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Pretransfusion Compatibility Testing by Conventional Tube and Gel Method A Comparative Study at Tertiary Care Center

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Abstract **Original Research Article**

Introduction: pre-transfusion compatibility testing is critical in transfusion medicine so as to prevent immune reaction which might be fatal sometime. The traditional tube method is gold standard however newly introduce matrix gel card has improve the quality of testing and give end point stable result. ***Aim:*** This study done to compare newly introduce matrix gel card method in our blood bank to conventional tube method. ***Material and method:*** Total 1200 random sample taken for compatibility testing by commonly use test tube method and then matrix gel card method based on indirect Coomb's test. ***Result:*** Our study show 100% compatibility by saline based CTT, while 05 (0.4%) samples were incompatible by CTT with anti-human globulin (AHG) and matrix gel card. So 05 sample show false positive and 05 sample show false negative of previous 100% compatible by CTT without AHG. Sensitivity and specificity is 100% of matrix gel card and indirect Coomb's tube test using AHG, whereas saline tube test specificity is 99.5%. ***Conclusion:*** Matrix gel card method is simple, easy to performer and gives more stable end point result that can be recorded and photocopied. It is more sensitive and specific than Conventional saline method though CTT with AHG is sensitive and specific as Gel card but result cannot record and require more time than saline and gel card method.

Keywords: Compatibility testing; Matrix Gel method, Conventional tube method.

INTRODUCTION

In transfusion medicine it is difficult to establish uniform serological testing for consistence accurate and reliable identification of antibody which can easily adept and apply for clinically. Pre - transfusion compatibility testing is a crucial part of the entire transfusion medicine to enhance patient's safety [1]. Pre -transfusion testing is done to prevent transfusion mediated immune hemolytic reaction [2] which may be life threaten sometime .The traditional serological technique by CTT method consider gold standard however it affected by many factor like serum : Cell ionic Strength and pH more ever it is time. and labor-intensive, require experience, well trained staff to perform and interpret result [3-4].

Compatibility testing and cross matching requires potentiation with bovine albumin, enzyme technique and use of anti-human globulin (AHG) i.e. indirect antiglobulin test (IAT) [5]. Lapierre *et al* in 1988, the gel test has revolutionized Pretransfusion testing and become a widely-used serological testing method in Immunohaematology laboratories worldwide.

The introduction of newer techniques such as column agglutination technique (CAT), has improve the quality of testing and the reproducibility of results. CAT has been shown to be more sensitive than CTT for blood grouping and cross matching [6].

The present study was done at a tertiary care Center sir T hospital Bhavnagar in India to evaluate the matrix gel card technique and compare the matrix gel card method to conventional tube method for Pretransfusion compatibility testing.

MATERIAL METHOD

The prospective study conducted in blood bank of sir T hospital Bhavnagar total 1200 random sample were tested for pretransfusion compatibility testing.First blood grouping of patient and donor done by forward and reverse method by using antisera A,B, and D of (tulip diagnostic) for forward grouping and inhouse (blood bank) prepared pooled cells for reverse

grouping.Then cross matching is done by both methods. First by **CTT** (Conventional tube test) with and without AHG (IAT) then CAT (column agglutination test) by MATRIX GEL card. For CTT in major cross match patient 's serum taken in test tube to this donor red cell of 2-5% suspension added ,mix it , incubate for 5 minute (spin method) centrifuge at 1000 rpm for 1 min. after adding IAT reagent (tulip diagnostic) absence of hemolysis or agglutination is indicate negative result compatible. All negative results are microscopically confirmed. Minor cross match of same patient done using donor serum and 2-5 % red cell suspension of patient cell rest of procedure same as above.

Matrix gel card incorporate with polyspecific antihuman globulin (AHG) was used for evaluation of gel technique as per the manufacturer's instructions Label the Matrix gel card with patient "s ID BBR number and Donor bag BB number. Remove aluminium foil carefully. Prepare 0.8% of red blood cell suspension in matrix TM diluents of both patient and donor red cell. Pipette 50 microliters of 0.8% donor red cell in appropriate micro tube of gel card, to this add 25 micro liter of patient serum. For minor add 50 microliter of 0.8%of patient cell and 25 microliter of donor serum Incubate for 15 minute at 37degreeC in incubator then centrifuge it in gel card centrifuge for 10 min then retrieve the card and record result.

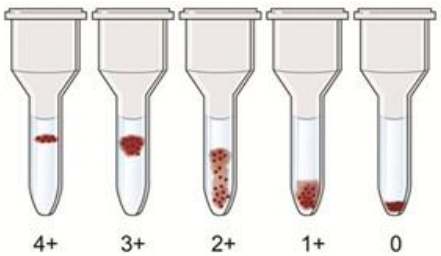
Negative reaction

Non agglutinated red blood cells settle at the bottom of the microtube forming a compact button. (COMPATIBLE)

Positive reaction

Agglutinated red blood cells forming a clear line at the top of the gel column or agglutinates dispersed in the gel column (INCOMPATIBLE). Positive results are graded for 1+ to 4+. A 4+ reaction is indicated by a solid band of red blood cells (RBCs) on top of the gel. A 3+ reaction most of agglutinated RBCs in the upper half of gel column. A 2+ reaction is characterized by dispersed agglutinates RBC throughout the gel column, while a 1+ reaction shows most of agglutinate RBC in lower half of the column. The result of compatibility testing by the matrix gel card (CAT) and CTT were compared.

Gel Technology



RESULT

Method	Sample	Compatible		Incompatible	
		TN	FP	TP	FN
Saline based CTT	1200	1190	05	00	05
AHG (IAT) CTT	1200	1195	00	05	00
Matrix gel card	1200	1195	00	05	00

It is observe from table -1 all 1200 random blood sample without AHG (IAT) show 100% compatibility, however 05 blood sample are false positive and 05 sample are false negative, this is interpreted after the sample were tested by CTT with AHG and matrix gel card system where 1195(99.58) sample are compatible and 05(0.4%) are incompatible in both method, that CTT with AHG and Matrix gel card method. The 05 samples showing incompatibility in results in the IAT phase of cross match were subjected to antibody screening by manual CAT using 3-cell and 11-cell panels (Bio-Rad Laboratories) as per the manufacturer's instructions. Which reveal anti-M and anti-k antibody.

DISCUSSION

It is interpreted from our study that compatibility testing by CTT without AHG show 100% compatible that is not correct as 05 samples were false positive and 05 samples were false negative. There is 0.41% sample are incompatible by CTT with AHG and matrix gel card method which on further testing with panel 3-cell and 11-cell show unexpecting antibody anti-M and anti-k. The specificity and sensitivity of both gel card and conventional tube method with IAT (AHG) is 100% ,where as specificity of conventional tube (Spin tube) without IAT is 99.5% Result of our study are comparable with other studies [7,8,9]. Bromilow *et al* [9], proposed in their study that in gel IAT the serum to cell ratio is increase and there is no need of wash phase, so it reduce possibility of elution of weakly bound antibodies from red blood cells so it will decreasing the chances of false positive or false negative results.

In our study the result of CTT with AHG is same as MATRIX gel card easy to use and gave reliable, reproducible results. Noveretti MCZ et al [10]. Result shows that gel test is more sensitive than tube test for identifying potentially clinically significant antibody. At last but not least aspect of gel card system is cost, which is found to be 40-45% higher than the CTT. However this cost not include the expenditure on more man power require for manual CTT Baijpai *et al*[3] propose that automation in immunohematology require initially large investment, the cost per test than gradually decrease as number of sample increase.

CONCLUSION

The results of testing by CAT are comparable to CTT, The gel system is simple to perform, gave reliable, reproducible, stable end point result which can be preserved and photocopied for future record.

Moreover gel card are easy to dispose by incineration. Blood bank personnel less likely to expose the blood sample so it will decrease chance of exposure to transfusion transmitted disease. Apart from cost factor of gel card system other drawback are inability to test hemolysed/lipemic or icteric sample and require large sample load. So it must apply in blood bank of tertiary care center, where men power is difficult to manage and work load is high due to drainage from surrounding large number of health center. Finally from our study and from various references we conclude and advice to use gel card system in blood bank for all routine blood grouping and cross matching as it has high sensitivity and specificity than conventional test tube method.

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