ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 07, pp.53800-53803, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EVALUATION OF METHODOLOGY AND COMPARATIVE STUDY BETWEEN SPIN SALINE TUBE AND MATRIX GEL CARD TECHNIQUES FOR BLOOD COMPATIBILITY

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ARTICLE INFO

Article History:
Received 20th April, 2017
Received in revised form
16th May, 2017
Accepted 19th June, 2017
Published online 26th July, 2017

Key words:

Spin saline tube method,
AHG, LISS,
Matrix Gel card technique.

ABSTRACT

Introduction: A study on Evaluation of methodology and comparative study between Spin saline tube using without AHG, with AHG and Gel card technique for blood cross- matching on the basis of efficacy, sensitivity and specificity was undertaken on approximately 500 samples processed in Blood Bank of U.P. University of Medical Sciences, Hospital, Saifai, Etawah, India.

Material and Methods: Most commonly Spin saline tube method are used widely in blood banks. A new technique of cross matching is introduced as AHG gel card. In this study we used Matrix gel card method based on indirect coombs test (ICT) for cross match and tube method including Spin saline tube method with AHG and without AHG.

Result: five hundred samples are taken for the study and out of this 490 samples are compatible using Spin saline tube method without coombs reagent, 10 sample shows incompatibility, whereas in Spin saline method by using coombs reagent shows 99.2% compatibility, 06 samples show false positive and 04 samples show true positive of previously result. As per findings specificity and sensitivity is 100% of gel card and tube test using AHG, whereas Spin saline tube test specificity is 98.8 %.

Spin saline tube method at room temperature, shows 98% compatibility due to 06- sample false positive and 04 sample true positive, whereas Spin saline tube with coombs reagent at 370C, shows 99.2% compatibility due to 496 sample were found compatible and 04 sample true positive. In matrix gel card also shows 99.2% compatibility.

Conclusion: The usage of Matrix Gel card in Blood Bank for cross match is easy to performed with recorded test result and more sensitive and specific then Spin saline tube method whereas indirect coombs tube test is also sensitive and specific but more time consuming as compare to Gel card but cannot recorded result and more time consuming than Spin saline and gel card method.

Citation: Dr. Nouratan Singh, Neeraj Singh, Reeba Rachel Joseph, Anil Kumar Gautam and Dr. Neeraj Tandan, 2017. "Evaluation of methodology and comparative study between Spin saline tube and matrix gel card techniques for blood compatibility", *International Journal of Current Research*, 9, (07), 53800-53803.

INTRODUCTION

This study based on the recorded data analysis, was done in blood bank of U.P. University of Medical Sciences, Hospital, Saifai, Etawah (U.P.) with the presence and supervision of Pathologist. Matrix Gel Card a newly introduced technique for blood cross matching. The Spin saline tube method is used previously for blood cross match which is mainly Spin saline tube method (Spin saline tube method at RT) and indirect coombs tube method. Matrix gel card technique is introduced by Lapierre, which was based on controlled centrifugation of red blood cells in sephadex gel contained within microtube gel techniques (Lapierre, 1988; Letich*et al.,* 1993).

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It also used for various test such as ABO and Rh typing, identification of alloantibodies, indirect and direct coombs test (ICT & DCT) (Mollison, 1993; Lapierre and Rigal, 1990). This study is also carried out for evaluation of methodology and comparative study between Spin saline tube using without AHG, with AHG and matrix gel card technique used for blood cross- matching on the basis of efficacy, sensitivity and specificity.

Aims and objectives of study

Evaluation of methodology and comparative study between Spin saline tube using without AHG, with AHG and matrix gel card technique for blood cross- matching on the basis of efficacy, sensitivity and specificity.

MATERIALS AND METHODS

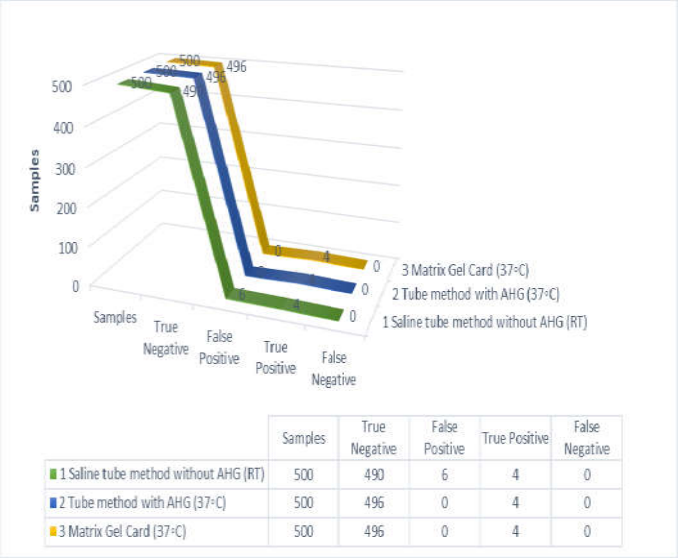
The study based on data analysis total 500 sample randomly selected from day wise round the clock duty wise stored sample of requisition for cross matching blood in blood bank of UPUMS, Hospital, Saifai, Etawah. Most commonly Spin saline tube method are used widely in blood banks. A new technique of cross matching is introduced as AHG gel card. In this study we used Matrix gel card method based on ICT for cross matching and tube method including Spin saline tube method and indirect coombs test tube method used. Sample comes from ward with issuing form, the collection of blood from healthy donors who have >45 kg of weight with negative all serology of HIV, HbsAg, HCV, VDRL and Malaria. In this study first we follow the steps: Blood grouping of patient blood and donor blood from pilot tube by the help of antisera A, B, D. After matched of blood group we proceed to perform cross matching of blood of both donor and patient's blood by three methods.

Spin saline tube method without AHG and with AHG reagent, other third method is Matrix Gel card method which is recently introduced in blood bank. Centrifuge the both blood samples and extract the serum and red cells from patient and donors samples, prepared cell suspension of the donor's red cells and patient's red cells. The method which is apply in Spin saline tube method, marking tubes as major and minor with marker, in major tube we mixing of patient's serum and red cells of donor, in minor tube serum of donor and red cell from patient sample. After that we add the AHG reagent in spin saline tube method and kept it incubate for one hour at 37^0C and then centrifuge the both tubes, see the result if clumping or agglutination or hemolysis present in both test tubes, blood bag is incompatible for patient. If clumping or agglutination not present blood is compatible for patient (Coombs, 1945 & 1946). In Gel Card technique we used Matrix Gel Card incorporated with AHG reagent (each plastic card containing six microtubes), incubator (cartridge warmer), Card centrifuge for centrifuge of Gel Card, Diluent-2 LISS, test tubes and micropipette. Firstly we prepared a 0.8% red cell suspension by adding 10µl of packed red cells of donor in 1ml Diluent-2 LISS in to clean test tube by micro pipette, after that we take a Matrix gel card, open the foil of one microtube gently and write the patient details, ID number at below part of microtube, add 50µl of 0.8% donor red cell suspension, after this add 25µl patient serum in same microtube by proper way. Incubate the Matrix gel card in card incubator (cartridge warmer) for 15 minutes at 37^0C. After incubation centrifuge the Matrix gel card in card centrifuge machine for 10 minutes at preset/ 950 rpm, at the end of centrifuge read the result. If gel card shows RBCs are settled bottom of particular microtube means No agglutination (Negative result) that means Donors blood is compatible to the recipient and suitable for transfusion to patient. If RBCs are trapped or floated between upper and bottom of tube that means something is wrong and result are called Positive result and incompatible for recipient. Positive result shows grading in to 1+ to 4+. (1+ means near to bottom of micro tube and 4+ means top of micro tube). In case of 4+ reaction, indicated if a solid band of red blood cells (RBCs) on top of the gel card's microtube, 3+ reaction displays if agglutination of RBCs in the upper half, 2+ reaction is indicated by RBCs agglutinate dispersed throughout the microtube, while a 1+ reaction shows if RBCs aggregate in mainly lower half part of the microtube with dotted structure in column.

RESULTS

Total 500 random blood sample cross matched by using Spin saline tube method with and without using AHG and Matrix Gel Card. Result are observed in Spin saline tube method without AHG, 500 sample shows 98% compatibility but in 06 sample (1.2%) shows false positive (FP) and four sample shows true positive (TP), if we Add AHG (IAT) calculated after compare the result of Spin saline tube method with AHG and Matrix Gel card method which shows 496 (99.2%) sample compatible and 04 sample (0.8%) True Positive (TP) found in observation, incompatibility of 06 samples (FP) disappear after incubation with AHG reagent at 37^0C.

Fig. 1. Compatibility shows by Matrix Gel card Technique



	Samples	True Negative	False Positive	True Positive	False Negative
1 Saline tube method without AHG (RT)	500	490	6	4	0
2 Tube method with AHG (37°C)	500	496	0	4	0
3 Matrix Gel Card (37°C)	500	496	0	4	0

Fig. 2. Results plotted in graph

In table:1, five hundred samples are taken for the study and out of this 490 samples are compatible using Spin saline tube method without coombs reagent, 10 sample shows incompatibility, whereas in Spin saline method by using coombs reagent shows 99.2% compatibility, 06 sample shows false positive and 04 sample shows true positive of previously result. Sensitivity and specificity is 100% of gel card and indirect coombs tube test using AHG, whereas Spin saline tube test specificity is 98.8 %. Spin saline tube method at room temperature, shows 98% compatibility due to 06- sample false

Table 1. Result observation

	Method Used	Samples	Compatible		Incompatible	
			TN	FP	TP	FN
1.	Spin saline tube method without AHG (RT)	500	490	06*	04	00
2.	Spin saline tube method with AHG (37^0C)	500	496	00	04	00
3.	Matrix Gel Card (37^0C)	500	496	00	04	00

*Result obtained only if AHG not used with Spin saline tube method otherwise it shows compatible result with AHG.

positive and 04 sample true positive, whereas Spin saline tube with coombs reagent at 37^0C, shows 99.2% compatibility due to 496 sample were found compatible and 04 sample true positive. In matrix gel card also shows 99.2% compatibility.

DISCUSSION

Matrix gel card technique recently introduced for blood cross-matching and ABO & Rh Blood Grouping system in India and other country. The matrix gel card test performed in various institutions and hospitals for blood cross match, matrix gel card have six microtube embedded in a plastic card (Malyska, 1994). The advantages of matrix gel card as easy reading of microtube, easily recording for a long time, handling and disposal (Malyska, 1994). In this study 0.8% sample out of 500 sample shows incompatibility (agglutination) by gel card method and also spin saline tube method using AHG. Whereas Spin saline tube method without AHG shows 98% compatibility which is not correct because 06 sample shows False Positive if we subjected to AHG. The specificity and sensitivity is 100% of both gel card and Spin saline tube method with AHG, whereas specificity of Spin saline tube without AHG is 99.2%. Matrix gel card method is better than Spin saline tube method because of its simplicity, stability of results, better handling, long time recorded, dispensation of controls with comparable sensitivity and specificity which is follow with this study (Col*et al.,* 2008). Matrix gel test at least assensitive as an LISS AHG tube test with a better balance of both sensitivity and specificity in blood cross-matching (Rumsey and Ciesielski, 2000). The number of non-specific antibodies and false-positive screens of results were reduced using the matrix gel test system. In antibody titers performed using the gel system were more sensitive than without AHG tube method (Bromilow, 1992). The matrix gel system was easy to use and provide reproducible and reliable results. The results of my study obtained with tube AHG same as matrix gel card method. The result shows that gel test is more sensitive than tube test for identifying clinically potentially significant of antibodies (Bromilow *et al.,* 191). The testing efficiency improved by the using of the matrix gel test into routine use (Novaretti *et al.,* 2000). It's proved that matrix gel cardsystem also easy to use and its finding suggest more sensitive than the Spin saline tube agglutination technique without AHG (Cate John and Reilly, 1999). Matrix gel card system is better than Spin saline test tube method and simple to perform and less exposure of blood bank personal to blood specially area with HIV, HbsAg and HCV infections (Nathalang *et al.,* 1993). It also concluded that matrix gel card test is better alternative to the Spin saline tube test for blood cross- matching as well as coombs tests (Direct and Indirect) (Jai prakash *et al.,* 2006). In some study author concluded that Spin saline tube method show false negative result but in my study Spin saline tube method provided six false positive, which is different from previous studies.

CONCLUSION

Matrix Gel card is more sensitive and more specific than Spin saline tube methods and also less time consuming but more costly than Spin saline tube methods. Matrix Gel Card technique is more stable and fully recordable for a long period. We can shoot the picture or scan of result and share or stored for further investigations. As per result, time consuming, recording, handling, less exposure, we concluded and advice for use of gel card in various blood banking services as routinely test performed in cross matching for blood transfusion because of high sensitivity and specificity then Spin saline tube methods. Matrix gel card method is better than Spin saline tube method because of its simplicity, stability of results, better handling, long time recorded, dispensation of controls with comparable sensitivity and specificity which is follow with this study. The result shows that gel test is more sensitive than tube test for identifying clinically potentially significant of antibodies. Matrix gel card test also less time consuming than tube method with AHG reagent but cost effective method. We recommended that the usage of Matrix Gel card for routine blood cross-matching, blood grouping (forward and reverse) in all blood bank.

Acknowledgement

We are highly thankful especially to all faculty, technical and supportive staff of department of transfusion medicine (Blood Bank), UPUMS, Saifai, Etawah.

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