



COMPARISON OF BLOOD CROSS MATCH USING GEL TECHNIQUE AND CONVENTIONAL TUBE METHOD IN SSIMS, BHILAI, C.G.: CROSS SECTIONAL STUDY

Pathology

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ABSTRACT

INTRODUCTION- Conventional tube methods are used widely for blood cross match. Now a days, a new technique (Gel card technique) of cross match is introduced. In this study, matrix gel card method is compared with conventional tube method for cross match. **MATERIAL METHODS-** Comparative study of blood cross match between conventional tube method and gel card technique was undertaken on 800 sample, in Shri Shankaracharya medical college blood bank unit, bhilai, Chhattisgarh. **OBSERVATION-** Comparative cross match was done in all the 800 sample by both conventional and matrix gel card method. Out of 800 sample, 796 sample came out to be compatible by both methods, while 04 samples were found to be compatible by conventional tube cross match method, but these 04 sample's came out to be incompatible by gel matrix cross matching method. **CONCLUSION-** Gel card method is easy to perform, read, and record. Gel card method is more specific and accurate. While conventional tube method is sensitive but it has many disadvantages like it is more time consuming, results are difficult to appreciate (subjective) and this method is not suitable for future record keeping.

KEYWORDS

cross match, matrix gel card test, conventional tube method

INTRODUCTION –

The study was done in SSIMS blood bank, to implement newly introduced technique called Matrix Gel card technique for blood cross match. Previously, conventional tube methods were used for blood cross match which is mainly saline tube method (Spin tube method) and indirect coombs tube method.

Since its inception by Lapiere et al. in 1988, the gel test has revolutionized pretransfusion testing and has become a widely-used serological testing method in immunohematology laboratories worldwide. The benefits of using gel for antibody screening have been widely published and include ease of use, reduced number of procedural steps, reduced sample size, ease of reaction readability, and increased antibody detection sensitivity.¹

According to the AABB Technical Manual, it is imperative that antibody detection systems used by each laboratory be sufficiently sensitive.¹

Since the discovery of the ABO system and red cell agglutination by Landsteiner in 1901 and development of the antiglobulin test by Coombs in 1945, the immunohematologists are trying to establish and improve various serological investigations in human blood.²

Basically, these procedures try to establish the compatibility between donor and recipient ABO and Rh systems and to rule out the existence of antibodies in the recipient's serum that could react with transfused red cells. To establish the ABO and Rh compatibility between donor and recipient, both the recipient and the blood to be transfused are typed to rule out the existence of antibodies (other than anti-A or anti-B).³

Crossmatch is done to ensure that particular unit of blood may be safely transfused to a patient, normally, group specific blood, ABO and Rh (D). The purpose of cross match is to select blood components that will have acceptable survival when transfused and will not cause harm to the recipient. Compatibility (pre transfusion) testing is done to ensure safe transfusion therapy.⁴ The pretransfusion compatibility testing is performed to select red blood cell (RBC) units for transfusion to decrease the incidence of immune-mediated hemolytic reactions.⁵

Gel card is more sensitive and more specific than conventional tube methods and also less time consuming but more costly than conventional tube methods.⁶

Cross matching of blood is routinely done using tube method, which involves washing steps and takes 60 min (1 hour). In gel card technique washing steps are not required and the time taken is only 30 min. The gel test is a reliable and advantageous technique and is appropriate for routine use for detection and identification of all-antibodies in blood bank service.⁸

The gel card technique is now considered better and has been introduced as a replacement to conventional tube technique on an automation platform. Though Conventional tube technique (CTT) is still considered gold standard in pretransfusion testing, it still has various disadvantages and depends on accurate hand to eye work of the laboratory personnel.

Therefore, this paper aims at comparing the accuracy and sensitivity of gel card technique and saline tube method which can be achieved with the following objective:

- To assess the compatibility test by matrix gel card method and saline tube method with and without AHG by its sensitivity and specificity.
- To support matrix gel card test related studies.

Materials and Method:

Type of study: cross sectional

Place of study: SSIMS blood bank unit of SSIMS, Bhilai

Duration of study: 1 year (01 June 2018 to 31 May 2019)

Study subjects: A total of 800 random sample selected and collected from donors attending SSIMS blood bank unit of SSIMS, Bhilai

Sample size: 800

Statistical method: data was collected, compared, and analyzed using appropriate test

Inclusion criteria: Donors were healthy, have >45 kg weight, with >12.5 gm% Hb and with negative serology for HIV, HCV, HbsAg, VDRL and Malaria.

Methodology: In present study, first blood grouping was performed by using Antisera A, B, D of patient blood and donors blood bag. After

matching of blood group, cross matching of the donor and recipient blood was done by using two methods, first was Conventional tube method with AHG (IAT) and without it. Second method was Matrix Gel Card method which has been newly introduced in our blood bank. In Conventional tube method, first mark the patient and donor test tube with marker, then centrifuge both blood sample to extract the serum of patient and donor red cells, following which mixing of patient serum and red cells of donor in clean test tube was done and then in that add the Anti Human globulin (AHG, Coombs Reagent) and incubate at 37°C and then finally read the result. If clumping was present in test tube, blood bag was incompatible, if not present then blood was compatible for patient. Second method used was Matrix Gel Card method. In this method special machine was used for centrifuge of Gel Card and also incubator for Gel card, LISS, test tubes and micropipette. As per procedure; first prepare a 0.8% red cell suspension by adding 1ml diluents-2 in to clear test tube then add 10µl of packed red cells of donor by micropipette to it. After this take a Matrix gel card, open the foil of one micro tube gently and write the patient id no. below particular micro tube then add 50µl of 0.8 donor red cell suspension to it after this add 25µl patient serum to it. Incubate the gel card in Matrix gel card incubator for 15 minutes at 37-degree C. After incubation, centrifuge the card in Matrix gel card centrifuge machine for 10 min and then read the result. If gel card results show, RBCs were settled at bottom of particular micro tube means [no agglutination (Negative result)] donors' blood is compatible to the recipient and suitable for trans-fusion. If RBCs are trapped between upper and bottom of tube that means something is wrong and result are called Positive result, incompatible for recipient.

Observation and Results:

This study was done in Shri Shankaracharya Institute of Medical Sciences Blood Bank Unit during period of 1 year from June 2018 to May 2019. A total of 800 samples were included in the study.

TABLE 1: comparative results of blood cross match by using Matrix gel card method and conventional tube method.

Method used		Sample size	Compatible		Incompatible	
			TN	FP	TP	FN
01	Conventional tube method without AHG	800	792	04	00	04
02	Conventional tube method with AHG	800	796	00	04	00
03	Matrix gel card	800	796	00	04	00

As shown in Table no. 1, 800 random blood sample were cross matched by using conventional tube method with and without AHG (IAT) and matrix gel card.

Conventional tube method without AHG showed 100% compatibility, but when AHG (IAT) was added then 04 samples showed false positive (FP) and 04 samples were false negative (FN). This was calculated by comparing the observation of conventional method with AHG and Matrix gel method which showed 796 samples compatible while 4 samples to be true positive i.e. incompatible.

DISCUSSION:

Lapierre et al. was the one who first introduced Gel test by giving idea of six microtube filled with specific gel embedded in plastic card. This has made test easy to read, record, handle and even easy to dispose. In India, this gel card test has already taken over conventional method.^{9,10}

In this study, 0.5% of samples shows agglutination (incompatible) by conventional tube method using IAT and also by using Gel card method. Whereas tube method (spin tube) without IAT showed 100% compatibility which is considered false result after performing other two test (tube test with IAT and Matrix gel method). Sensitivity and specificity of tube test with IAT and Matrix gel card method found to be 100% in this study. In study done by Rumsey DH et al. and Kaur et al., concluded that gel card method is as sensitive as IAT tube test with better sensitivity and specificity, which is similar to this study.^{11,12}

Cate et al. showed testing efficiency was improved following introduction of gel test into routine use.¹³

Bromilow IM et al. concluded that false positive results were reduced using gel card test. He also concluded that antibody titers of gel card test were more sensitive than tube IAT method, but our study results showed similar sensitivity of both tube IAT method and gel card test

method. This requires further investigation.^{14,15} Overall, this study is found to be in agreement with previous studies.^{16,17,18,19}

CONCLUSION:

Gel card method is more sensitive and specific than conventional tube methods. It is also less time consuming, easy to perform, has reproducible results, more user friendly and easy to interpretate. Thus, gel card method is recommended over conventional tube method.

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