

Abnormal peri-operative haemorrhage in asymptomatic patients is not predicted by laboratory testing

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Abstract The pre-operative identification of individuals at high risk of bleeding during major elective surgery is obviously important. Extensive haemostatic screening is, however, expensive and may be inappropriate in low-risk groups. Accordingly, we undertook two studies to determine whether it could be justified in patients without a history of abnormal bleeding. In the first of these, 45 of 159 patients were excluded because of aspirin ingestion and a further 3 because of positive bleeding history so that prothrombin time, activated partial thromboplastin time, bleeding time and platelet count were measured in 111 asymptomatic patients about to undergo major surgery. A single patient had mild thrombocytopenia, and 8 had a prolonged partial thromboplastin time; none showed abnormal peri-operative haemorrhage. In the second study, over a 4-month period, 49 patients out of 1 872 required larger peri-operative blood transfusions than anticipated; on investigation, none of these patients was shown to have disturbances in haemostatic mechanism, the transfusion having been indicated for technical reasons. Patients undergoing elective surgery should be asked about medication and previous bleeding and if they have no history thereof and a physical examination is negative, pre-operative screening for coagulation defects would appear to be unnecessary.

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Undetected bleeding disorders could result in unanticipated excessive blood loss during elective surgical procedures, with a consequent increase in morbidity and mortality. Several approaches that involve pre-operative laboratory testing to predict unexpected haemorrhage have been suggested, including evaluation of prothrombin and partial thromboplastin times,¹ bleeding time,² a battery of nine tests, including a platelet count,³ or a sophisticated four-level evaluation of haemostasis.⁴ These practices are commonplace, particularly in the USA, and are often recommended as standard procedures.⁵ Implicit in this concept of haemostasis screening is that patients are, by definition, asymptomatic and therefore free of known risk factors, such as a personal and family history of easy bruising or inappropriate bleeding and having recently taken any medication likely to impair haemostasis. This is different from the diagnostic or confirmatory use of tests in the presence of an existing or suspected bleeding disorder, when such testing becomes essential.

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This report examines the role of screening tests in low-risk, asymptomatic patients in two ways; firstly, by performing haemostatic screening pre-operatively and, secondly, by investigating individuals who had disproportionate peri-operative haemorrhage, to see whether they had haemostatic defects that might have been detected by pre-operative screening.

Patients and methods

Pre-operative screening

One hundred and fifty-nine patients admitted for elective major surgery over a 4-month period at one thoracic service and two general surgical services at Groote Schuur Hospital, Cape Town, form the basis of this part of the study. The operations scheduled were the routine gastro-intestinal, breast, vascular and thoracic procedures that would be encountered in an average general or thoracic practice. The patients were chosen at random and their participation required informed consent. In no case was the result of the haemostasis screening known to the surgeon or anaesthetist.

In each individual a detailed history was taken by means of a questionnaire, with particular emphasis on previous abnormal bleeding at operations, after trauma or dental extractions, and during menstruation and obstetric procedures. Information about medicines taken during the preceding 7 days, whether prescribed or purchased over the counter, was also obtained. Individuals with a positive history in any of these categories were excluded from this study.

The remaining patients had their bleeding time measured by one investigator (C.R.M.) using the Simplate II method. Venous blood was collected for a platelet count using a blood cell counter⁶ (Coulter S-Plus II, Hialeah, Fl.), and for assessment of prothrombin and partial thromboplastin time. Plasma was separated within 1 hour of collection, frozen at -70°C and then assayed in batches by means of the Coag-a-mate (Model X2, General Diagnostics, USA) in the appropriate mode. Wherever possible, abnormal results were further investigated by the taking of another specimen for confirmation and the performing of any additional testing that was appropriate. Each patient was again reviewed postoperatively for evidence of excessive bleeding, defined as transfusion of more blood during surgery or in the 24 hours thereafter than had been ordered pre-operatively.

Investigation of disproportionate haemorrhage

To identify excessive bleeding in patients undergoing elective surgery we inspected transfusion records from the blood bank of the hospital. The surgeons in charge of the patients were consulted as to whether there were technical reasons for the bleeding or whether any disturbance existed that could have been revealed by pre-operative testing.

Results

Pre-operative screening

Of 159 patients interviewed, 45 were excluded because of their having taken aspirin the previous week. Three of the remaining 114 gave a history that suggested easy bruising or inappropriate bleeding and were excluded from further study on these grounds. The remaining 111 patients underwent haemostasis screening. None had abnormal bleeding or prothrombin times, but 9 had other confirmed abnormal results. One had a slightly reduced platelet count of $130 \times 10^9/l$ (normal range $150 - 450 \times 10^9/l$) and 8 had prolongation of the activated partial thromboplastin time, ranging from 35 seconds to 85 seconds (normal upper limit 32 seconds). Appropriate assays excluded the presence of lupus-like anticoagulant and congenital factor deficiencies; no other cause for this abnormality was identified. In none of these patients was blood loss judged to be excessive when gauged by intra-operative transfusion needs greater than the standard volume ordered before surgery.

Investigation of disproportionate haemorrhage

Forty-nine of 1 872 patients undergoing major surgery exceeded the anticipated pre-operative estimation for blood transfusion (Table I). In 23 instances there were technical difficulties that either arose from extensive malignant disease or were associated with vascular surgery. In 9 there was widespread granulation tissue associated with tuberculosis or irradiation; a technical error occurred in 8 cases. In 9 cases there was no acceptable clinical reason for the transfusion; in 4 of these, postoperative haemoglobin determinations led to transfusion; and in 5 the indications remain unexplained.

TABLE I.
Indicators for transfusion in excess of predicted/ordered requirement in over 1 872 elective major surgical procedures

Technical difficulties	23
Infection or irradiation granulations	9
Surgical errors	8
Erroneous postoperative haemoglobin determinations	4
No cause found	5
Total	49

Discussion

Although 10% of pre-operatively screened patients were found to have a mild unexplained abnormality — usually prolonged partial thromboplastin time — none had untoward blood loss. Also, no haemostatic defect was found, according to the same battery of tests employed for pre-operative screening, in 49 of 1 872 patients who had undergone major surgical procedures and required a transfusion greater than anticipated pre-operatively; in these cases the haemorrhage was usually due to a local cause or surgical error.

Failure of laboratory tests to identify patients at risk of haemorrhage is well known. Diamond and Porter⁷ drew attention to the fact that abnormal values were obtained in some patients who did not bleed, whereas no laboratory abnormalities occurred in others who bled excessively. The activated partial thromboplastin time was used as a screen in 12 000 patients and was unable to identify the occurrence of abnormal bleeding in any low-risk groups, but was a predictor of modest strength

in a high-risk group.⁸ Our study did not, however, examine the predictive value of laboratory screening in high-risk patients as is the case, for example, in patients with liver failure. In a further study, both the prothrombin and the partial thromboplastin times were used to screen low-risk patients; only 13 of 480 were identified as having abnormal results and only 1 of these had an abnormal haemorrhage. This did not appear to be attributable to a known coagulation defect. The bleeding time also failed to predict excessive bleeding in 43 patients who bled peri-operatively.⁹

There are multiple potential causes of intra-operative bleeding and elaborate screening strategies have been designed to exclude virtually all of these.⁴ The expense and time involved make these investigations impractical both for the routine surgical service and for the patient. Accordingly, this approach would not be cost-effective for those at low risk of inappropriate bleeding.

From the evidence it would appear that the most important screening test is to take a comprehensive history from the patient. In keeping with current practice, we recommend that a series of questions be incorporated into the nursing evaluation of the newly admitted patient and that the answers to these be confirmed by the responsible physician, particularly where significant abnormalities have emerged. Thus laboratory evaluation, other than a routine blood and platelet count, seems unnecessary if the patient denies excessive bleeding in response to surgery, trauma or dental extractions, or during menstruation or childbirth, if there is no family history of easy bruising or inappropriate bleeding, and, in addition, if no medicines have been ingested during the preceding week.

Non-steroidal anti-inflammatory agents, as well as aspirin-containing compounds, are being consumed with increasing frequency. This was reflected by the fact that over 30% of our patients who were interviewed had taken such drugs, most commonly the latter, in the previous week. They were excluded from this study.

The finding of abnormal screening tests also does not correlate with inappropriate surgical blood loss. In many instances these may be caused by technical errors, of which inadvertent contamination of the specimen with heparin is the single most common cause of prolonged activated partial thromboplastin time, with correction by repeating the test after the addition of heparin-absorption resin. Sensitivity of *in vitro* testing does not correlate closely with a reduction in individual factors that cause surgical bleeding. Finally, it is self-evident that the most common cause of bleeding during or after surgery is vascular damage¹⁰ and that careful attention to surgical haemostasis can achieve a bloodless operation site, even if there is some degree of haemostatic impairment.

Pre-operative screening in low-risk, asymptomatic patients who are not on medication is not cost-effective and is unlikely to predict abnormal haemorrhage. Administrative restriction may be required to change some long-standing but redundant clinical policies, among which is mandatory pre-operative screening for coagulation abnormalities.¹¹

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