West Middlesex University Hospital

Date of Search: 16/17 May 2016

Sources: Medline, Embase, DynaMed, Cochrane Library

Search History:
1. EMBASE; (immunological AND platelet AND count*).ti; 3 results.
2. EMBASE; (immuno AND platelet AND count*).ti; 1 results.
3. EMBASE; "immuno count*".ti; 1 results.
4. EMBASE; immunocount*.ti; 2 results.
5. EMBASE; immuno*.ti; 440348 results.
6. EMBASE; exp THROMBOCYTE COUNT/; 56837 results.
7. EMBASE; preg*.ti,ab; 510679 results.
8. EMBASE; exp PREGNANCY/; 615992 results.
9. EMBASE; 7 OR 8; 801218 results.
10. EMBASE; 5 AND 6 AND 9; 69 results.
11. EMBASE; (immuno* AND count* AND (platelet* OR thrombocyte*)).ti; 44 results.
12. EMBASE; 9 AND 11; 7 results.
13. EMBASE; (immunoplatelet* adj2 count*).ti,ab; 19 results.
14. EMBASE; 9 AND 13; 3 results.
15. EMBASE; (immunothrombocyte adj2 count*).ti,ab; 0 results.
16. EMBASE; ("immuno thrombocyte*" adj2 count*).ti,ab; 0 results.
17. EMBASE; immunoplatelet*.ti; 16 results.
18. Medline; (immunological AND platelet AND count*).ti; 3 results.
19. Medline; (immuno AND platelet AND count*).ti; 0 results.
20. Medline; PLATELET COUNT/; 18475 results.
21. Medline; immuno*.ti; 294496 results.
22. Medline; 20 AND 21; 467 results.
23. Medline; preg*.ti,ab; 412923 results.
24. Medline; exp PREGNANCY/; 785164 results.
25. Medline; 23 OR 24; 877400 results.
26. Medline; 22 AND 25; 37 results.
27. Medline; (immuno* AND count* AND (platelet* OR thrombocyte*)).ti; 35 results.
28. Medline; (immunoplatelet* adj2 count*).ti,ab; 10 results.
29. Medline; (immunothrombocyte adj2 count*).ti,ab; 0 results.
30. Medline; ("immuno thrombocyte*" adj2 count*).ti,ab; 0 results.
31. Medline; immunoplatelet*.ti; 11 results.
32. Medline; IMMUNOLOGIC TECHNIQUES/; 11637 results.
33. Medline; 20 AND 25 AND 32; 0 results.
34. Medline; 20 AND 32; 9 results.
35. Medline; exp TIME FACTORS/; 1054264 results.
36. Medline; 20 AND 35; 1806 results.
37. Medline; 20 AND 25 AND 35; 69 results.

38. Medline; 20 AND 32 AND 35; 1 results.
39. Medline; *TIME FACTORS/; 1604 results.
40. Medline; 20 AND 39; 0 results.
41. Medline; *PLATELET COUNT/; 1899 results.
42. Medline; 35 AND 41; 167 results.
43. EMBASE; exp TIME/; 498404 results.
44. EMBASE; 6 AND 9 AND 43; 23 results.
45. EMBASE; *THROMBOCYTE COUNT/; 3006 results.
46. EMBASE; 43 AND 45; 46 results.
47. EMBASE; exp SPINAL ANESTHESIA/; 19430 results.
48. EMBASE; 6 AND 47; 103 results.
49. Medline; exp ANESTHESIA, SPINAL/; 11101 results.
50. Medline; 20 AND 49; 19 results.
51. Medline; exp ANESTHESIA, EPIDURAL/; 12687 results.
52. Medline; 20 AND 51; 33 results.
53. EMBASE; *THROMBOCYTOPENIA/; 17755 results.
54. EMBASE; 47 AND 53; 15 results.
55. EMBASE; exp IMMUNOLOGICAL PROCEDURES/; 1341080 results.
56. EMBASE; 6 AND 55; 6167 results.
57. EMBASE; 45 AND 55; 125 results.
58. EMBASE; 9 AND 56; 270 results.
59. Medline; (immuno* adj2 analys*).ti; 4313 results.
60. Medline; immunoanalys*.ti; 76 results.
61. Medline; 59 OR 60; 4388 results.
62. Medline; 20 AND 61; 4 results.
64. Medline; immunoanalys*.ti,ab; 328 results.
65. Medline; (immuno* adj2 analys*).ti,ab; 35426 results.
66. Medline; 64 OR 65; 35721 results.
67. Medline; (thrombocyte* OR platelet*).ti; 80188 results.
68. Medline; 20 OR 67; 92320 results.
69. Medline; 66 AND 68; 246 results.
70. Medline; 25 AND 69; 4 results.
71. Medline; 20 AND 66; 22 results.
72. EMBASE; immunoanalys*.ti,ab; 446 results.
73. EMBASE; (immuno* adj2 analys*).ti,ab; 95684 results.
74. EMBASE; exp IMMUNOASSAY/; 431786 results.
75. EMBASE; 72 OR 73 OR 74; 519988 results.
76. EMBASE; 6 AND 9 AND 75; 111 results.
77. EMBASE; 45 AND 75; 78 results.
78. EMBASE; pregn*.ti; 223390 results.
79. EMBASE; 45 AND 78; 78 results.
80. EMBASE; immunoplatelet*.ti,ab; 35 results.
81. Medline; immunoplatelet*.ti,ab; 19 results.
82. EMBASE; exp TURNAROUND TIME/; 2506 results.
83. EMBASE; 45 AND 82; 0 results.
84. EMBASE; exp TIME/; 498404 results.
85. EMBASE; 45 AND 84; 46 results.

Immunoplatelet Counting (in Pregnancy):

Title: The use of immunoplatelet counting for establishing an accurate platelet count during pregnancy

Citation: British Journal of Haematology, May 2014, vol./is. 165/(23), 0007-1048 (May 2014)

Author(s): Velosa Ferreira B., Moita F., Robinson S.E.

Language: English

Abstract: The aim of this study was to examine whether the use of immunoplatelet versus automated platelet count impacts upon treatment requirements in ITP in pregnancy and decision making regarding epidural anaesthesia in ITP and Gestational thrombocytopenia (GT). A retrospective analysis of women referred to the Obstetric Haematology Clinic over 5 years with thrombocytopenia or known ITP was conducted. Automated platelet counts were performed on Beckman Coulter analyzers LH750. Immunoplatelet count was performed by flow cytometry. Thresholds for treatment of ITP and epidural anaesthesia were based on International Consensus Recommendations and local guidelines. 80 women (84 pregnancies) were referred. Immunoplatelet counts were performed in 62 pregnancies (170 samples) and compared to automated platelet counts. A diagnosis of ITP was established in 32 women and GT in 52 women. Using Wilcoxon matched pairs, signed rank test the difference between automated and immunoplatelet counts was significant for both ITP and gestational thrombocytopenia ($p < 0.001$). Applying the International Consensus recommendations for ITP, using automated platelet counts, 1 woman <34/40 of pregnancy and 11 women >34/40 would have required treatment. Using the immunoplatelet count only 1 woman would have required treatment. The immunoplatelet count was determined in 27 women at delivery. According to the automated platelet count 15 women were not suitable for epidural anaesthesia, 3 were not suitable for epidural anaesthesia if the immunoplatelet count was considered. During pregnancy platelet count determination using automated instruments appears to underestimate the true platelet count and may lead to unnecessary treatment and treatment-related toxicity as well as preventing epidural anaesthesia. Further studies to establish the use of immunoplatelet count as the method of reference for treatment decisions as well as for determining suitability for interventional procedures in ITP in pregnancy are required.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Title: The use of immunoplatelet counting for establishing an accurate platelet count during pregnancy

Citation: Haematologica, June 2011, vol./is. 96/(328), 0390-6078 (01 Jun 2011)

Author(s): Moita F., Robinson S.

Language: English

Abstract: Background. The determination of platelet count in pregnancy using automated counters can lead to erroneous results as it excludes the large platelets that are commonly present in both immune and gestational thrombocytopenia. The immunoplatelet count has been validated as an international reference method for determining an accurate platelet count. Aim. The aim of this study was to determine if there is a significant difference between automated platelet count and immunoplatelet count in thrombocytopenia in pregnancy and whether this difference would impact upon treatment decisions. Methods. A retrospective analysis of patients referred to an Obstetric Haematology Clinic in the past two years with platelet counts less than 100 x 109/L during pregnancy or with a history of immune thrombocytopenia (ITP) was conducted. The diagnosis of ITP was established if platelet counts were less than 60 x 109/L or if there was a previous diagnosis of primary or secondary ITP. Gestational thrombocytopenia was considered if platelet counts were above 60 x 109/L and resolved postpartum. Automated platelet counts were performed on Beckman Coulter analyzers LH750. Immunoplatelet count was performed by flow cytometry using the platelet specific antibodies CD41 and CD61. The thresholds considered for treatment and for epidural anesthesia delivery were based on International consensus report and local guidelines. Results. A total of 42 women were referred to our clinic for thrombocytopenia during pregnancy. Immunoplatelet counts were performed in 27 women (total of 68 samples analyzed) at different stages of pregnancy and compared to automated platelet counts. A diagnosis of ITP was established in 14 women and of gestational thrombocytopenia in 13 women. When comparing the platelet count using automated analyzers and immunological methods the immunoplatelet count was greater than the automated platelet count in 97% of samples (n=66/68). Using Wilcoxon matched pairs, signed rank test the difference between automated and immunoplatelet counts was significant for both ITP and gestational thrombocytopenia ($p<0.001$). According to the Mann-Whitney U-test this difference was greater in the ITP subgroup ($p=0.007$). The median increase in platelet count in this subgroup was 68% compared to 38% in the gestational thrombocytopenia subgroup. If we apply the International Consensus Recommendations, using the automated platelet count, 1 woman in the first 33 weeks of pregnancy and 5 women in the late stages of pregnancy would have required treatment. Using the immunoplatelet count all patients had platelet counts above the treatment thresholds. The immunoplatelet count was determined in 8 women at delivery. According to the automated platelet count 5 had a platelet count less than 70 x 109/L and may not have been considered suitable for epidural anesthesia. Of these 5 women 4 had an immunoplatelet count greater than 70 x 109/L. Conclusion. During pregnancy platelet count determination using automated instruments underestimates the platelet count. This may lead to unnecessary treatment as well as preventing the delivery of epidural anesthesia. We suggest further studies to establish the use of immunoplatelet count to guide treatment decisions and interventional procedures in women with thrombocytopenia in pregnancy.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available from *National Library of Medicine* in Haematologica
Available from *Highwire Press* in Haematologica
Available from *National Library of Medicine* in Haematologica

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Immunoplatelet counting (general)

Title: Impact of immunological platelet counting (by the platelet/RBC ratio) on haematological practice

Citation: Cytometry Part B - Clinical Cytometry, September 2005, vol./is. 67/1(1-5), 1552-4949 (September 2005)

Author(s): Harrison P., Segal H., Briggs C., Murphy M., Machin S.

Language: English

Publication Type: Journal: Review

Source: EMBASE

Full Text:
Available from *Wiley-Blackwell Free Backfiles NHS* in Cytometry Part B: Clinical Cytometry
Available from *John Wiley and Sons* in Cytometry Part B: Clinical Cytometry
Available from *John Wiley and Sons* in Cytometry Part B: Clinical Cytometry

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Title: The newly developed sysmex XN-2000 hematology autoanalyzer provides a more accurate platelet count than the older sysmex XE-2100 when compared with the CD41/CD61 immunoplatelet reference method of flow cytometry

Citation: Vox Sanguinis, June 2014, vol./is. 107/(203-204), 0042-9007 (June 2014)

Author(s): Park S.H., Park C.J., Kim M.J., Lee B.R., Cho Y.U., Jang S.

Language: English

Abstract: Background: The Sysmex XN-2000 hematology autoanalyzer provides a new method (PLT-F) for platelet counting that is based on a Fluorocell fluorescent RNA staining dye named oxazine. The PLT-F method in the XN-2000 has been reported to achieve more accurate platelet counting in thrombocytopenic samples than the PLT-O method used in XE-2100. We performed correlation and bias analysis between platelet counts measured by the

XN-2000 and XE-2100 hematology autoanalyzers and those calculated from the CD41/CD61 immunoplatelet reference method (IRM) of flow cytometry. Aims: To evaluate the performance of the new Sysmex XN-2000 hematology autoanalyzer in platelet counting. Methods: A total of 195 peripheral blood samples for which complete blood cell (CBC) counts were requested in the authors' institution from July to September 2013 were randomly selected. All samples were analyzed with the XE-2100 and XN-2000 hematology autoanalyzers within 4 h after collection. Platelet counts were acquired with the PLT-O method in the XE-2100 and the PLT-F method in the XN-2000. In addition, the CD41/CD61 IRM of flow cytometry was obtained on a FACScantoII (Becton-Dickinson, Sunnyvale, CA). Linear regression and Bland-Altman analysis was applied to compare the platelet counts measured by the two hematology autoanalyzers and those produced by CD41/CD61 IRM of flow cytometry. Results: For the XE-2100, the correlation results between platelet counts directly measured by the XE-2100 (XE PLT) and the CD41/CD61 IRM-based platelet count obtained by using the RBC count measured by the XE-2100 (XE flow-based PLT) yielded a correlation coefficient of gamma = 0.986. For the XN-2000, the correlation analysis produced a comparative correlation coefficient of gamma = 0.984 between the platelet count measured by the XN-2000 (XN PLT) and the CD41/CD61 IRM-based platelet count obtained by using the RBC count measured by the XN-2000 (XN flow-based PLT). Bias analysis between the XE PLT and XE flow-based PLTs demonstrated a mean bias of-37.6 x 10³/mul. For the XN-2000, the same bias analysis between the XN PLT-and XN flow-based PLTs showed a mean bias of-24.2 x 10³/mul, which suggest a significant reduction of bias (13.4 x 10³/mul) compared with the reference method when the XN-2000 is used instead of the XE-2100. Summary/Conclusions: We have demonstrated that the Sysmex XN-2000 PLT-F method can more accurately assess platelet counts than the Sysmex XE-2100 PLT-O method. Therefore, the Sysmex XN-2000 hematology autoanalyzer can be more helpful for appropriate clinical decision making by providing more accurate platelet counts.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available from *John Wiley and Sons* in Vox Sanguinis

Title: The Sysmex XN-2000 hematology autoanalyzer provides a highly accurate platelet count than the former Sysmex XE-2100 system based on comparison with the CD41/CD61 immunoplatelet reference method of flow cytometry

Citation: Annals of laboratory medicine, November 2014, vol./is. 34/6(471-474), 2234-3814 (01 Nov 2014)

Author(s): Park S.H., Park C.-J., Kim M.-J., Han M.-Y., Lee B.-R., Cho Y.-U., Jang S.

Language: English

Publication Type: Journal: Article

Source: EMBASE

Full Text:
Available from *National Library of Medicine* in Annals of Laboratory Medicine

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Title: Performance evaluation of platelet counting by novel fluorescent dye staining in the XN-series automated hematology analyzers

Citation: Journal of clinical laboratory analysis, September 2014, vol./is. 28/5(341-348), 1098-2825 (01 Sep 2014)

Author(s): Tanaka Y., Gondo K., Maruki Y., Kondo T., Asai S., Matsushita H., Miyachi H.

Language: English

Abstract: BACKGROUND: Conventional automated hematology analyzers have limitations in platelet measurements such as poor accuracy and precision in the low count range and interference by nonplatelet particles. In order to improve it, the newly developed XN-Series automated hematology analyzers (Sysmex Corporation, Kobe, Japan) have been installed with a new dedicated channel for platelet analysis (PLT-F), which is based on a fluorescence flow cytometry method with uses of a novel fluorescent dye specifically staining platelets. We evaluated the basic performance of this new PLT-F channel.METHODS: Basic performance of the PLT-F channel in within-run reproducibility and assay linearity was studied using standard methods. Correlation was studied between PLT-F and a conventional automated hematology analyzer (XE-2100) and immunoplatelet analysis using anti-CD61 monoclonal antibody (Cell-Dyn Sapphire; Abbott Laboratories). The assay interference by nonplatelet particles such as fragmented red and white blood cells was evaluated by using clinical samples, respectively, from burn injury and acute leukemia.RESULTS: Basic performance of the PLT-F platelet counting was satisfactory in within-run reproducibility, linearity and correlation with the conventional analyzer. The correlation was satisfactory also with the immunoplatelet analysis, even for samples from a patient with burn injury, and those with white blood cell fragments displayed, platelet abnormal flag and low platelet counts (<50 x 10(9)/l).CONCLUSION: The platelet counting performance of the PLT-F channel of the XN Series had improved accuracy and precision in the low range and in abnormal samples, avoiding the interference by nonplatelet particles.

Publication Type: Journal: Article

Source: EMBASE

Full Text:
Available from *John Wiley and Sons* in Journal of Clinical Laboratory Analysis

Title: A novel high-throughput whole blood immuno-counting assay is useful in the assessment of platelet responses to antiplatelet therapy

Citation: Arteriosclerosis, Thrombosis, and Vascular Biology, May 2014, vol./is. 34/(no pagination), 1079-5642 (May 2014)

Author(s): Lordkipanidze M., Dovlatova N., Algahtani M., Lundberg M.H., Warner T.D., Fox S.C., Watson S.P.

Language: English

Abstract: Background: The current gold standard in platelet function testing, light transmission aggregometry, is time-and labor-intensive, and uses platelet-rich plasma which makes it sub-optimal for high throughput testing. In order to reduce blood manipulation prior to platelet function testing and to study multiple platelet activation pathways simultaneously, we have developed a 96-well plate-based assay carried out in whole blood, where aggregation is measured as a decrease in the number of fluorescently-labeled single platelets by flow cytometry. Aim: To investigate whether a 96-well plate-based whole blood assay can be used to assess platelet function. Methods: Platelet function in response to 5 concentrations of lyophilized arachidonic acid (AA), ADP, collagen, epinephrine, TRAP, U46619, and ristocetin, was assessed in healthy volunteers (n=20) to establish normal ranges. The effect of antiplatelet drugs was assessed in vitro by incubation with aspirin (100 muM), cangrelor (1 muM) or both (n=20), and in patients on dual antiplatelet therapy (n=20). After addition of 40 mul of whole blood per well, the plate was shaken for 5 min at 1000 rpm at 37degreeC; a fixative solution (Platelet Solutions, Nottingham) was applied to stop platelet aggregation and allow analysis in a central laboratory. Fixed whole blood samples (stable for up to 9 days) were labeled with FITC-conjugated CD42a and assessed by flow cytometry. Aggregation was calculated as (Platelet count in vehicle-treated sample-Platelet count in agonist-stimulated sample) / Platelet count in vehicle-treated sample x 100. Results: Dose-response curves were readily assessable for all agonists and intra-individual variability was minimal in healthy volunteers (CV<10%). In vitro addition of aspirin alone resulted in inhibition of AA-and collagen-induced aggregation, whereas cangrelor induced a shift in dose-response to most agonists in addition to profound inhibition of ADP responses. In patients on dual antiplatelet therapy, the pattern of response was consistent with the results obtained with in vitro agents. Conclusions: A 96-well plate-based whole blood assay with a minimal blood volume requirement (<2 ml) could be used to provide a global portrait of platelet responses to antiplatelet agents.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Title: Proposal of additional considerations to reference method of platelet counting necessary for transition to monoclonal method

Citation: International Journal of Laboratory Hematology, May 2013, vol./is. 35/(127), 1751-5521 (May 2013)

Author(s): Nagai Y., Jishage Y., Kondo H.

Language: English

Abstract: Introduction: The monoclonal method for platelet counting is based on the contemporary reference method. However the results might be different from the phase contrast microscope method(PCMS) as an alternate historical comparative method, because of their detecting different minimum limits. From our previous studies, additional considerations necessary for transition to the monoclonal method were deduced using "minimum detection sensitivity and the lower limit size of platelet", "stability of the sample after immunostaining" and "indirect counting with ratio of red cell and platelet". In the standardization of platelet-derived microparticle counting by ISTH, the size range was defined between 0.5 and 1.0mum beads. Therefore it might be appropriate to adapt the lower limit size of platelet definition by using 1.0mum beads in the monoclonal method for platelet counting. First consideration requirement was how to set the lower limit by using various beads, and other consideration requirements were to reduce the influence of natural activation of the platelet and platelet counting without using red cell counting. Methods: Blood specimens(n=6) from healthy volunteers were anti-coagulated with K2EDTA, and were used for each examination. Monoclonal method(CD61, CD41a) was performed based on CLSI H26-A2 guideline referenced by both ICSH and ISLH in 2001. Flowcytometer(FACS Calibur, Beckton Dickinson:BD) were utilized for each flowcytometry(FCM). Beads(0.5mum, 1.0mum, 2fL:1.56mum) were used for the SOP of FCM. It made comparative study including the sensitivity examination for detection ability of small particles on the condition of discriminator threshold position(DTP) and the lower limit position(LLP). Sample stability examination was performed(after 30min, 1day, 5days, 7days), and 1% paraformaldehyde(CellFIX:BD) was used for reducing the influence of natural activation of the platelet. The specialized beads(TruCOUNT:BD) were used to determine an accurate count. We compared the monoclonal method with the PCMS method provided by both WHO and ICSH in 2000. Results: All results were described with average of platelet counting(109/L). DTP(low) and LLP(None, 1.0mum, 2fL):261, 233, 97; DTP(low, 0.5mum, middle, 1.0mum) and LLP(1.0mum):549, 296, 282, 277; Sample stability(PBS, DTP-low, LLP-1.0mum):549, 461, 244, 193; Sample stability(CellFIX, DTP-1.0mum, LLP-1.0mum):290, 293, 281, 279; Comparative study: Indirect counting(FCM, FCM>1mum), Direct counting(FCM, PCMS): 342, 309, 307, 262; Conclusions: Sensitivity was confirmed by being able to distinguish 0.5 and 1.0mum beads and the threshold of the discriminator was set between 0.5 and 1.0mum beads. The lower limit of platelet was set at the mean value of distribution of 1.0um beads, and 2fL(1.56mum) beads were counted as platelet. Reducing influence of natural activation of the platelet was effective. Indirect FCM Counting with lower limit at 1mum was same as Direct FCM Counting and higher than Direct PCMS Counting.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Title: Potential clinical impact of inaccurate automated platelet counts in the setting of severe thrombocytopenia

Citation: Blood, November 2012, vol./is. 120/21(no pagination), 0006-4971 (16 Nov 2012)

Author(s): Marionneaux S.M., Maslak P.G., Francisco N., Chan V., Hanenberg J., Lynch J., Rafael J., Yao J., Chua C.

Language: English

Abstract: Severe thrombocytopenia is not an uncommon finding in the setting of hematologic malignancies. The key to a successful outcome often lies in the ability to support the patient through periods of cytopenia by adopting an aggressive transfusion strategy for platelets. Therefore, an accurate assessment of the platelet count is of utmost importance particularly as it relates to various levels which "trigger" prophylactic platelet transfusion. However, the accuracy and precision of conventional platelet counting methods have been shown to be suspect in severely thrombocytopenic samples. We investigated the accuracy of several commercial hematology analyzers currently available in clinical practice which use optical, impedance and immunologic platelet determination methods and assessed whether biased results could have an impact on decisions regarding platelet transfusion. Four-hundred three (403) EDTA-anticoagulated samples collected from patients with hematologic malignancies and a platelet count of < 50 x 10e3/uL were selected from the standard workflow processed in the hematology laboratories at MSKCC. Samples were split and tested within 8 hours of collection using optical based methods on the Advia 2120i (Siemens, Tarrytown, NY) and CELL-DYN Sapphire (Abbott Diagnostics, Santa Clara, CA). During the study, an additional analyzer became available, the XE-2100 (Sysmex, Kobe, Japan) which enumerates platelets by impedance and optical technology. One hundred twenty seven (127) of the 403 samples were split and tested by the Sysmex analyzer. Platelet counts from each method were then compared using the CD61 immunoplatelet determination (Abbott, Santa Clara, CA) as the reference value. The CD61 immunoplatelet method was chosen as the reference standard because we found excellent correlation in linear regression between this method and phase microscopy (r =0.99, y = -0.96 + 0.88x; n = 37). Also, the International Counsel for Standardization in Haematology and the International Society for Laboratory Hematology recommend the counting of specifically labelled platelets (CD41, CD61) by flow cytometry as a reference method for the enumeration of platelets. Bland-Altman difference plots were used to visualize the agreement between the reference and test methods and the paired t-test evaluated the statistical significance of the difference between methods. We then compared the number

of platelet transfusion indications (at various platelet thresholds) as determined by all methods with potential transfusion decisions made using the reference method. There was a statistically significant positive bias among the optical and impedance methods compared with CD61 enumeration. Using various platelet transfusion decision points, the number of patients who were at risk for under transfusion (platelet count above threshold when reference result is < threshold) ranged from 1-2 % at a threshold of 50k/uL to 30-40 % when the threshold was lowered to 10k/uL. These results highlight the limitations in the accuracy of optical and impedance methods, particularly in the setting of severe thrombocytopenia. Since prophylactic platelet transfusions are by and large based on standard "triggers," an overestimation of the platelet count may lead to under-transfusion, especially in patients at the highest risk for hemorrhage. Clinicians should be aware of the limitations of automated platelet determinations and consider this when making medical decisions regarding supportive transfusions.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available from *Highwire Press* in Blood
Available from *Free Access Content* in Blood

Title: Low platelet count evaluation on the new sysmex XN2000 haematology analyser

Citation: International Journal of Laboratory Hematology, June 2012, vol./is. 34/(133-134), 1751-5521 (June 2012)

Author(s): Oomes J., Schoorl M., Van Pelt H.

Language: English

Abstract: Objectives: In thrombocytopenic subjects, especially when a decision on platelet (PLT) transfusion has to be made, high accuracy and precision of low PLT count is essential for appropriate decisions. A PLT transfusion threshold of 10x10⁹/L is recommended for prophylactic transfusion in stable patients and <20x10⁹/L in the presence of risk factors such as splenomegaly, coagulation factor deficiencies and rapid decrease in PLT count or bleeding. During preoperative evaluation, PLT counts between 50 and 100x10⁹/L are used as an indicator of the potential need for PLT transfusion. These subtle differences require an accurate method for determining the PLT count. The Sysmex XN2000 automated haematology analyser is a newly developed multi parameter blood cell counter with new functions to enhance precision in blood cell counting. The XN2000 analyser is equipped with three methodologies for PLT counting: impedance (PLT-I channel), optical (PLT-O channel) and a new fluorescence (PLT-F channel) method. The PLT-F methodology is based on a Fluorocell fluorescent dye and an extended counting volume. Platelets are clearly distinguished from other blood cells using the difference in forward scattered light and the fluorescence intensity. The precision of the

PLT-F counting methodology in patients with PLT count <50x10⁹/L was investigated and compared with the CD61-ImmunoPLT flowcytometric reference method (ICSH). For comparison, PLTI and PLT-O were analysed on the Sysmex XN2000 and the routinely used Sysmex XE2100 analyser. Methods: Blood samples were selected from patients with PLT count < 50 x 10⁹/L (n=37) and analysed with parameter profile CBC+RETI+PLT-F in order to ensure that results of all parameters were available. Blood samples were drawn into Vacutainer tubes, anticoagulated with K2EDTA and analyzed within 4 hours after collection. For comparison blood samples were analysed on the Sysmex XE2100 analyser. The immunoplatelet reference method, by application of the PLT/RBC ratio, according the ISCH guidelines for PLT counting, was performed on a Beckman Coulter FC-500 flowcytometer. Reproducibility was performed by sequential analysis of a sample with a low PLT count (PLT 20x10⁹/L). Results: At a level of 20x10⁹/L PLTs, reproducibility for PLT-I, PLT-O and PLT-F on the XN2000 demonstrated coefficients of variation of 9.3%, 8.5% and 3.0% respectively. PLT-O counts < 50x10⁹/L correlated excellent (r>0.977) between XN2000 and XE2100. Linear regression analysis for PLT-F compared with the CD61-ImmunoPLT method is determined as PLT-F = 0.71*CD61 - 0.8 (r=0.988). Linear regression analysis for PLT-F compared with PLT-O on XN2000 is determined as PLT-F = 1.05*PLT-O - 2 (r=0.975). Using the transfusion threshold of 20x10⁹/L PLTs, linear regression analysis for PLT-F compared with PLT-O on XN2000 is determined as PLT-F = 0.90*PLT-O - 0.4 (r=0.956). Conclusions: The new PLT-F method demonstrated excellent results for reproducibility in samples with PLT concentrations <20x10⁹/L. With respect to the transfusion threshold, PLT-F could be helpful to make better decisions for PLT transfusions.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Title: Standardisation of platelet counting accuracy in blood banks by reference to an automated immunoplatelet procedure: comparative evaluation of Cell-Dyn CD4000 impedance and optical platelet counts.

Citation: Transfusion and apheresis science : official journal of the World Apheresis Association : official journal of the European Society for Haemapheresis, Oct 2001, vol. 25, no. 2, p. 93-106, 1473-0502 (October 2001)

Author(s): Johannessen, B, Haugen, T, Scott, C S

Abstract: Prophylactic and therapeutic platelet transfusions are increasingly used for patients with conditions associated with thrombocytopenia in order to prevent the development of potentially life threatening bleeding. These clinical strategies have led to a significant expansion in platelet unit manufacture, and this now represents a major resource

and cost commitment for blood banks. As part of the manufacturing process, blood banks are required to implement control procedures, and the determination of platelet counts in particular is necessary to confirm that the quality of platelet unit production meets the standards defined by national or international guidelines. Apart from linearity analysis and comparisons of platelet counts given by different instruments, there has been no systematic standardisation of platelet counting methods in blood bank practice because to date there has been no suitable reference method for counting platelets in citrate anticoagulants. The recent introduction of an automated immunoplatelet procedure on the Cell-Dyn CD4000 provides a means of determining a true platelet count that is unaffected by changes induced either by storage or anticoagulant. The CD4000 in its routine configuration also provides simultaneous impedance and optical platelet counts and this study was therefore undertaken in order to compare all three different platelet counting methods in parallel with a representative series of platelet units. Platelet counts determined after sub-sampling of platelet units into EDTA vs plain non-anticoagulated tubes revealed no differences in impedance or immunoplatelet counts but generally lower optical counts when aliquoted into tubes that did not contain EDTA. This study therefore routinely used EDTA for platelet unit sub-samples. Comparative results of platelet counts for buffy coat platelet units (n = 36) aliquoted into EDTA indicated that the impedance count was higher than the reference immunoplatelet count by a mean factor of 1.25 while the optical count was lower by a mean factor of 0.87. The degree of impedance count overestimation was particularly consistent while the optical count underestimation was more variable. Linearity studies of 10 fresh platelet units showed no deviation in the range 0-2305 x 10(9) l(-1) for impedance and 0 to 1420 x 10(9) l(-1) for the optical counts, and the relative numerical relationships between impedance and optical counts were conserved throughout the range of dilutions tested. In the CD4000 optical analysis, blood samples anticoagulated with EDTA showed a distinctive elliptical population distribution that fell within the system thresholds. In contrast, the optical pattern observed for platelet units (in CPD) and ACD-anticoagulated venous blood showed a wider 90 degrees scatter with a population of platelet events above the upper parallel discriminator. As these were excluded from the optical count (but were still identified as platelets by the immunoplatelet method) it meant that the optical counts of samples in citrate-based anticoagulants were systematically lower than immunoplatelet counts. Platelet units (n = 15) analysed daily over a seven day period of storage revealed that the greatest decline in platelet counts was with the optical measurement while the most stable value was obtained by impedance analysis. The results of the immunoplatelet analysis further suggested a progressive increase in small platelets with increasing storage time. The use in this study of a standardised immunoplatelet reference method to examine the question of analyser suitability for determining platelet counts/yields of platelet units thus provided a number of important findings. An impedance platelet counting method is utilised by the great majority of haematology instruments in current use, and in common with the CD4000 analyser, a correction factor is employed to take account of RBC/platelet coincidence. This study found that when analysed samples such as platelet units were RBC-free, that an inappropriate correction factor was applied. Consequently, the CD4000 impedance platelet count will provide reliable platelet counts, irrespective of the day of platelet unit storage, when a factor of 1.25 is applied to the system-reported result. By comparison, optical methods are more likely to be affected by subtle morphological changes that may result from anticoagulants or progressive storage time. The method limitations documented by this study may well affect many other analysers and mean that the

implementation of process control statistics related to platelet counts may be less reliable than previously assumed. It is suggested that standardisation could be much better achieved if there was some form of system cross-calibration that was referenced to an independent method such as an immunoplatelet assay. It is proposed that studies of this type should be extended to a wide assessment of platelet count accuracy of blood bank instruments in order to standardise data within national organisations. If consistent inter-instrument correction factors such as those documented here can be identified, it would considerably increase the relevance of determining platelet counts in production control processes.

Source: Medline

Title: Evaluation of platelet count in patients receiving chemotherapy by the Cell-Dyn sapphire CD61-Immunoplatelet method

Citation: International Journal of Laboratory Hematology, May 2011, vol./is. 33/(86), 1751-5521 (May 2011)

Author(s): Kim B., Kim J.-E., Woo K.-S., Cho S.-S., Ahn K.-S., Han J.-Y.

Language: English

Abstract: Objectives: Spurious elevation of automated platelet counts occasionally occurs in patients receiving chemotherapy or radiotherapy associated with tumor lysis syndrome. Tumor lysis syndrome was originally described in patients with Burkitt' lymphoma after effective chemotherapy. Subsequently, it has been reported in patients with solid organ tumors, leukemia, and other lymphomas. Methods: We performed a platelet count with the Cell-dyn Sapphire and XE-2100. The Cell-dyn Sapphire detects platelets with a CD61 monoclonal antibody and uses both impedance and optical technology. We evaluated platelet counts obtained with Cell-dyn Sapphire impedance, optical, and CD61 methods and compared them with the results obtained with XE- 2100hematology analyzers. We analyzed 111 samples from hospitalized patients with various hematologic diseases who were receiving chemotherapy or radiotherapy. Results: The impedance, optical, and CD61 methods and XE- 2100 all showed significant linearity, with correlation coefficients greater than 0.99. The impedance method yielded higher platelet counts than the other methods. 3 cases of these had a significant platelet count compared with PLTi, PLTo, CD61 and XE-2100 analyzer results. Case 1: PLTi 22.4 k/mul, PLTo 9.6 k/mul, CD61 8.3 k/mul, and our laboratory analyzer yielded 17 k/mul. Case 2: PLTi 17.2 k/mul, PLTo 7.8 k/mul, CD61 4.95 k/mul, and our laboratory analyzer yielded 13 k/mul. Case 3: PLTi 30.6 k/mul, PLTo 19.4 k/mul, CD61 2.87 k/mul, and our laboratory analyzer yielded 26 k/mul. We also performed microscopic examination: the examination showed cellular fragments of the leukemic cells and very low platelet count corresponded with CD61 values. It should be noted that many cellular fragments were the same size or smaller than platelets and were thus counted as such, since automated blood counter assesses cell populations by their dimensions. Conclusions: We suggest hat the platelet counts obtained by the CD61 method are the true

platelet counts of our patients. However, since only a small number of cases show different platelet numbers, further evaluation is needed.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Title: Comparison of platelet counts by CellDyn sapphire (abbot diagnostics), LH750 (Beckman Coulter), ReaPanThrombo immunoplatelet method (ReaMetrix), and the international flow reference method, in thrombocytopenic blood samples

Citation: Cytometry Part B - Clinical Cytometry, July 2010, vol./is. 78/4(279-285), 1552-4949;1552-4957 (July 2010)

Author(s): Sehgal K., Badrinath Y., Tembhare P., Subramanian P.G., Talole S., Kumar A., Gadage V., Mahadik S., Ghogale S., Gujral S.

Language: English

Abstract: Background: We compared the international flow reference method (IRM) platelet counts with those obtained from CellDyn Sapphire (impedance and optical counts), LH750 (impedance counts), and the flowcytometry based ReaPanThrombo Immunoplatelet method (ReaMetrix). We further evaluated the degree of agreement of above methods with the IRM at the transfusion thresholds of 10 x 10⁹ I⁻¹ and 20 x 109 I⁻¹. Methods: A total of 104 thrombocytopenic blood samples with platelet count of <50 x 10⁹ I⁻¹ were selected for the study. All samples were tested in parallel by various methods within 6 h of blood collection. Results: For bias estimation, a Bland-Altman analysis was done by taking the IRM as the standard method. The bias for CDS-I counts was +6.505 x 10 ⁹ I⁻¹ (95% LA -2.110 to +15.122), for CDS-O counts the bias was -3.779 x 10⁹ I⁻¹ (95% LA -8.950 to +1.392), for LH750 the bias was +0.111 x 10⁹ I⁻¹ (95% LA -5.862 to +6.084) and that for ReaMetrix was -1.602 x 10⁹ I⁻¹ (95% LA -7.400 to +4.194). The LH750 had the least average bias and it overestimated platelet counts marginally. The ReaMetrix method showed the highest degree of agreement with the IRM, at both the threshold points with a K value of 0.960 (threshold < 10 x 10⁹ I⁻¹) and 0.923 (threshold < 20 x 10⁹ I⁻¹). Conclusions: Impedance platelet counts from LH750 were more accurate than optical methods in thrombocytopenic patients. ReaMetrix immunoplatelet counts show the maximum degree of agreement with the IRM at clinically relevant transfusion thresholds. We conclude that as current platelet transfusion thresholds are based on results of automated hematology analyzer methods, the true thresholds may be determined using the IRM and CD41/61 based single-platform immunoplatelet methods. © 2010 Clinical Cytometry Society.

Publication Type: Journal: Article

Source: EMBASE

Full Text:
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Available from *John Wiley and Sons* in Cytometry Part B: Clinical Cytometry
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Title: Evaluation of low platelet counts by optical, impedance, and CD61-immunoplatelet methods: Estimation of possible inappropriate platelet transfusion

Citation: Transfusion, April 2010, vol./is. 50/4(795-800), 0041-1132;1537-2995 (April 2010)

Author(s): Cid J., Nascimento J.D., Vicent A., Aguinaco R., Escoda L., Ugarriza A., Llorente A.

Language: English

Abstract: Background: The Cell-Dyn Sapphire (Abbott Diagnostics) detects platelets (PLTs) with a CD61 monoclonal antibody directed against glycoprotein IIIa as well as impedance (IMP) and optical (OPT) technology. We decided to evaluate low PLT counts produced by IMP and OPT methods and to compare them with the CD61 method. We also examined the possibility of inappropriate PLT transfusion resulting from an inaccurate PLT count. Study design and methods: We analyzed consecutive blood samples with OPT PLT counts of less than 50 x 10 ⁹/L. We performed the PLT count with the OPT, IMP, and CD61 methods and we compared the number of prophylactic PLT transfusion indications according to the PLT counts determined by the OPT and IMP methods with the number of prophylactic PLT transfusion indications according to our reference CD61 method. Results: We collected 135 samples. In the bias analysis, the OPT method and the IMP method showed higher PLT counts when compared with the CD61 method (mean of difference 1.69 x 10⁹ and 19.1 x 10⁹/L, respectively). We saw overtransfusion in 1.5% of cases and undertransfusion in 15.2% of cases (p = 0.01; McNemar's test) when we selected a threshold of 10 x 10⁹/L with the OPT method. We saw undertransfusion in 22.2% of cases (p = 0.03; McNemar's test) when we selected a threshold of 5 x 10⁹/L with the OPT method. Conclusions: Low PLT counts determined by the OPT and IMP methods showed some disagreement when compared with the CD61 method. This disagreement caused both PLT undertransfusion and overtransfusion. © 2009 American Association of Blood Banks.

Publication Type: Journal: Article

Source: EMBASE

Full Text:
Available from *John Wiley and Sons* in Transfusion

Title: Platelet count evaluation using three automated haematology analysers compared with the immunoplatelet reference method, and estimation of possible inadequate platelet transfusion.

Citation: International journal of laboratory hematology, Jun 2009, vol. 31, no. 3, p. 298-306, 1751-553X (June 2009)

Author(s): Hong, K H, Kim, M J, Lee, K W, Park, K U, Kim, H S, Song, J

Abstract: The accuracy of three automated haematology analysers [Sysmex XE-2100 (both optical and impedance mode), Bayer Advia 120, and Beckman Coulter LH-750] was compared with the immunoplatelet reference method for platelet measurement. A total of 165 blood specimens were obtained from patients and platelet counts were determined using the four-automated haematology analyser methods and the immunoplatelet reference method. The coefficients of determination (R(2)) between the automated haematology analyser methods and the immunoplatelet reference method for the overall platelet range were >0.98. A bias study, however, showed some disagreement. The use of a coincidence correction calculation for the immunoplatelet method did not improve the correlation between the immunoplatelet method and the automated haematology analyser methods. To estimate the possibility of inadequate platelet transfusion, the number of prophylactic platelet transfusion indications determined by the automated haematology analyser platelet counts were compared with the number of transfusion indications according to the platelet counts determined by the immunoplatelet method. An additional 48 blood specimens were included in this analysis. All of the automated haematology analysers showed some disagreement in the transfusion indications when compared with the immunoplatelet method, suggesting the possibility of inadequate platelet transfusion.

Source: Medline

Title: Evaluation of the platelet counting by Abbott CELL-DYN SAPPHIRETM haematology analyser compared with flow cytometry

Citation: International Journal of Laboratory Hematology, April 2009, vol./is. 31/2(151-160), 1751-5521;1751-553X (April 2009)

Author(s): Grimaldi E., Del Vecchio L., Scopacasa F., Lo Pardo C., Capone F., Pariante S., Scalia G., Caterina M.D.

Language: English

Abstract: The Abbot Cell-Dyn Sapphire is a new generation haematology analyser. The system uses optical/fluorescence flow cytometry in combination with electronic impedance to produce a full blood count. Optical and impedance are the default methods for platelet counting while automated CD61-immunoplatelet analysis can be run as selectable test. The aim of this study was to determine the platelet count performance of the three counting methods available on the instrument and to compare the results with those provided by Becton Dickinson FACSCalibur flow cytometer used as reference method. A lipid interference experiment was also performed. Linearity, carryover and precision were good, and satisfactory agreement with reference method was found for the impedance, optical and CD61-immunoplatelet analysis, although this latter provided the closest results in comparison with flow cytometry. In the lipid interference experiment, a moderate inaccuracy of optical and immunoplatelet counts was observed starting from a very high lipid value. © 2007 Blackwell Publishing Ltd.

Publication Type: Journal: Article

Source: EMBASE

Title: Relationships between platelet counts, platelet volumes and reticulated platelets in patients with ITP: evidence for significant platelet count inaccuracies with conventional instrument methods.

Citation: International journal of laboratory hematology, Apr 2009, vol. 31, no. 2, p. 199-206, 1751-553X (April 2009)

Author(s): Diquattro, M, Gagliano, F, Calabrò, G M, Tommasi, M, Scott, C S, Mancuso, G, Palma, B, Menozzi, I

Abstract: The platelet count has a primary role in the diagnosis and treatment of idiopathic thrombocytopenic purpura (ITP). This study analysed the accuracy of ITP patient platelet counts determined by Abbott CD-Sapphire (impedance/optical) and Bayer Advia 120 (optical) analyses, compared with a reference immunoplatelet method. Instrument platelet estimates showed broad equivalence in the higher range of observed values, but significant discrepancies against the immunoplatelet count were seen when platelet counts were <10 x 10(9)/l. CD-Sapphire mean platelet volume (MPV) results revealed increased (>12 fl) platelet volumes in eight of eight ITP patients with counts of <20 x 10(9)/l compared with 6/6 and 5/13 patients with platelet counts of 20-50 and >50 x 10(9)/l. In contrast, Bayer Advia MPV values showed no relationship with the platelet count. Increased reticulated platelets were associated with an increasing CD-Sapphire MPV (R(2) = 0.61) and a decreasing platelet count. High (>40%) reticulated platelet values were seen in 9/9 patients with immunoplatelet counts of <20 x 10(9)/l compared with 0/19 patients with platelet counts above 20 x 10(9)/l. There may be a need for caution in the interpretation of platelet counts

in ITP patients obtained with conventional instrument methods, and therapeutic decisions should ideally be validated by reference immunoplatelet procedures.

Source: Medline

Full Text:
Available from *John Wiley and Sons* in International Journal of Laboratory Hematology
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Title: In vitro evaluation of platelet concentrates during storage: Platelet counts and markers of platelet destruction.

Citation: Transfusion and apheresis science : official journal of the World Apheresis Association : official journal of the European Society for Haemapheresis, Dec 2007, vol. 37, no. 3, p. 261-268, 1473-0502 (December 2007)

Author(s): Apelseth, Torunn O, Hervig, Tor

Abstract: Differences in platelet counts are observed by use of automated haematology analyzers making interlaboratory comparison difficult. Twenty-eight single-donor platelet concentrates (PCs) were collected. Platelet concentration and markers of platelet destruction were investigated during storage for 11/12 days. Increasing impedance-immunoplatelet ratio was observed during storage, correlating to platelet fragments, large platelets, platelet density and cell-lysis. High variability was observed for optical-immunoplatelet ratio. Immunoplatelet count or correction factor calculated by impedance-immunoplatelet ratio should be used to confirm that platelet unit meets platelet count requirements or to compare results from clinical trials. Optical platelet count is not recommended.

Source: Medline

Title: Discrepancy between impedance and immunofluorescence platelet counting has implications for clinical decision making in patients with idiopathic thrombocytopenia purpura

Citation: British Journal of Haematology, August 2006, vol./is. 134/3(320-322), 0007-1048;1365-2141 (August 2006)

Author(s): Bowles K.M., Bloxham D.M., Perry D.J., Baglin T.P.

Language: English

Abstract: This study investigated whether differences occur between the impedance and immunofluorescence methods for platelet quantification in idiopathic thrombocytopenia purpura (ITP). Immunofluorescence gave a platelet count >50% higher than the impedance

test in 9/35 (26%) patients, of which 4/35 (11%) were >100% higher. The clinical severity of thrombocytopenia was changed as a result of the immunofluorescence test in 14/35 (40%) patients. Neither mean platelet volume nor platelet distribution width predicted impedance/ immunofluorescence method discrepancy. It is suggested that immunofluorescence platelet counts should be performed on all ITP patients when the implementation of a therapeutic or diagnostic intervention is being considered. © 2006 The Authors.

Publication Type: Journal: Article

Source: EMBASE

Full Text:
Available from *John Wiley and Sons* in British Journal of Haematology
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Title: The platelet count accuracy of platelet concentrates obtained by using automated analysis is influenced by instrument bias and activated platelet components.

Citation: Vox sanguinis, Oct 2004, vol. 87, no. 3, p. 196-203, 0042-9007 (October 2004)

Author(s): Hervig, T, Haugen, T, Liseth, K, Kjeldsen-Kragh, J, Scott, C S, Johannessen, B

Abstract: The blood platelet content (in numbers) of platelet concentrates is required for production quality control and to predict clinical responses. This study compared the performance of automated counting from impedance and optical instruments to data from immunoplatelet reference analysis. All methods showed good linearity with evidence of significant instrument-specific deviations from the line of agreement. Relational formulae largely corrected bias, but did not resolve platelet count variability. A second confounding factor, related to the proportion of small (activated) platelets, was also shown to contribute to intermethod discrepancies. Blood processing centres should establish correction factors for each instrument compared to reference methods, such as the immunoplatelet count.

Source: Medline

Full Text:
Available from *John Wiley and Sons* in Vox Sanguinis
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Title: Usefulness of immunoplatelet measurement using the flow cytometric method for accurate platelet counting in hematological patients with severe thrombocytopenia

Citation: Rinsho byori. The Japanese journal of clinical pathology, February 2004, vol./is. 52/2(103-108), 0047-1860 (Feb 2004)

Author(s): Nishiyama M., Hayashi S., Futsukaichi Y., Suehisa E., Kurata Y.

Language: Japanese

Abstract: We measured platelet counts in 95 patients with hematological disorders accompanied by thrombocytopenia (platelet counts < 5.0 x 10(4)/microliter) including 35 patients with severe thrombocytopenia(platelet counts < 2.0 x 10(4)/microliter). We used four methods based on different principles and compared the results, i.e., the flow cytometric method (BEADS method) utilizing platelet-specific monoclonal antibody (SZ2, antiGPIb) in conjunction with fluorescent reference beads (Flow-Count Fluorospheres), manual hemocytometry, and two automated blood cell counters, the NE-8000 (impedance method) and the Technicon H-2 (optical method). The BEADS method was superior to the other methods in linearity of serial dilutions, and the coefficient variations of the BEADS method(2.5-5.2%) were superior to the other methods. The platelet counts measured by the automated blood cell counters were higher(0.6-0.9 x 10(4)/microliter) than those by the BEADS method and manual hemocytometry. Furthermore, the BEADS method was able to measure accurate platelet counts in samples containing red blood cell fragments. The BEADS method may be an accurate and useful method for measuring samples with severe thrombocytopenia, and, especially, samples containing red blood cell fragments.

Publication Type: Journal: Article

Source: EMBASE

Title: Immunoplatelet counting: potential for reducing the use of platelet transfusions through more accurate platelet counting.

Citation: British journal of haematology, May 2003, vol. 121, no. 4, p. 605-613, 0007-1048 (May 2003)

Author(s): Norris, Scott, Pantelidou, Despina, Smith, Dan, Murphy, Michael F

Abstract: Research is required to determine the optimal approach for prophylactic platelet transfusions in patients with haematological malignant disorders. It has been suggested that thresholds for prophylactic platelet transfusions of platelet counts below 10 x 109/l should be investigated, as these may be equivalent in clinical effectiveness and associated with lower costs and fewer complications. An important concern in such investigation is the accurate estimation of platelet counts below 10 x 109/l. This study aimed to further examine the potential reduction in platelet usage that could be made if a lowered platelet transfusion threshold of 5 x 109/l was used in conjunction with an immunoplatelet counting method. Clinical and laboratory data from 130 haematology patients were used. Standard platelet counting was performed using Bayer H3 and ABX Argos analysers. Immunoplatelet counting was performed by flow cytometry using anti-CD61. The potential for reducing platelet transfusions included consideration of clinical criteria that influence prophylactic platelet transfusion use. The results indicated that the use of an immunoplatelet count with a 5 x 109/l platelet transfusion threshold would potentially reduce the number of transfusions by 10.4% in comparison with a 10 x 109/l threshold and standard automated platelet counting with the ABX Argos analyser, and increase the number of transfusions by

5.4% in comparison with the same threshold using the Bayer H3 analyser. The immunoplatelet count may aid the clinical decision to transfuse platelets, but would not necessarily lead to a reduced use of platelet transfusions.

Source: Medline

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Title: Implementation of the immunological method for improvement on accurate platelet counts

Citation: Rinsho byori. The Japanese journal of clinical pathology, September 2002, vol./is. 50/9(887-892), 0047-1860 (Sep 2002)

Author(s): Osada E., Inose Y., Takeuchi K., Kawai Y., Watanabe K.

Language: Japanese

Abstract: Rapid and accurate platelet counting is clinically required in severe thrombocytopenia. Prophylactic platelet transfusions are usually indicated in thrombocytopenia with platelet counts less than 20,000/microliter. It was recently reported that the confidence lower limit of platelet counts by automated blood cell counter is about 14,000/microliter. Clinical blood samples occasionally contain red-cell fragments or large platelets. In these cases, platelets should be counted by the phase-contrast microscopy. However, this manual operation is accurate but not precise and needs complicated technique. Abbott has developed an immunological platelet counting method by CELL-DYN 4000. We measured platelet counts in 137 blood samples from thrombocytopenic patients. These samples included red-cell fragmentation and large platelets on blood smears. We compared platelet counts with the immunological method(PLTimm) to those with Brecher-Cronkite, the optical(PLTo) and the impedance method(PLTi). PLTimm correlated more closely with the phase-contrast microscopy counts than PLTo or PLTi. In patients with microangiopathic hemolytic anemia, PLTo or PLTi could not exclude red-cell fragments, but PLTimm absolutely excluded red-cell fragments. In patients with giant platelets, PLTo or PLTi could not include large platelets but PLTimm included them and coincided well with platelet counts by the phase-contrast microscopy. These results indicate that the immunological method by CELL-DYN 4000 appears to be accurate and a very useful method for accurate platelet counts in severe thrombotybopenia.

Publication Type: Journal: Article

Source: EMBASE

Title: Cryoglobulins interfere with platelet counts by optical and impedance methods but not with the CD61 immunoplatelet count.

Citation: Clinical chemistry, Oct 2001, vol. 47, no. 10, p. 1858-1860, 0009-9147 (October 2001)

Author(s): von Ahsen, N, Ehrlich, B, Scott, C S, Riggert, J, Oellerich, M

Source: Medline

Title: Problems with platelet counting in thrombocytopenia. A rapid manual method to measure low platelet counts.

Citation: Seminars in thrombosis and hemostasis, Jun 2001, vol. 27, no. 3, p. 237-243, 0094-6176 (June 2001)

Author(s): Sutor, A H, Grohmann, A, Kaufmehl, K, Wündisch, T

Abstract: Because most automated platelet counters cannot be relied on in thrombocytopenia, clinicians face a problem when decision making is based on platelet counts. Therefore we evaluated a visual platelet counting method from a blood smear with white blood cells (WBCs) as reference (PCW = platelet count based on WBC). Platelet counting for 74 thrombocytopenic (<120 x 10(9)/L) children was performed with PCW and with an automated counter (impedance principle); both methods were compared with evaluation by phase-contrast microscopy as the standard method. The PCW correlated well with the phase-contrast microscopy evaluation (y = -0.38 + 1.01x, r2 = 0.99). For platelet counts <20 x 10(9)/L the maximal deviation was 2 x 10(9)/L. The correlation between automated counts and the standard method was poor. The regression was y = 9.63 + 0.94x, r2 = 0.86. For platelet counts <20 x 10(9)/L the maximal deviation was 37 x 10(9)/L; on average, 7 x 10(9)/L platelets were counted in excess when compared with the standard method. PCW, in contrast to the automated impedance method, discriminated platelets from nonplatelet particles such as debris, fragments of red blood cells (hemolytic-uremic syndrome [HUS]) and of blast cells, and identified platelets of abnormal size. In addition, the appearance ofplatelets, WBCs, and RBCs gave clues to the etiology of thrombocytopenia, such as leukemia, infection, HUS, familial macrothrombocytopenia, and immune thrombocytopenia. PCW is a fast, reliable platelet counting method requiring less experience than the phase-contrast method. Visual evaluation from a stained smear clearly differentiates platelets and nonplatelet particles in contrast to most automated counters. In addition, the original smear can be preserved and reevaluated.

Source: Medline

Title: Automated CD61 immunoplatelet analysis of thrombocytopenic samples

Citation: British Journal of Haematology, 2001, vol./is. 112/3(584-592), 0007-1048 (2001)

Author(s): Kunz D., Kunz W.S., Scott C.S., Gressner A.M.

Language: English

Abstract: Revision of the current decision point for prophylactic platelet transfusion in thrombocytopenic patients requires the availability of a method that is able to provide accurate platelet counts to as low as 1 x 10⁹/l. This study is the first to evaluate the immunoplatelet method (CD61-Imm) of the haematological analyser Cell-Dyn 4000 in direct comparison with the flow cytometric procedure. Additionally CD61-Imm results were compared with CD4000 optical (Plto) counts in the ranges 20-547 x 10⁹/l (n = 127) and 1-35 x 10⁹/l (n = 107). The immunoplatelet and Plto results were in good agreement between 20 x 10⁹/l and 547 x 10⁹/l, but for samples of < 25 x 10⁹/l the Plto tended to overestimate the counts. We determined the limits of detection (LD) and quantification (LLQ) for all three methods using standard statistical procedures. The LD for the flow cytometric CD41a method was 0.02 x 10⁹/l compared with 0.009 x 10⁹/l and 1.73 x 10⁹/l for the CD61-Imm and Plto methods respectively. The LLQ<inf>CV</inf> = 15% for the CD41a method was 1.8 x 10⁹/l compared with 1.6 x 10⁹/l and 18.0 x 10⁹/l for the CD61-Imm and Plto procedures. In conclusion, (i) the CD61-Imm method performance is at least equivalent to the reference flow cytometric method, and (ii) in severe thrombocytopenia the CD61-Imm count is superior to the Plto count.

Publication Type: Journal: Article

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Title: Standardisation of platelet counting accuracy in blood banks by reference to an automated immunoplatelet procedure: Comparative evaluation of Cell-Dyn CD4000 impedance and optical platelet counts

Citation: Transfusion and Apheresis Science, 2001, vol./is. 25/2(93-106), 1473-0502 (2001)

Author(s): Johannessen B., Haugen T., Stephen Scott C.

Language: English

Abstract: Prophylactic and therapeutic platelet transfusions are increasingly used for patients with conditions associated with thrombocytopenia in order to prevent the development of potentially life threatening bleeding. These clinical strategies have led to a

significant expansion in platelet unit manufacture, and this now represents a major resource and cost commitment for blood banks. As part of the manufacturing process, blood banks are required to implement control procedures, and the determination of platelet counts in particular is necessary to confirm that the quality of platelet unit production meets the standards defined by national or international guidelines. Apart from linearity analysis and comparisons of platelet counts given by different instruments, there has been no systematic standardisation of platelet counting methods in blood bank practice because to date there has been no suitable reference method for counting platelets in citrate anticoagulants. The recent introduction of an automated immunoplatelet procedure on the Cell-Dyn CD4000 provides a means of determining a true platelet count that is unaffected by changes induced either by storage or anticoagulant. The CD4000 in its routine configuration also provides simultaneous impedance and optical platelet counts and this study was therefore undertaken in order to compare all three different platelet counting methods in parallel with a representative series of platelet units. Platelet counts determined after sub-sampling of platelet units into EDTA vs plain non-anticoagulated tubes revealed no differences in impedance or immunoplatelet counts but generally lower optical counts when aliquoted into tubes that did not contain EDTA. This study therefore routinely used EDTA for platelet unit sub-samples. Comparative results of platelet counts for buffy coat platelet units (n=36) aliquoted into EDTA indicated that the impedance count was higher than the reference immunoplatelet count by a mean factor of 1.25 while the optical count was lower by a mean factor of 0.87. The degree of impedance count overestimation was particularly consistent while the optical count underestimation was more variable. Linearity studies of 10 fresh platelet units showed no deviation in the range 0-2305x10⁹l⁻¹ for impedance and 0 to 1420x10⁹l⁻¹ for the optical counts, and the relative numerical relationships between impedance and optical counts were conserved throughout the range of dilutions tested. In the CD4000 optical analysis, blood samples anticoagulated with EDTA showed a distinctive elliptical population distribution that fell within the system thresholds. In contrast, the optical pattern observed for platelet units (in CPD) and ACD-anticoagulated venous blood showed a wider 90degree scatter with a population of platelet events above the upper parallel discriminator. As these were excluded from the optical count (but were still identified as platelets by the immunoplatelet method) it meant that the optical counts of samples in citrate-based anticoagulants were systematically lower than immunoplatelet counts. Platelet units (n=15) analysed daily over a seven day period of storage revealed that the greatest decline in platelet counts was with the optical measurement while the most stable value was obtained by impedance analysis. The results of the immunoplatelet analysis further suggested a progressive increase in small platelets with increasing storage time. The use in this study of a standardised immunoplatelet reference method to examine the question of analyser suitability for determining platelet counts/yields of platelet units thus provided a number of important findings. An impedance platelet counting method is utilised by the great majority of haematology instruments in current use, and in common with the CD4000 analyser, a correction factor is employed to take account of RBC/platelet coincidence. This study found that when analysed samples such as platelet units were RBC-free, that an inappropriate correction factor was applied. Consequently, the CD4000 impedance platelet count will provide reliable platelet counts, irrespective of the day of platelet unit storage, when a factor of 1.25 is applied to the system-reported result. By comparison, optical methods are more likely to be affected by subtle morphological changes that may result from

anticoagulants or progressive storage time. The method limitations documented by this study may well affect many other analysers and mean that the implementation of process control statistics related to platelet counts may be less reliable than previously assumed. It is suggested that standardisation could be much better achieved if there was some form of system cross-calibration that was referenced to an independent method such as an immunoplatelet assay. It is proposed that studies of this type should be extended to a wide assessment of platelet count accuracy of blood bank instruments in order to standardise data within national organisations. If consistent inter-instrument correction factors such as those documented here can be identified, it would considerably increase the relevance of determining platelet counts in production control processes. Copyright © 2001 Elsevier Science Ltd.

Publication Type: Journal: Article

Source: EMBASE

Title: Immunoplatelet counting: a proposed new reference procedure.

Citation: British journal of haematology, Feb 2000, vol. 108, no. 2, p. 228-235, 0007-1048 (February 2000)

Author(s): Harrison, P, Horton, A, Grant, D, Briggs, C, MacHin, S

Abstract: Given the high degree of interoperator error and poor precision of manual platelet counting, it has recently been proposed that an immunoplatelet counting method could become the new reference procedure. Platelets are identified immunologically with a suitable monoclonal antibody, and the platelet count is derived from the ratio of fluorescent platelet events to collected red blood cell (RBC) events that are also counted by a reliable and calibrated standard impedance counter (RBC ratio). In this study, we have set up a rapid and simple method for immunoplatelet counting and simultaneously compared the RBC ratio with the bead ratio derived from two different preparations of commercial calibration beads (Trucount and FlowCount beads). Comparison of the level of imprecision of the RBC ratio with either the manual count or bead ratios revealed a superior coefficient of variation of < 5% even in samples with a platelet count < 20 x 10(9)/l. The RBC ratio correlated extremely well with the existing manual phase reference method (r2 = 0.93) and especially well with three different commercial impedance counters and a dual-angle optical counter (r2 = 0.98-0.99). However, at < 100 x 10(9)/l, the correlation of the RBC ratio with the dual-angle optical count (ADVIA 120) (r2 = 0.96) was superior to all impedance counters. This suggests that automated optical counting methods may be more accurate at determining platelet counts in thrombocytopenic samples. As the RBC ratio is rapid, cheap and relatively easy to perform, we propose that this method could replace the manual count as a new international reference method.

Source: Medline

Full Text:

Available from *John Wiley and Sons* in British Journal of Haematology

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Title: Comparison of automated platelet counting methods in the presence of interfering substances

Citation: International Journal of Laboratory Hematology, May 2010, vol./is. 32/(151-152), 1751-5521 (May 2010)

Author(s): Marionneaux S., Sarduy B., Plante N., Fagan D., Marie Vega A., Quinn D., Chan V.

Language: English

Abstract: Objectives: Myelodysplastic syndrome (MDS) is a group of acquired clonalhematologic disorders characterized by ineffective and disorderlyhematopoiesis. The result is peripheral cytopenias and morphologicabnormalities in the erythroid, myeloid, and/or megakaryocytic cell lines. MDSrelated cellular abnormalities such as microcytes/schistocytes and large/giantplatelets have been shown to affect the accuracy of automated platelet countingmethods. The count can be falsely elevated in samples containing small redblood cells (RBC) of similar size to platelets. Conversely, large/giantplatelets may exceed the upper threshold of what is classified as platelets, resultingin a falsely decreased count. In this study, we investigated the effect of theseinterferences on the accuracy of four automated platelet count methods. TheCD61 immunoplatelet count method served as the reference method. CD61 has shownexcellent agreement with the reference immunological method (CD41/CD61) innumerous studies. Further, the CD61 method is not affected by the presence of cellularabnormalities because platelets are enumerated using a monoclonal antibodyspecific to platelets. Methods: Thirty (30) EDTA-anticoagulated samples with microcytes orschistocytes, and twenty-nine (29) with large/giant platelets were selectedfrom the routine CBC workload after review by experienced morphologists.Samples were split and tested within eight hours of collection using twooptical based platelet count methods (Advia 2120, Siemens, Tarrytown, NYand CELL-DYN Sapphire, Abbott,Santa Clara, CA), two electrical impedance methods (Coulter LH750, Beckman- Coulter,Hialeah, FL and CELL-DYN Sapphire), and the CD61 immunoplatelet method as thegold standard. Platelet counts from each method were compared with the goldstandard CD61 method using the paired t-test ($p<0.05$). Differences in individual samples were visualized usingBland Altman plots. Results: Among the fifty-nine patient samples tested, most had a diagnosis of MDS. Due to limitations in sample volume, 22 samples containing large/giant platelet and 23 with microcytes/schistocytes were tested on the Advia. Platelet counts ranged from 3 - 447 X 109/L. Five samples produced no result on the Sapphire impedance method as the platelet count was below the linear limit of 20 X 109/L. One sample with large platelets produced an erroneous result on the Sapphire optical method and was excluded. In Tables 1 and 2, the paired t-test results are shown for each method vs. theCD61 reference method in the large/giant platelet and microcytes/schistocyte groups, respectively. In samples containing large/giant platelets, the Sapphire optical and Coulter impedance methods significantly underestimated the platelet count, and the Advia significantly overestimated the platelet counts. Circulating microcytes/schistocytes resulted in a statistically significant positive bias in all four methods

(although the Abbott optical difference of 3,400 is not likely to be medically significant). (Table presented) Conclusions: This study showed that cellular interferences posesignificant analytical challenges for platelet counting methods. While most samples tested in this study were associated with a diagnosis of MDS, large/giantplatelets and schistocytes/microcytes can be found in a variety of conditions.Laboratories should be aware of the potential for platelet count inaccuraciesand perform testing by alternate methodologies when necessary.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available from *John Wiley and Sons* in International Journal of Laboratory Hematology
Available from *John Wiley and Sons* in International Journal of Laboratory Hematology

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Title: Evaluation of different platelet counting methodologies vis-a-vis the international reference method by flow cytometry

Citation: Indian Journal of Hematology and Blood Transfusion, December 2009, vol./is. 25/4(183-184), 0971-4502 (December 2009)

Author(s): Khodaiji S., Sethi M., Patil S., Mehta A., Bastian S.

Language: English

Abstract: Introduction: An accurate platelet count is of utmost importance for better management. of oncology patients in whom transfusion decisions have to be made, and in patients with dengue, malaria, chikungunya, leptospirosis and those with low platelet counts needing emergency surgery. The manual count by phase contrast microscopy has now been replaced (recommended by ICSH and the ISLH) by the immuno-platelet method called the international method (IRM) as the reference method for enumeration of platelets. The Aim: of our study was to compare the conventional impedance counts and newly introduced optical platelet counts obtained on the hematology analyzer with the IRM. Since manual counting is laborious time consuming and subjective, requiring skilled technologists to perform, the optical count which is quicker to perform than the immuno-platelet count by flow cytometry, can be reported if statistical correlation is seen Material and Method: Samples were collected in K2EDTA vacutainers. Anticoagulated samples with clots, or fibrin strands were rejected. A total of 61 samples, 31 normal and 30 with low or normal platelet counts not correlating with smear examination were included in the study. Platelet counting was performed by manual phase contrast method, impedance counts on Sysmex XE 2100 and Beckman Coulter LH750, optical count on the Sysmex XE2100 and by flow cytometry on FACS Canto II using CD61 antibody. The platelet/RBC ratio method was used for counting platelets Results: Using the regression analysis and co-efficient of correlation obtained between the various methods it was seen that the impedance and optical methods of platelet counting are reliable when compared with the IRM We recommend that if an automated impedance platelet count does not correlate with the

smear, the optical count, should be reported after correlating with smear as it is quicker than the manual and IRM methods and equally accurate.

Publication Type: Journal: Conference Abstract

Source: EMBASE

Full Text:
Available from *Springer Link Journals* in Indian Journal of Hematology and Blood Transfusion
Available from *National Library of Medicine* in Indian Journal of Hematology and Blood Transfusion

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Title: Advances in platelet counting

Citation: Hematology, 2001, vol./is. 5/6(421-427), 1024-5340 (2001)

Author(s): Harrison P., Briggs C., Machin S.

Language: English

Abstract: Accurate and reliable platelet counting is critical for the clinical management of platelet disorders, especially in thrombocytopenia. The platelet count is used to determine if the patient requires a platelet transfusion. As the prophylactic transfusion trigger is now set anywhere between 10-20 x 10⁹/L (depending upon the institution) it is therefore important that reliable and accurate counts are obtained in severely thrombocytopenic samples. The accuracy and precision of automated platelet counts is totally reliant upon optimal discrimination of platelets from other cells and interfering particles. However, clinicians often still rely upon counts that have been generated using so called "1-dimensional" cell size analysis systems, which not only fail to discriminate platelets from cell fragments of similar size but exclude large platelets from the final count. Also the current reference method for platelet counting (the manual phase count), upon which analysers are usually calibrated is highly imprecise, time consuming and unreliable. Thus there has been a demand for improvements in platelet counting technology in order to improve accuracy of counting in thrombocytopenia so that correct clinical decisions can be made. More recent developments including the introduction of "2-dimensional" optical counting and immunoplatelet counting within automated systems are significant advances. The availability of new technologies coupled with the recent development of a new candidate international reference method (flow cytometric immunocounting using the PLT/RBC ratio) should therefore improve the overall reliability of platelet counting especially in thrombocytopenia. In this review, the history and recent advances in platelet counting methodologies will be presented. The relative advantages and disadvantages of each technology will then be discussed along with their potential impact on improved accuracy of platelet counting.

Publication Type: Journal: Article

Source: EMBASE

Title: Do we need time adjusted mean platelet volume measurements?

Citation: Laboratory hematology : official publication of the International Society for Laboratory Hematology, Sep 2010, vol. 16, no. 3, p. 28-31, 1523-6528 (September 2010)

Author(s): Lancé, Marcus D, van Oerle, Rene, Henskens, Yvonne M C, Marcus, Marco A E

Abstract: Mean platelet volume (MPV) is associated with various diseases. Several authors reported anticoagulant and time dependency. Therefore, standardized laboratory methods are essential. The aim of this study was to standardize the MPV measurement. Blood was collected in potassium-ethylenediaminetetra-acid (EDTA) and sodium-citrate tubes. First, MPV and platelet count were determined every half hour for 4 hours in 20 healthy volunteers. The same parameters were acquired from a second group of 100 healthy donors. We measured at the point of highest stability determined in the first step and aimed to determine a reference range. Citrate samples revealed significantly smaller MPV (7.0 fL ± 0.69 standard deviation [SD]) than EDTA (8.0 fL ± 0.8 SD). Platelets swell until 120 minutes in EDTA and until 60 minutes in citrate. Mean platelet count changed significantly in citrate. In the second group, no inverse correlation between MPV and platelet count was seen. A reference range was calculated (EDTA, 7.2-10.8 fL; citrate, 6.1-9.5 fL). Platelets stored in citrate are significantly smaller compared to those stored in EDTA. Timing is important when measuring platelet volume. Optimal measuring time should be 120 minutes after venipuncture. For this we depicted a reference range. Platelet count is most stable in EDTA. There was no inverse relation between MPV and platelet count.

Source: Medline

Title: In vitro evaluation of platelet concentrates during storage: Platelet counts and markers of platelet destruction.

Citation: Transfusion and apheresis science : official journal of the World Apheresis Association : official journal of the European Society for Haemapheresis, Dec 2007, vol. 37, no. 3, p. 261-268, 1473-0502 (December 2007)

Author(s): Apelseth, Torunn O, Hervig, Tor

Abstract: Differences in platelet counts are observed by use of automated haematology analyzers making interlaboratory comparison difficult. Twenty-eight single-donor platelet concentrates (PCs) were collected. Platelet concentration and markers of platelet destruction were investigated during storage for 11/12 days. Increasing impedance-immunoplatelet ratio was observed during storage, correlating to platelet fragments, large platelets, platelet density and cell-lysis. High variability was observed for optical-immunoplatelet ratio. Immunoplatelet count or correction factor calculated by impedance-immunoplatelet ratio should be used to confirm that platelet unit meets platelet count

requirements or to compare results from clinical trials. Optical platelet count is not recommended.

Source: Medline

Title: Pre-anaesthetic assessment of coagulation abnormalities in obstetric patients: usefulness, timing and clinical implications.

Citation: British journal of anaesthesia, Jun 1997, vol. 78, no. 6, p. 678-683, 0007-0912 (June 1997)

Author(s): Simon, L, Santi, T M, Sacquin, P, Hamza, J

Abstract: The usefulness and optimal timing of laboratory coagulation tests before obstetric extradural analgesia are controversial. Moreover, the significance of mild coagulation abnormalities during pregnancy remains unclear. We have assessed the reliability of coagulation tests performed several weeks before delivery as predictors of coagulation abnormalities during labour. Platelet count, plasma fibrinogen concentration, prothrombin time (PT) and activated partial thromboplastin time (aPTT) were sampled in 797 women during the ninth month of pregnancy and checked during labour. Platelet count was less than 100 x 10(9) litre-1 for 11 women during labour. Only three had been detected by the first sample. Platelet count less than 100 x 10(9) litre-1 or fibrinogen concentration less than 2.9 g litre-1 during labour were associated with an increase in the incidence of postpartum haemorrhage (odds ratio = 19.7). We conclude that a platelet count several weeks before delivery was not reliable in predicting thrombocytopenia during labour and that women with mild coagulation abnormalities in early labour may need special attention regarding the risk of postpartum haemorrhage.

Source: Medline
