COMPARISON BETWEEN MANUAL BLOOD CULTURE AND AUTOMATED BLOOD CULTURE SYSTEM IN CARDIOLOGY INSTITUTE

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ABSTRACT...OBJECTIVE: IN THIS STUDY WE COMPARED THE TWO TECHNIQUES USED FOR DETECTION OF MICROORGANISMS. **STUDY DESIGN:** RETROSPECTIVE CROSS SECTIONAL. **PLACE AND DURATION:** STUDY WAS CONDUCTED AT CHOUDHARY PERVAIZ ELLAHI INSTITUTE OF CARDIOLOGY, MULTAN FROM 2018 TO 2019. **METHODOLOGY:** BLOOD CULTURE IS GOLD STANDARD FOR THE DETECTION OF BACTEREMIA. TWO TYPES OF TECHNIQUES ARE USED FOR BLOOD CULTURES WHICH ARE THE MANUAL BLOOD CULTURE SYSTEM (CONVENTIONAL) AND THE AUTOMATED BLOOD CULTURE SYSTEM (MODERN). WE CONDUCTED 214 BLOOD CULTURE TESTS ON MANUAL BLOOD CULTURE SYSTEM AND 339 ON AUTOMATED BLOOD CULTURE SYSTEM (BACT/ALERT). RESULTS: THE PERCENTAGE OF POSITIVE YIELD WAS 10.3 WITH MANUAL BLOOD CULTURE SYSTEM AND PERCENTAGE OF POSITIVE YIELD WAS 15.3 WITH BACT/ALERT WHICH IS SIGNIFICANTLY HIGHER. CONCLUSION: THIS FINDING WILL CONTRIBUTE IN REDUCTION IN MORTALITY OF PATIENTS WITH SEPSIS IN OUR HOSPITAL AND WE RECOMMEND USE OF AUTOMATED BLOOD CULTURE SYSTEM OVER MANUAL BLOOD CULTURE SYSTEM AT TERTIARY CARE HOSPITALS.

INTRODUCTION

Infectious diseases are major cause of death in all over the world. The morbidity and mortality due sepsis is very high which is around 15 % Blood culture is a test that checks for the foreign invaders like bacteria, yeast and other microorganism in the blood 1. Microorganisms in blood stream can be a sign of blood infection, and this condition is known as bacteremia. Blood culture techniques are used to identify bacteremia 2.

Blood culture is gold standard for the detection of bacteremia 3. Two types of techniques are used for blood cultures which are the manual blood cultur system (conventional) and the automated blood culture system (Modern) 4. In manual blood culture system the bottles used require more blood 07 to 10ml and initial detection is based presence of turbidity which is dependent on human eye and subculture is required for identification of the microorganism 5. Therefore time delaying and chances of false negative results are presnt. The manual culture method mostly take longer duration for the infection detection and are very laborious 6.

The automated blood culture systems have been developed in which detection system is used identification of micro-organisms which are presents in the blood sample taken from the suspected patient having Bacteremia 7. The automated blood cultures detect the microorganism by colorimetric sensor and reflected light to monitor the presence and production of carbon dioxide dissolve in the culture medium 8. This system monitor the blood culture bottle after every 10 min therefore chances of false positive results are less and early detection leads to early results and can be a useful tool in lowering the mortality due to sepsis 9. Various comparative studies have shown that these automated blood culture systems have detected growth earlier than the manual systems and they have greatly improved the efficiency of blood cultures [4}. In this study, we intended to compare the conventional blood culture system with the automated blood culture system –BacT/ALERT with reference to yield 10.

METHODOLOGY

This retrospective cross sectional study was conducted in Department of pathology CPEIC Multan and was approved by Hospital ethical Committee.In this study we compared the detection rate of manual blood culture system with automated blood culture system (Back Alert), from 2018 to 2019. All blood cultures samples from ICU and emergency departmentwere included in study. blood sample were obtained from ICU & emergency by the well trained phlebotomist. Skin was disinfected with Alcohal swab. The preferred sites for sampling were Antecubital& median cubital fossa. Skin was disinfected with 70% isopropyl alcohol, Allow to dry& wiped with sterile gauze prior to take the sample. 8--10ml of blood was collected for manual blood culture bottle 5ml of blood was collected for Bact Alert blood culture bottle. Blood culture bottles were checked for adequacy of volume of blood, & proper labeling.

The bact Alart bottles were loaded in the bactAlart system that is automated blood culture system. Incubation period was 5 days. Positive blood culture flagged by yellow color on screen of instrument and bottle also showed turbidity. Positive bottle was unloaded from instrument & was subculture in blood agar,maconkey , agar & chocolateagar for the isolation of microorganisms. Positive subculture shows microganism on solid media plates and subsequently antibiotic sensitivity was done. Negative blood culture not flagged by yellow color on screen and no turbidity was identified. Bottle was unloaded from instrument after 05 days of incubation, no micro organism isolated on subculture.

Conventional or manual blood culture system bottle contain 50 ml brain-heart infusion plus 7-10ml of blood. Bottle was checked for adequacy of volume of blood & proper labeling. Bottle was incubated at 37 °C .After 18 to 24 hours incubator subculture was done on solid media e.gblood agar chocolate agar & macConkey agar. Bottle was visually observed for turbidity. All negative blood culture bottles were again subculture after 05 days incubation and also checked visually turbidity of bottles. Positive subculture shows micro organism on solid media plates and were subsequently anti biotic sensitivity test was done. All the relevant data were entered in Microsoft Excel and demographic parameters were analyzed. Comparison of results between conventional and automated blood culture system was done.

RESULTS

Two hundred and fourteen cultures applied on conventional blood culture system in a period of one year. There were n=168 (78.5%) male patients and n=46 (13.6%) were female patients. The negative cultures were n=192 (56.6%) and positive weren=22 (6.5%).The most common microorganism was staph aureus i.e. n=15 (68.2%). (Table. I).

Three hundred and thirty-nine cultures applied on Bact/Alert (automated blood culture system) in the period of one year, in which n=221 (65.2%) male patients and n=118 (34.8%) female patients. The positive cultures were shown in n=52 (15.3%) patients and negative cultures were shown in n=287 (84.7%) patients. The most common microorganism was staph aureus and pseudomonas i.e.n=24 (46.2%) and n=18 (34.6%), respectively. (Table. II).

The positive recovery was higher in automated blood culture system as compare to the manual cultures system i.e. n=52 (15.3%) and n=22 (6.5%), respectively. The difference was statistically significant, (p=0.000). (Table. III).

Table. I
Cultures on manual system

Variable	Presence
Negative blood culture	n=192 (56.6%)
Positive blood culture	n=22 (6.5%)
Staph aureus	n=15 (68.2%)
Pseudomonas	n=5 (22.7%)
Non-Hemolytic Streptococci	n=1 (4.5%)
Coagulase Negative Staphylococci	n=1 (4.5%)

Table. II
Cultures on automated system

Variable	Presence
Negative blood culture	n=287 (84.7%)
Positive blood culture	n=52 (15.3%)
Staph aureus	n=24 (46.2%)
Pseudomonas	n=18 (34.6%)
Non-Hemolytic Streptococci	n=6 (11.5%)
Coagulase Negative Staphylococci	n=4 (7.7%)

Table. III
Association of conventional blood culture system and automated blood culture system

Automated blood culture system	Conventional blood culture system		Total	P-value
	Positive	Negative		
Positive	22	30	**52**	0.000
Negative	0	162	**162**	
Total	**22**	**192**	**214**	

DISCUSSION

Accurate and early detection of the bacteremia is the main function of microbiology laboratory 11. In order to provide the reliable blood culture results the selection of appropriate and modern techniques is essential. In the present study the recovery rate of microorganisms was compared and evaluated between conventional and automated blood culture system. The automated blood culture system we used is Bact/Alert 12.

In our study the detection rate of the microorganism with Bact/Alert system is 15.3 % which is comparable with various studies conducted on automated blood cultures system 13 while the recovery rate in manual blood culture system was found 10.3 % which is bit low butcomparable with various other studies 14.

In this study Both systems were comparable for the recovery of majority of clinically significant isolates. The BacT/ALERT automated system was superior to the manual culture system in the detection of the organisms and even the recovery rates for commonly isolated organism groups were higher than the manual system 15. Many studies have reportedhigher recovery rate for all group of organisms when using an automated blood culture system as compare with manual blood culture system 16.

In our study, BacT/ALERT system showed significantly higher recovery of pseudomonas aurogenosa than the manual culture system, while the one study has shown the higher recovery of E.coli byBact/Alert as compare to manual system 17.The contamination rates have been found to be higher in different systems in different studies 18. In our study, BacT/ALERT automated system showed more contaminants than the manual culture system which is also shown in a study conducted in India 19.

CONCLUSION

Automated blood culture is more effective and reliable as compare to manual blood culture in detection of microorganisms.

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