

ORIGINAL ARTICLE

ROUTINE PREOPERATIVE BLOOD GROUP AND SAVE TESTING IS UNNECESSARY FOR ELECTIVE LAPAROSCOPIC CHOLECYSTECTOMY

Ashutosh Tandon, Khalid Shahzad, Quentin Nunes, Milind Shrotri, Raimundas Lunevicius

Department of General Surgery, Aintree University Hospital NHS Foundation Trust, University of Liverpool, L9 7AL, Liverpool-UK

Background: Although the practice of preoperative testing of ABO group and Rh (D) type for elective cholecystectomy has deep historical roots, it is not evidence-based. We aimed to assess the preoperative blood group and save testing practice for a cohort of patients subjected to elective laparoscopic cholecystectomy for symptomatic cholelithiasis between January 2010 and October 2014. **Methods:** National Health Service (NHS) hospital based, surgical procedure-specific, retrospective study was conducted. A final group consisted of 2,079 adult patients. We estimated the incidence of perioperative blood transfusion attributable to laparoscopic cholecystectomy. The results of eight other studies are presented. **Results:** A preoperative blood group and save test was performed in 907 patients (43.6%), whereas cross-matching was documented in 28 patients (3.1%). None required an intraoperative blood transfusion. Twelve patients (0.58%) underwent blood transfusion postoperatively following laparoscopic cholecystectomy, of which ten were transfused due to severe intra-abdominal bleeding (0.48%). There were no deaths. **Conclusions:** The likelihood of blood transfusion attributable to elective laparoscopic cholecystectomy is 1:200. A routine preoperative blood group and save testing is unnecessary. It neither alters the management of severe hypovolemia, secondary to perioperative bleeding, nor does it lead to better outcomes.

Keywords: Cholelithiasis; laparoscopic cholecystectomy; blood group; blood transfusion

J Ayub Med Coll Abbottabad 2017;29(3):373– 7

INTRODUCTION

The routine practice of determining a patient's ABO group and Rh (D) type pre-operatively in abdominal surgery has deep historical roots. It is based on the presumed need for emergency blood transfusion secondary to unexpected intraoperative or postoperative bleeding.¹ However, this practice is changing as not only the blood transfusion needs have decreased but, more importantly, even a small increase in additional preoperative workup has substantial resource implications in a healthcare setting.^{2, 3} Therefore, a shift towards individualised preoperative detection of blood group is suggested. It is based on a small probability of need for a group-specific blood transfusion in the perioperative period.⁴⁻⁶

The practice of routine blood group and save testing for elective laparoscopic cholecystectomy, which is an intermediate grade surgical procedure, therefore requires a thorough review, as the relationship between the incidence of perioperative bleeding and the need for an unexpected blood transfusion, should be clearly understood. Interestingly, the actual incidence of perioperative laparoscopic cholecystectomy-related major haemorrhage is unknown due to

the multifactorial nature of the problem. A recent overview of 19 articles showed that the range of overall incidence of clinically significant bleeding during laparoscopic cholecystectomy is 0.004–2.3%.⁷ Another report based on an analysis of 39,238 laparoscopic cholecystectomies carried out in 91 hospitals showed the rate of severe postoperative bleeding was 0.1%.⁸ In contrast, other researchers reported markedly higher rates of perioperative bleeding – 4.1% out of 14,243 laparoscopic cholecystectomies⁹ and 3.2% out of 43,028¹⁰ – thus concluding that clinically significant bleeding is common during laparoscopic surgery. However, it is necessary to emphasize that major vascular injury in laparoscopic cholecystectomy is rare – 0.08%.⁹

A large, register-based, cohort study on the incidence of blood transfusion related to laparoscopic cholecystectomy provides the practical figures.¹¹ It showed that up to 1.6% and 1.3% of patients were subjected to blood component or red blood cell transfusion, respectively. Such findings enhance the assumption that actual incidence of clinically significant bleeding related to laparoscopic cholecystectomy is higher than reported in other

studies.⁷ However, it also suggests that laparoscopic cholecystectomy is associated with low unexpected transfusion rates.

The primary endpoint of this retrospective study was to assess the preoperative blood group and save testing practice from a cohort of patients subjected to elective laparoscopic cholecystectomy for symptomatic cholelithiasis, in a university teaching hospital, with the intention to change the practice. The second endpoint was to show the incidence of perioperative blood transfusion for intraoperative haemorrhage in elective laparoscopic cholecystectomy. To provide meaningful comparisons, the results from other similar studies are presented.

MATERIAL AND METHODS

Laparoscopic cholecystectomies performed between January 2010 and October 2014 were identified using the hospital data collection system. The Office of Population Censuses and Survey's Classification of Interventions and Procedures codes J18.3 for "total cholecystectomy" and Y75.2 for "laparoscopic approach to abdominal cavity" were used for this purpose. Emergency and open cholecystectomies, as well as cases in which elective laparoscopic cholecystectomy was not the index surgery, but a part of other procedures such as liver resection, gastrectomy, colectomy were not included into the statistical analysis. The patients subjected to preoperative blood group and save testing and perioperative transfusions were identified from the hospital blood bank database.

A literature search of articles published in English up to October, 2016, was undertaken using PubMed/Medline (<https://www.ncbi.nlm.nih.gov/pubmed/>). A combined search of the Medical Subject Heading keywords 'Blood', 'Save', and 'Cholecystectomy' generated three articles.¹²⁻¹⁴ A further 282 titles of articles linked to them were screened and the available abstracts reviewed, resulting in the identification of two other theme-related articles.¹⁵⁻¹⁶ The sixth and seventh relevant articles were identified from the references of the identified articles¹⁷ or using the search engine <https://scholar.google.co.uk>¹⁸. A final search using three other combinations of keywords 'Group Save Cholecystectomy', 'Type Screen Cholecystectomy', and 'Group Screen

Cholecystectomy' generated 58 items, of which one was relevant as a reference.¹

RESULTS

Overall, 2,303 laparoscopic cholecystectomies were performed between January 2010 and October 2014, out of which 2,083 were elective procedures. Four patients were excluded from further analysis, as they were included in another index procedure. A final group for this study consisted of 2,079 adult patients (>16 years old).

A preoperative blood group and save test was done in 907 patients (43.6%), while cross-matching was documented in 28 patients (3.1%). Of them, none required a perioperative blood transfusion, whereas 12 patients (0.58%) underwent a postoperative blood transfusion. The functional health status of 10 of these 12 patients was graded as ASA 1 or 2, according to the American Society of Anaesthesiologists classification; one was ASA 3 whereas the last patient was graded as ASA 4. Of 1,172 patients admitted for elective laparoscopic cholecystectomy without preoperative blood group and save testing (56.4%), none underwent a perioperative transfusion.

The proportion of patients requiring blood transfusion due to significant haemorrhage attributed to elective laparoscopic cholecystectomy was 0.48% (10 of 2,079). Faecal peritonitis following a laparoscopic converted to open cholecystectomy, was an indication for blood transfusion in the other patient, whereas the 12th patient suffered from a post cholecystectomy bile leak. He underwent a repeat laparoscopy, washout, and drainage of the peritoneal cavity, followed by therapeutic ERCP. Anatomical and management details of all 12 post-cholecystectomy patients who underwent a blood transfusion are presented in table-1. There were no deaths.

Key endpoints from eight other studies on preoperative blood group and save testing, and the incidence of transfusion for clinically significant bleeding or other cause of low haemoglobin in a perioperative phase of laparoscopic cholecystectomy, are summarised in table-2. It shows that a range of the overall transfusion incidence is 0-1.1%.¹²⁻¹⁴ Authors of seven out of eight papers concluded that routine preoperative group and save testing is not justified in laparoscopic cholecystectomy.

Table-1: Characteristics and management of twelve laparoscopic cholecystectomy patients to whom a blood transfusion was required

Gender	Age	ASA grade	CT	Indication for blood transfusion	Management	Units of blood*	Major comorbidity	Hospital stay (days)
Female	70	2	No	Bleeding: greater omentum and cystic plate	Surgical: Laparoscopy	1	CABG 15 years ago	5
Male	50	2	No	Bleeding: umbilical port site	Surgical: Laparoscopy	1	COPD	6
Female	40	2	No	Bleeding: umbilical port site	Surgical: Laparoscopy	1	None	7
Male	56	2	Yes	Bleeding: left hepatic artery	Angioembolisation	2	None	5
Female	64	2	Yes	Bleeding: right hepatic artery pseudoaneurysm	Angioembolisation	2	None	7
Female	42	2	Yes	Bleeding: port site	Conservative	1	Hypothyroidism	4
Female	37	1	Yes	Bleeding: umbilical port site	Conservative	1	None	3
Male	58	2	No	Bleeding: source not identified	Surgical: Laparoscopy	1	HT	4
Female	52	2	No	Bleeding: source not identified	Surgical: Laparoscopy	1	DM	3
Female	61	4	No	Bleeding: source not identified	Surgical: Laparoscopy	1	COPD, DM, DU ulcer	5
Female	36	1	No	Bile leak	Surgical: Laparoscopy and ERCP	2	None	17
Female	68	3	No	Faecal peritonitis	Surgical: Laparotomy and colostomy	2	DM, HT, Pacemaker	20

*Units of red blood cells transfused. Abbreviations: ASA – American Society of Anesthesiologists five-category physical status classification system, ERCP – retrograde cholangiopancreatography, CABG – coronary artery bypass grafting, COPD – chronic obstructive pulmonary disease, HT – hypertension, DM – diabetes mellitus, DU – duodenal ulcer, CT – Computed Tomography

Table-2: Key endpoints from eight retrospective studies on preoperative (pre-admission) blood group and screen testing and verification of ABO / Rh status, and the incidence of transfusion attributable to elective laparoscopic cholecystectomy

Author	Paper	Year	Country	Period	Patients	Group & Screen*	Transfusions for bleeding*	Transfusions for other cause*	Contribution / concern
Thompson	12	2016	England	04/2012–03/2014	293	87% (256)	0	0	Abandon pre-operative G&S
Hack-Adams	13	2016	England	12/2013–01/2014	53	33% (17)	0	0	Patients over investigated
			England	04/2014–05/2014	50	12% (6)	0	0	Pre-admission handbook is useful
Hamza	18	2015	England	11/2009–03/2011	913	100%	0.9% (8)	0	Routine G&S sample is unnecessary
Quinn	14	2011	Scotland	01/1998–02/2005	4,462	65.4% (2,916)	0.93% (27)	0.72% (21)	Routine G&S is not justified
Ghirardo	15	2010	USA	07/2005–07/2007	1,137	Routine	0.09% (1)	0.26% (3)	Eliminate routine T&S
Saxena	1	2007	USA	01/2003–12/2003	103	100%	n/a	n/a	T&S is a requirement to all
Lin	17	2006	Taiwan	12/2004–03/2005	71	8.5% (6)	1.4% (1)	n/a	T&S orders may be safely disregarded
Usal	16	1999	USA	01/1990–12/1996	2,589	Routine	0.08% (2)	0.39% (10)	Eliminate routine T&S
Our data	n/a	2016	England	01/2010–10/2014	2,079	43.6% (907)	0.48% (10)	0.1% (2)	Routine G&S testing is unnecessary

* Number of patients in parenthesis. The terms ‘Group & Screen’, ‘Group & Save’ (G&S) and ‘Type & Screen’ (T&S) are synonyms. n/a – not applicable.

DISCUSSION

We conducted a retrospective study on preoperative blood group and save testing for patients listed for elective laparoscopic cholecystectomy and found that group and save test was performed in 44% of these patients. We also found that 0.5% of patients required an unexpected blood transfusion due to unexpected intra-abdominal bleeding after surgery. It shows that an estimated probability to undergo an emergency

blood transfusion, secondary to perioperative haemorrhage following elective laparoscopic cholecystectomy, is approximately 1:200. Therefore, clinically significant bleeding requiring blood transfusion should be considered as an uncommon complication of elective laparoscopic cholecystectomy.^{19,20}

The literature review also showed a similar probability of perioperative blood transfusion related to laparoscopic cholecystectomy.^{15,16} This finding can

be regarded as a basis for a further overview of existing guidelines and protocols for preoperative ABO group and Rh-type testing in patients listed for elective laparoscopic cholecystectomy. It is important to note that NICE guidelines were published in 2003 and 2016 on the use of routine preoperative tests for adults undergoing non-cardiothoracic and non-neurosurgical elective surgery. Both guidelines emphasise the necessity to reduce unnecessary testing.^{3,21} They do not support the routine preoperative blood group and save testing, and there is little direct evidence to suggest that preoperative testing improves health outcomes in low-risk patients. As per those guidelines, routine preoperative tests are not required for ASA 1 grade patients undergoing intermediate grade procedures (laparoscopic cholecystectomy). For ASA 2 patients with cardiovascular and renal comorbidities or diabetes, only disease-related tests are needed.

Our study shows that preoperative blood group and save testing is very common in biliary surgery in England and elsewhere (Table-2). Such historical perception, based on the erroneous belief that the patient may need a blood group and type specific intraoperative blood transfusion, should undergo a review. Any unexpected intraoperative catastrophic bleed during laparoscopic cholecystectomy should activate the standard massive haemorrhage protocol. This, fortunately, is a rare event in elective laparoscopic cholecystectomy (<0.1%).^{9,10}

In light of standard emergency transfusion practice in NHS hospitals, factors influencing preoperative blood group and save testing for patients listed as day case laparoscopic cholecystectomy also warrant a thorough review. It is hard to disagree with a theory provided in a paper published in 1999²², which states that cost-effective preoperative evaluation can be approached in a variety of ways, including simple measures such as education and use of evidence-based guidelines, in order to modify clinical practice. Recent prospective audit of 50 patients showed that simple awareness of doctors and nurse practitioners to change their practice of preoperative patient care, reduced the rate of unnecessary investigations to 12%.¹³

This analysis has a few limitations. This study does not provide detailed information on reasons for a differentiated approach to preoperative blood group and screen testing. It also does not show the impact of the organisational process for the preoperative ordering of a group and screen test. Finally, we missed the opportunity to include other routine preoperative tests³ such as haemoglobin, haematocrit, full blood count, biochemistry,

haemostasis, and electrocardiograms into this study to provide broader generalizations.

CONCLUSIONS

The incidence of an unexpected blood transfusion attributable to elective laparoscopic cholecystectomy is 0.48%. A routine preoperative blood group and save test is unnecessary. It neither alters the management of severe hypovolemia secondary to perioperative bleeding, nor does it lead to better outcomes. Table-3 provides the bulleted key point summary of this paper.

Table-3: Key point summary for elective laparoscopic cholecystectomy

- | |
|--|
| <ul style="list-style-type: none"> • Preoperative blood group and save testing is common – 44% • Likelihood of an unexpected blood transfusion attributable to is 1:200 • Routine blood group and save testing prior surgery is unnecessary |
|--|

AUTHORS' CONTRIBUTION

AT, KS and MS designed the study. AT was responsible for study data collection and drafting of a first version of the manuscript. QNM contributed drafting it. RL and KS revised the first draft critically and substantially for important intellectual content, re-conceptualized the study, performed a literature search and overview, and essentially redrafted the manuscript.

Funding: This study had no specific funding.

Competing interests: None; no influence from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work.

Transparency declaration: The author affirms that the manuscript is an honest, accurate, and transparent account of the study being reported.

REFERENCES

1. Saxena S, Nelson JM, Osby M, Shah M, Kempf R, Shulman IA. Ensuring Timely Completion of Type and Screen Testing and the Verification of ABO/Rh Status for Elective Surgical Patients. *Arch Pathol Lab Med* 2007;131(4):576–81.
2. Czoski-Murray C, Lloyd Jones M, McCabe C, Claxton K, Oluboyede Y, Roberts J, *et al.* What is the value of routinely testing full blood count, electrolytes and urea, and pulmonary function tests before elective surgery in patients with no apparent clinical indication and in subgroups of patients with common comorbidities: a systematic review of the clinical and cost-effective literature. *Health Technol Assess* 2012;16(50):1–159.
3. Routine preoperative tests for elective surgery. Guidance and guidelines, NICE. [Internet]. [cited 2016 May 18]. Available

- from: <https://www.nice.org.uk/guidance/ng45>
4. Ransom SB, McNeeley SG, Hosseini RB. Cost-effectiveness of routine blood type and screen testing before elective laparoscopy. *Obstet Gynecol* 1995;86(3):346–8.
 5. Parker S, Mahawar K, Balupuri S, Boyle M, Small P. Routine group and save unnecessary for gastric band surgery: a retrospective case review audit of 1018 bariatric patients. *Clin Obes* 2012;2(2-3):73–7.
 6. Hildebrand DR, Binnie NR, Aly EH. Is routine blood cross-matching necessary in elective laparoscopic colorectal surgery? *Int J Surg* 2012;10(2):92–5.
 7. Kaushik R. Bleeding complications in laparoscopic cholecystectomy: Incidence, mechanisms, prevention and management. *J Minim Access Surg* 2010;6(3):59–65.
 8. Huang X, Feng Y, Huang Z. Complications of laparoscopic cholecystectomy in China: an analysis of 39,238 cases. *Chin Med J (Engl)* 1997;110(9):704–6.
 9. Schäfer M, Lauper M, Kr.henbühl L. A Nation's experience of bleeding complications during laparoscopy. *Am J Surg* 2000;180(1):73–7.
 10. Opitz I, Gantert W, Giger U, Kocher T, Krahenbühl L. Bleeding remains a major complication during laparoscopic surgery: analysis of the SALTS database. *Langenbecks Arch Surg* 2005;390(2):128–33.
 11. Suuronen S, Kivivuorii A, Tuimala J, Paajanen H. Bleeding complications in cholecystectomy: a register study of over 22 000 cholecystectomies in Finland. *BMC Surg* 2015;15:97.
 12. Thomson PM, Ross J, Mukherjee S, Mohammadi B. Are Routine Blood Group and Save Samples Needed for Laparoscopic Day Case Surgery? *World J Surg* 2016;40(6):1295–8.
 13. Hack-Adams N, King N, Ahuja M, M Higgs S. Optimising the Pre-Operative Investigative Work Up for Elective Surgical Patients. *BMJ Qual Improv Rep* 2015;4(1):u206272.
 14. Quinn M, Suttie S, Li A, Ravindran R. Are blood group and save samples needed for cholecystectomy? *Surg Endosc* 2011;25(8):2505–8.
 15. Ghirardo SF, Mohan I, Gomensoro A, Chorost MI. Routine preoperative typing and screening: a safeguard or a misuse of resources. *JSLs* 2010;14(3):395–8.
 16. Usal H, Nabagiez J, Sayad P, Ferzli GS. Cost effectiveness of routine type and screen testing before laparoscopic cholecystectomy. *Surg Endosc* 1999;13(2):146–7.
 17. Lin JS, Chen YJ, Tzeng CH, Lyou JY, Lee CH. Revisiting of preoperative blood ordering policy – a single institute's experience in Taiwan. *J Chin Med Assoc* 2006;69(11):507–11.
 18. Hamza N, Pereira M, Gilliam A. Routine “group and save” is unnecessary on the day of surgery for elective laparoscopic cholecystectomy. *Bull Royal Coll Surg Engl* 2015;97(6):E1–4.
 19. Royal College of Obstetricians and Gynaecologists. Presenting information on risk. *Clinical Governance Advice No. 7*. London; 2008. [Internet]. [cited 2016 May 18]. Available from: <https://www.rcog.org.uk/globalassets/documents/guidelines/clinical-governance-advice/cga7-15072010.pdf>
 20. Calman KC, Royston GH. Risk language and dialects. *BMJ* 1997;315(7113):939–42.
 21. Reeves B, Emberton M, Thoms G. Preoperative Tests: the use of routine preoperative tests for elective surgery. *NHS* 2003. [Internet]. [cited 2016 May18]. Available from: <file:///C:/Users/Wali%20Muhammad/Downloads/29094.pdf>
 22. Fischer SP. Cost-effective Preoperative Evaluation and Testing. *Chest* 1999;115(5 Suppl):S96–100.

Received: 11 November, 2016

Revised: 18 December, 2016

Accepted: 23 March, 2017

Address for Correspondence:

Khalid Shahzad, Department of General Surgery, Aintree University Hospital NHS Foundation Trust, Longmoor Lane, Liverpool L9 7AL-UK

Email: khalid.shahzad@aintree.nhs.uk