Blood Culture From The Umbilical Vein In The Diagnosis Of Neonatal Sepsis.

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Citation


Abstract

Background: Sepsis is a significant cause of mortality and morbidity in Neonatology Departments. Frequently neonatologists use the presence of a positive blood culture to confirm diagnosis and then they undergo lumbar puncture. Positive blood cultures are the gold standard and are used to predict neonatal outcome and determine type of antibiotics combination and length of treatment. Objective: The aim of this study was to obtain blood culture from umbilical vein in newborns with infection risk factors and seeing if its culture is more sensible for isolating micro-organisms. Design: A prospective study of 784 deliveries with 45 infection risk factors newborns. Patients: We select a cohort of newborns with perinatal infection risk factors during 3 months. Clinical data for these neonates were recorded prospectively and in the delivery room a blood sample from the umbilical vein was culture. These neonates were followed during almost the firsts 72 hours of life and clinical and laboratory test was made. Results: We obtained a total sample size in this study of 30 blood cultures. From this sample blood culture was positive in 13 (43%) and negative in 17 (57%). Of the 13 positive blood cultures 7 (54%) neonates presents clinical and laboratory findings and sepsis diagnosis was made, 3 (23%) were considered contaminants and 3 (23%) were bacteraemias. In all neonates serial RBC, leukocyte counts and CRP were made and in newborns with positive blood culture a new blood sample for culture and CSF culture was performed. Conclusions: Diagnosis of neonatal sepsis by positive blood culture in clinical practice is difficulted by maternal antibiotic prophylaxis and blood sample size. Various diagnostics approaches are necessary to make diagnosis and to determine the length of therapy. Umbilical vein samples represented a new and more sensible way to diagnostics early neonatal sepsis.

INTRODUCTION

Neonatal sepsis is high-risk disease with a low incidence(1,2). The early identification of septic neonates is difficulted because subtle initial sings no ever are seen or are not presents. Many approaches are described to detect newborns with initial risk of sepsis, and there are various guidelines(3,4,7) trying to give an accuracy definition of sepsis and only are defined like true sepsis when blood culture is positive.

The isolation of an organism in a blood culture confers the possibility of an optimal choice and length of antibiotics.

Many known factors(5,6,8) influence the sensibility of blood cultures like maternal antibiotic prophylaxis or time for sample collection. One of the most important risk factor is volume sample (11). To improve this problem is recommended more than one sample recollection, and take almost 1ml, and that’s not ever possible.

For these reasons, a new strategy for obtained blood culture was developed in our centre. The objective of this study was improving the global percentage of positive blood cultures in neonatal sepsis risk newborns obtaining umbilical cord blood samples.

MATERIAL AND METHODS

Previously we designed a new protocol of data collection to include patients with perinatal risk factors (table 1).

Clinical data were registered prospectively and retrospectively analyzed for this article.

Newborns included were born in Clínica Virgen de la Vega hospital from January 2006 to May 2007.
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Figure 1
Table 1: Perinatal risk infection factors

- Intra-partum fever >38°C
- Chorioamnionitis
- Neonatal fever in the delivery room
- Amniotic membrane rupture more than 18 hours
- Screening SGB not made or positive with incomplete IAP
- Cervical cerclage
- Abnormality in fetal heart rhythm not from mechanical origin
- Neonatal sepsis infant in a previous delivery

784 neonates were born in this time period with gestational ages between 33 and 42 weeks.

We found infection risk factors in 45 newborns; obtaining 30 umbilical chord vein blood samples.

We recorded data on birth weight, EGA, gender, APGAR score, maternal age, type of delivery, characteristics of amniotic fluid, time of amniotic membrane rupture, maternal temperature, newborns temperature, screening of SGB, blood culture results, clinical evolution and diagnosis when it was made. Were made serial peripheral complete blood counts and peripheral blood culture on newborns.

We obtained an ethics committee approval of our center previously with a write assent of parents.

RESULTS

A total of 30 blood samples were analyzed. Of the newborns mean EGA was 38+4 weeks (range 2670-4020). 60% were male infants and 40% were female.

Median APGAR score were 8,6 and 9,9 at 1 and five minutes.

Of 30 samples 13 were positive, in 10 of blood culture grew a potential bacterial pathogen and included gram positive organism (50%) and gram negative (50%)

Clinical and analitic checking were made at 12, 24 and 48 life hours. (Table 2)

In 7 newborns blood cultures were positive showing clinical and analitic data characteristics of sepsis and was decided to start with antibiotic treatment in 6 patients in his first 24h of life and in one patient before 48h with a satisfactory progress after treatment’s start. In 3 patients blood culture result was considered a contamination (1 St viridans and 2 Staph coag neg) and they have not clinical or laboratory pathological data. 3 cases diagnosis was bacteriemia (1 E.Coli, 1 Citrobacter k y 1 Enterococo)

In the others 17 newborns there did not growingth in blood cultures after 5 days. Nobody have clinical or analitic changes and they was discharges from hospital agree of center’s rules. (Table 3)

Figure 2
Table 2: Clinical, bacteriological and laboratory findings

In our center the umbilical blood culture had a sensibility of 100% (we did not had, in this period, any patient with sepsis out of the study) and a specificity of 74% with a predictive positive value of 54%

DISCUSSION

Diagnosis of newborn sepsis is based on presence of clinical signs and sintoms that usually can be subtle or not founds with analitical alterations (2,3)

Our study focuses on the near term and term in whom diagnosis represents a challege because in normal circumstances this patient are under parents observation.

Another fact is the each more frecuently short stay at the hospital that in our center is normally between 36-48 hours being checked by pediatrician 1 or 2 times

The acquisition of venous blood samples for blood cultures in newborns can be difficult (11,14). The finding of a negative blood culture frequently influences management (13).

We have reviewed medical literature and we could not found
any similar observation except one report of 1967 (12) in which an umbilical blood sample was obtained previous to a umbilical venous canilization for a blood exchange but with a different study objective.

Bacterial spectrum: The first item to see is the actual bacterial espectrum involves in neonatal sepsis (6). The pathogens we report are similar to those of reviewed literature with significative number of pathogens not sensible to IAP for GBS. That has been seen in previous reports and give us to review the actual protocols for control of vertical sepsis that has been thogh to control the infections for GBS (8,9)

Volume sample: The volume sample for a correct blood culture recommended is almost of 0,5ml to 1ml. More volume is neccessary to increase the sensibility of blood culture as shown Connell et cols.(11). In this study was noted a significative increase in the number of positive blood cultures when the volume sample was 3 or more milimeters.

In clinical practice we know difficulties that it takes; not only by complications in sample extraction and there more because these patients may be with hemodynamic inestability.

Intrapartum antibiotic prophylaxis: Each time is more frequently an IAP for a SGB in maternal genital tract or urine infection, maternal fever, prolonged rupture of membranes or fetal tachycardia. The antibiotic action difficults bacterial grow in culture mediums. Other face like we can read in the interesting article by Schrag et col. is a numerous percetage of E.coli sensible to GBS IAP, that can take to ginecologists to extend IAP to mothers with urinary tract infections to E.Coli (8).

Time to obtain blood sample. We think that time from born to blood sample extraction is important for this patients because it’s mean more time to antibiotic effect. We take an umbilical blood sample imediately in the delivery room. And we know that bacterial concentration is more important in this case(11,14,15).

Time to treatment. With this strategy we can obtain laboratory results in the first 24 hours of life than meens an early diagnosis and treatment with a better outcome (10).

CONCLUSIONS

Neonatal sepsis is a serious illness with a significant cause of mortality and morbidity and an early treatment influences prognosis.
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