0.16% and 0.58% for laparoscopic appendicectomy and cholecystectomy respectively.³ These perioperative transfusion rates are similar to our own result of 0.18%.

The main factor necessitating urgent blood products during laparoscopy is the event of major vessel injury during trocar insertion. Historically, serious acute haemorrhage resulted from injury to the aorta, vena cava and internal iliac vessels.⁷ Bleeding may also arise from direct injury to anterior abdominal wall vessels such as the inferior epigastric arteries.^{8–10}

Rates of injury to major intra-abdominal vessels have been reported at 0.02–0.04%¹¹ and to those in the anterior abdominal wall at 0.25–0.6%.^{12–14} Level 1 evidence demonstrates that the risk of significant vascular injury can be

Table 2 Reasons for sample rejection by blood bank	
Reasons	n
Incomplete details	41
Sample haemolysis	28
Duplicate sample	13
Incorrect details	7
Not tested within 3 days	2
Unsuitable specimen	1
Details not handwritten	1

Table 3 Distribution of ASA (American Society of Anesthesiologists) grades	
ASA grades	n
Grade 1	361
Grade 2	175
Grade 3	21
Grade 4	4
Not completed	1

mediated by the use of an open (Hasson) technique and application of non-bladed trocars.^{15,16} Hamza *et al* argue that in the rare event of a major vascular injury, the urgency of blood products means there is little added value in G&S over the use of O negative blood.¹⁷ The time taken to procure cross-matched blood following G&S (or to even receive group specific blood) would often be detrimental in such cases. Furthermore, the incidence of positive antibodies was 0.71% in our cohort; with our overall transfusion rate of 0.18%, this means that the predicted rate of a significant transfusion reaction may be estimated at just 0.13%.

With these considerations in mind, the present day risk of causing major haemorrhage when accessing the peritoneal cavity for laparoscopy is low. It follows that routinely sending two G&S samples prior to emergency laparoscopy may be an unnecessary use of resources.

There are also cost implications associated with routine use of two G&S samples for every patient. At our institution a single G&S sample costs £3.29. Consequently, if every patient in our series had two samples processed, the cost would have been £3,697.96 (£1,232.65 per year). Hamza *et al* estimated that the additional labour and disposables cost per sample was £17.29.¹⁷ If this figure is applied to our series, the total cost of arranging G&S twice for every patient before emergency laparoscopy would be £23,131.92 (£7,710.64 per year). This figure may appear relatively small locally but if we were to apply this across the National Health Service

(NHS), the potential financial implications become much more significant. In 2015–2016, 49,393 appendicectomies were performed in the NHS.¹⁸ Accordingly, the cost of sending two G&S tests for each of these patients alone would exceed two million pounds (£2,053,760.52).

Conclusions

Our results demonstrate that the rate of blood transfusion in emergency laparoscopic general surgical cases is low. Given the current healthcare funding pressures, there is an argument that routine G&S of all patients undergoing emergency diagnostic laparoscopy is unnecessary, particularly for those individuals under 50 years of age. The vast majority of patients in our series who underwent laparoscopic procedures had a low risk of intraoperative blood loss. It can therefore be argued that routine G&S was not warranted. As a result, we propose a more patient specific and targeted approach to the requirement for preoperative G&S (rather than a ‘one size fits all’ or procedure specific approach). The most common reason for requiring blood products is trocar related vascular injury and we suggest that availability of emergency O negative blood provides a safe and efficient way of managing this.

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