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A Comparative Study Of Gel Card And Saline Tube Techniques For Cross Matching Of Blood At A Primary Health Care Blood Centre

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ABSTRACT

Background: Gel card technique of cross matching is one of the latest techniques in blood centre. It has high sensitivity and gives accurate results. The aim of this study is to compare the sensitivity of gel card method with the conventional tube technique (CTT) for cross matching in blood centre.

Material and methods: 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 anti-human globulin (AHG) and without AHG at primary health care center for pre-transfusion cross matching on 100 blood samples.

Observation and result: 100 samples were analyzed. 96 were compatible using matrix gel card method and spin saline tube with AHG. Remaining 04 showed incompatibility in both methods. In saline method without AHG, compatibility was seen in 94. Out of the 06 which were incompatible, 04 were true negative for incompatibility and 02 were false positive for incompatibility. Sensitivity and specificity of CTT without AHG was found to be 97.9% and 100% respectively. Sensitivity and specificity of matrix gel card was found to be 100%.

Conclusion: Matrix gel card method is simple to perform and gives stable end point result that can be recorded and photocopied. It is more sensitive and specific than CTT. A larger cohort study is necessary to analyze the efficacy of Matrix gel card method over CTT without AHG.

Key Words: Blood transfusion, Blood centre, ABO blood group system, Blood grouping and cross matching, Coombs test, Agglutination.

INTRODUCTION

ABO blood grouping system was discovered by Landsteiner during 1901 and the first anti-globulin test was performed in 1945. Since then, more specific serological methods are being developed and to avoid ABO and Rh incompatibility between blood donors and recipient, [1] and also to analyze the presence of any antibody in recipient serum which can react with donor red cells and can cause serious complications after blood transfusion. [2] The purpose of cross match is to select blood component that will have acceptable survival when transfused and will not cause any adverse reaction to the recipient.

The terms “cross matching” and “compatibility test” are sometimes used interchangeably. It is necessary to perform cross match as final serological test of incompatibility even if the blood group of recipient and donor are known, because this can detect the faults done if any in ABO grouping and also unknown antibodies present, which may cause fatal hemolytic transfusion reactions. [3]

The Conventional tube technique(CTT) has been the cornerstone of compatibility testing over last 40 years, but the enhanced sensitivity of the gel card technique has made the interpretation of the tests more objective.[4] Lappiere et al. introduced the gel card method which is used for cross matching of blood along with saline tube method. The gel card method is a reliable, advantageous method and suitable for routine use to detect and identify the alloantibody [5]

Sephadex gel is used in gel cards which holds agg lutinate in semisolid medium and helps in clear visualization of agglutination than that of saline tube method. [4] When RBCs are added on to a gel card, gel acts as a trap. RBCs which agglutinate are seen trapped in gel at the bottom of the tube, which can be seen even after hours of performing the test. For easy handling, reading and testing there are 6 micro tubes in a single gel card.

Aim of this study is to compare the accuracy and sensitivity of gel card technique (LISS/COOMBS) and saline tube method, also to assess the compatibility test by gel card and saline tube method with and without coomb's reagent.

MATERIALS AND METHODS

The present study was carried out at Mallasandra urban primary health care center, Bangalore Karnataka in India to evaluate the matrix gel card technique and compare the matrix gel card method with conventional tube method for pre transfusion compatibility testing.

A total of 100 samples were collected, and compatibility testing was done using CTT and gel card Method. Donor samples were collected from the pilot tubes of the blood bags, collected from healthy donors with >45 kg body weight having negative serology of HIV, HBsAg, HCV, VDRL and Malaria. Patient samples were received from the ward with the blood requisition form. Cross-matching was carried out using the technique given below. Blood grouping of patient blood and donor blood with the help of anti-sera A, B, D was done. After confirmation of blood group, cross matching of both donor and patient's blood was carried out by two methods - spin saline tube method with and without AHG reagent and Matrix Gel card method.

All samples were cross matched by the following techniques:

1. Saline Tube Method: Major and minor cross match was performed using saline tube method. After preparing 5% red cell suspension, cross matching was done by adding serum and red cell suspension in

the ratio of 2:1 and incubated at 37°C for 30-60 minute. The tubes were centrifuged and observed for agglutination. The cells were washed 3-4 times to remove any unbound antibody. After adding AHG, the tubes were centrifuged, and were observed for agglutination. Check cells were added to all negative tubes for cross verification.

2. Gel card technique for Coombs test - The micro tubes of the ID-Card "LISS/Coombs" containing poly specific AHG, were used for cross matching. Patient serum and donor red cells were added to the micro tubes. The card was incubated at 37^0C for 15 minutes, centrifuged for 10 minutes and results were observed. Statistical Analysis was carried out using frequency percentage and chi square test.

RESULTS

In our study, 100 blood samples were cross-matched using Spin saline tube method with and without AHG and Matrix Gel Card. We compared both methods of cross-matching for sensitivity & specificity, the accuracy of results, and time taken. 96 (99.2%) samples were compatible, and 04 (0.8%) samples were incompatible in Gel card method. In CTT, 94 samples were compatible, and 06 samples were incompatible without AHG. In CTT with AHG 96 (99.2%) samples were compatible and 04 samples (0.8%) were incompatible. In our study, both sensitivity and specificity of matrix gel card method was found to be 100%. Whereas sensitivity of CTT without AHG was 100% but specificity was found to be 97.9%. Further positive predictive value and negative predictive value of gel card method was 100% but positive predictive value and negative predictive value of CTT without AHG was 66.6% and 100% respectively.

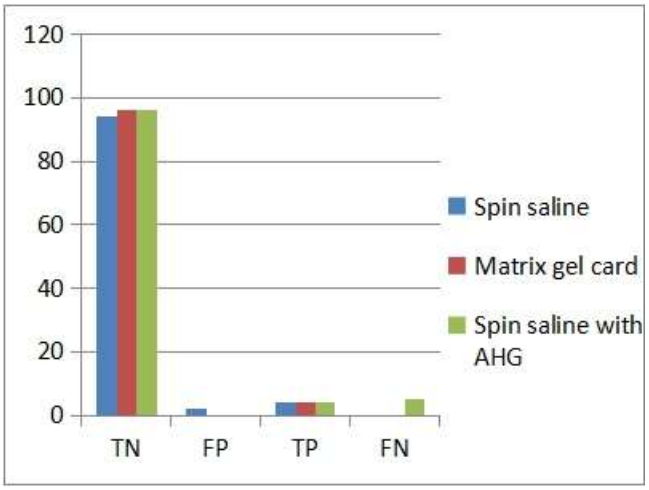
Table 01: Comparison Of Compatibility And Incompatibility Of Three Methods.

Technique used	Compatible	Incompatible	Total
Spin saline tube without AHG (Room Temperature)	94	06	100
Matrix Gel Card (37°C)	96	04	100
Spin saline tube with AHG(37^0C)	96	04	100

Table 02. Sensitivity And Specificity Of Three Methods.

Technique used	Compatible		Incompatible		Total
	TN	FP	TP	FN	
Spin saline tube without AHG (Room Temperature)	94	02	04	00	100
Matrix Gel Card (37^0C)	96	00	04	00	100
Spin saline tube with AHG(37^0C)	96	00	04	00	100

Figure 1 - Sensitivity And Specificity Of Three Methods.



DISCUSSION

CTT is the most commonly used method for pre-transfusion compatibility testing, but it is associated with certain disadvantages like being laborious and time-consuming method. These are nullified in gel card method.

In our study, 94 samples showed compatibility in CTT without AHG and considered as true negative. Out of 06 samples which were incompatible, 04 samples were found to be truly incompatible, and 02 samples were compatible, when subjected to CTT with AHG. Hence these two samples appear to be false positive. The findings of our study are in concordance with the studies conducted by Gond.S. K et al [06], Singh DN et al [07], Dhariwal.S.K et al [08], Gulati. P et al [09], Singh R et al [10], Sharma R et al [02]. The benefits of gel cards include simple micro tube reading, convenient long-term recording, handling, and disposal. Hence specificity and sensitivity of Gel card method is found to be higher than CTT without AHG. The Two false positive results can be attributed to technical insufficiency while performing the test.

Table 03: Comparison With Previous Studies.

Technique Used	CTT		CTT with AHG		GEL CARD	
	Compati	Incompat	Compati	Incompat	Compati	Incompat
OUR STUDY	94	06	96	04	96	04
Gond.S .K et al[06]	992	08	996	04	996	04
Singh DN et al [07] (n=500)	490	10	496	04	496	04
Dhariwal.S.K et al[08] (n= 800)	792	08	796	04	796	04
Gulati .P et al [09] (n=1295)	1295	00	1288	07	1288	07
Singh. R et al[10] (n = 500)	497	03	497	03	497	03
Sharma. R et al [02] (n = 600)	600	00	597	03	597	03

Limitations of the present study: Low sample size and high cost of matrix gel card when compared to CTT method.

CONCLUSION

Gel card is more sensitive and more specific than conventional tube methods and also less time consuming. The results of Gel card method are at par with results of CTT with AHG. This method is simple to perform, gives reliable, reproductive, stable end point result which can be preserved and photocopied for future record. Moreover, gel cards are easy to dispose by incineration thus preventing blood centre personnel from exposure to transfusion transmitted diseases. Gel card method of compatibility testing can be reliable method to check for pre transfusion cross matching in health centers with high workload as it can be carried out quickly and easily. It can also be used in suspected cases along with CTT with AHG method for confirmation of compatibility in centers which cannot afford routine gel card testing for all. As the results of our study were in concordance with previous studies, we conclude that matrix gel card method testing is more sensitive and specific. A larger cohort study is necessary to analyze the efficacy of matrix gel card method over CTT without AHG.

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