

Comparative Study between Preterm Newborn of Very Low Weight, in the Use of an Intensive Care Incubator and a Neonatal Laminar Flow Unit

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Abstract

This study evaluated a total of 36 premature newborns with 32 weeks of gestational age or less, all with variable neonatal conditions, but without malformations; 16 newborns using intensive care incubators and 20 newborns using the neonatal laminar flow unit.

Results: There were no statistically significant differences in weight and gestational age; there was also no statistically significant difference in the initial axillary mean temperature of the two groups. The group of the neonatal laminar flow unit had an axillary temperature recovery rate higher than the incubator group and a significantly lower incidence of late sepsis than the incubator group. There were no differences in weight gain on the 13th day of life, and mortality in both groups.

Conclusion: The neonatal laminar flow unit was more effective than the intensive care incubator regarding body temperature control and the incidence of late sepsis.

Keywords: Preterm Newborn; Intensive Care Incubator; Neonatal Laminar Flow Unit

Introduction

The use of incubators in the management of newborns, including ill preterm one, date dates back to more than one hundred years [1]. However to this day no definitive solution has been found yet to problems such as isolation [2], difficulty access and management of newborns, noise amplification [3] and high magnetic fields levels [4,5].

The Neonatal Laminar flow unit was created and developed in Brazil as of the year 2004, having its main concepts studies regarding its use for therapeutic hypothermia already published [6-8]; however studies regarding its use in very low-weight newborns have not been published yet.

Objective of the Study

To compare the results 36 Preterm Newborns of 32 weeks or less Gestational Age; 16 newborns using double-wall intensive care incubators, and 20 newborns using Neonatal Laminar flow unit; the aim to maintain axillary body temperature between 36.5 - 37°C.

Materials and Methods

After informed consent was signed, 36 extreme preterm newborns (≤ 32 weeks gestational age) were admitted; they presented with pathologies such as early sepsis, respiratory and metabolic disorders, newborns presenting malformation were excluded. They were compared in relation to weight, weight variation, gestational age, body temperature, morbidity and mortality by late sepsis.

Proof of the presence of bacterial infections was made by the association between the clinical picture, and the presence of CBC and CRP compatible with the diagnosis and/or positive blood culture.

All newborns had a hydration regimen of 80 ml/kg/day with a 20% discount on this volume for newborns making use of CPAP, BIPAP or mechanical ventilation.

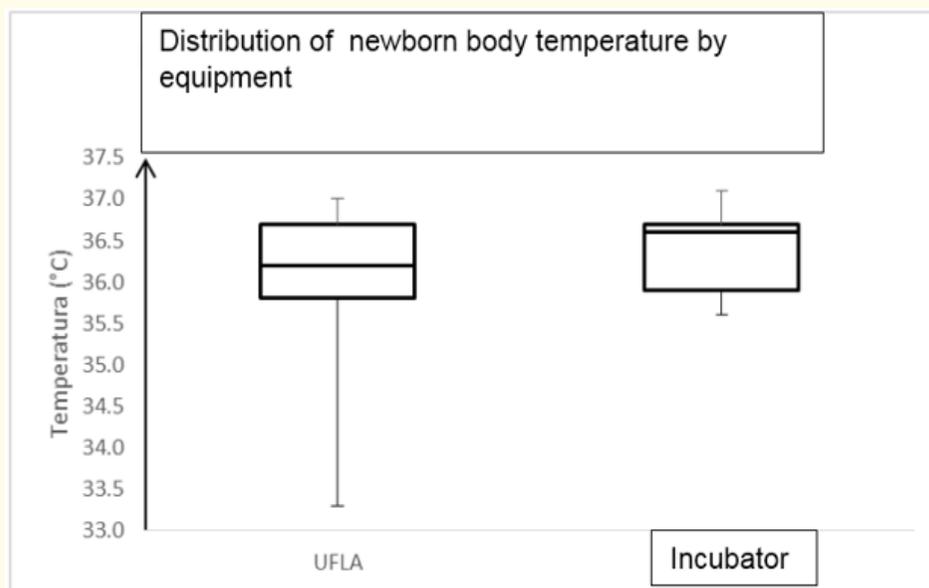
Statistical analysis comparing weight, gestational age and temperature was conducted by means of Student's T-distribution; the analysis of the frequency of infections, initial need for mechanical ventilation and mortality it was conducted by logistic regression

Since January 2010 the unit admits preterm infants, including extremely premature ones with very low and extra low weight. The relative weight of the preterm infants admitted by the unit in 2011 was 15,2% and in case of low birth weight infants - 16,6%.

Results

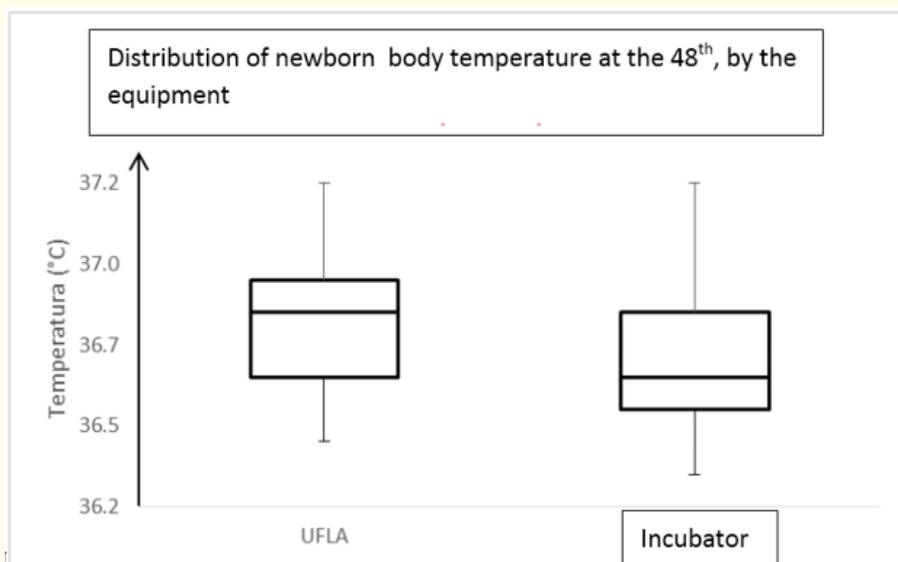
The average weight of the incubator group (1297, 50g) and the neonatal lamellar flow unit group (1171, 11g) did not present statistically significant differences ($w = 0.3889$); as for the average gestational age, the incubator group (30,7 weeks) and the neonatal lamellar flow unit (31,1 weeks) did not present significant differences either ($w = 0,6049$).

Regarding the initial average axillary temperature of the two groups, there was no significant difference either (36.3°C lamellar flow unit group/ $36,7^{\circ}\text{C}$ incubator group $w = 0,4799$), as seen in graph 1.



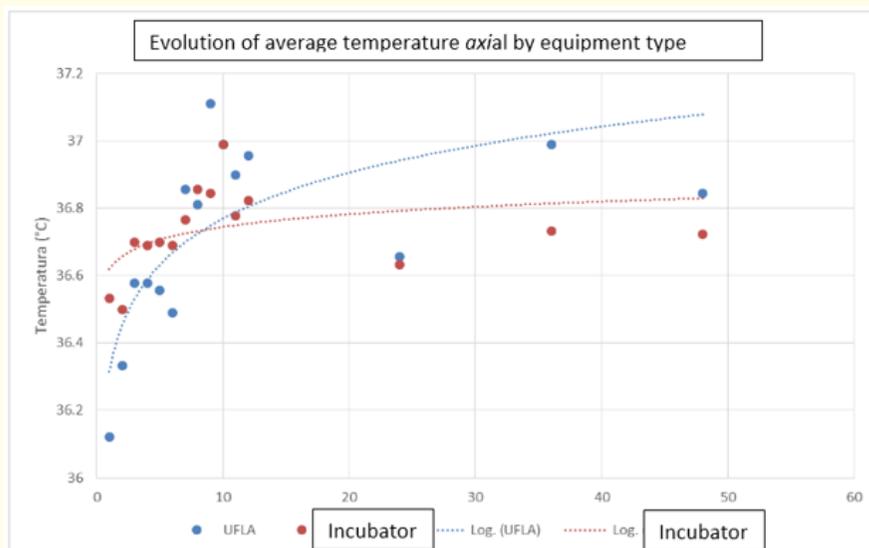
Graph 1: Distribution of newborn body temperature by equipment.
N-Neonatal Lamellar Flow Unit (UFLA-16), N-Incubator-20

Upon analysis of the recovery of the axillary temperature of the two groups with 48 hours of use of the neonatal laminar flow unit and the incubator, we observed an inversion of the average temperature between the two groups, with an average axillary temperature of 36.6°C in the incubator group and 36.8°C in the neonatal laminar flow unit group, although that does not represent statistically significant difference, as seen in graph 2.



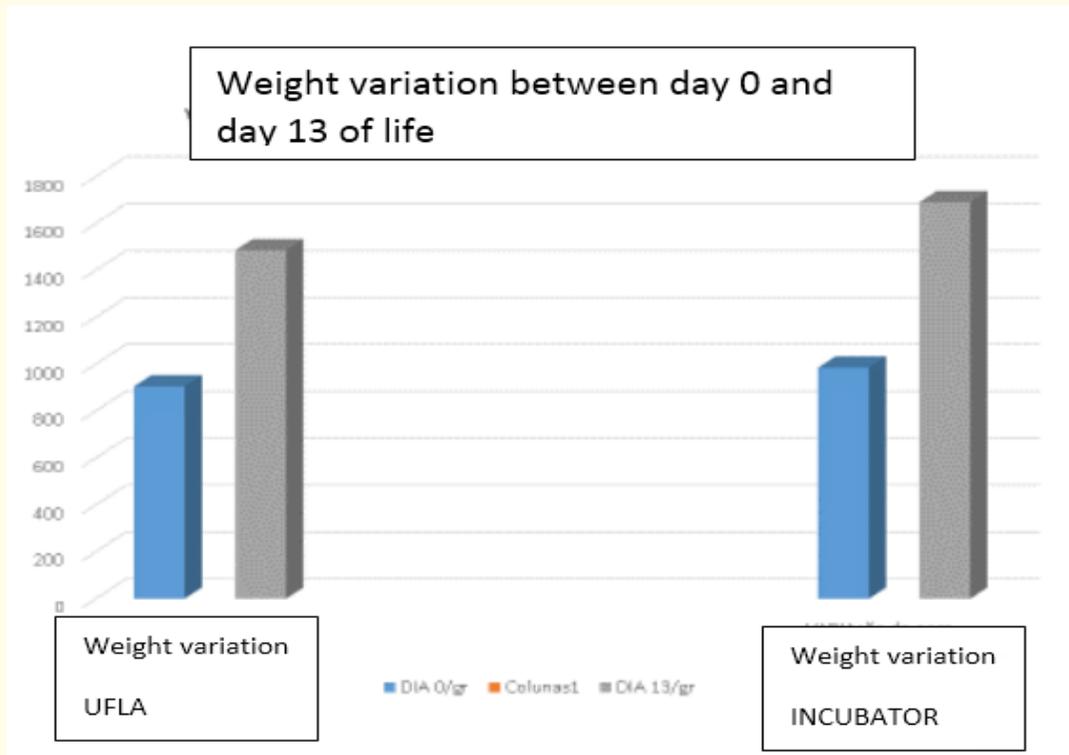
Graph 2: Distribution of newborn body temperature at the 48th, by the equipment.
N-UFLA-16, N-INCUBATOR-20

By observing the logarithmic trend curves for the temperature between the two groups, a curve of the upper axillary temperature in the neonatal laminar flow unit group can be seen in relation to the incubator group, as shown in graph 3 below.



Graph 3: Evolution of average temperature axial by equipment type.

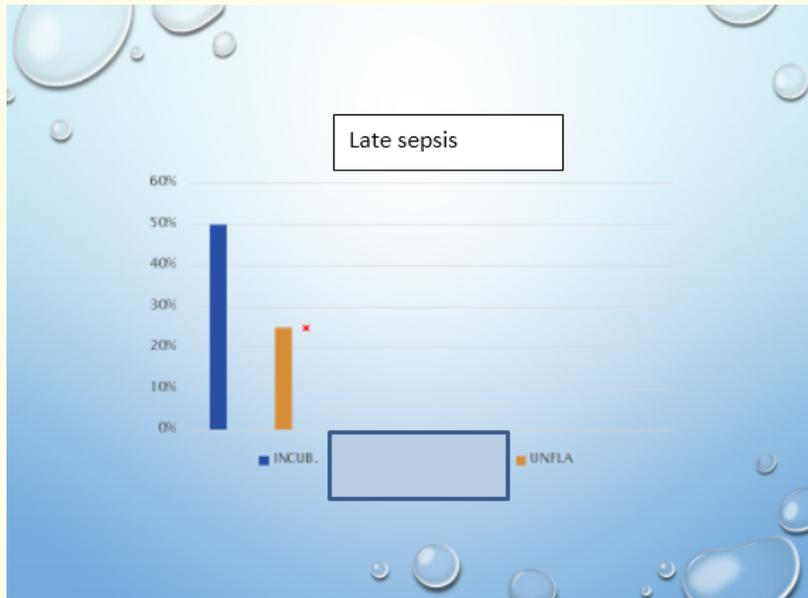
In relation to the weight variation between the two groups on the 13th day of life, which could be evidence of an greater impact on the insensitve losses with the use of the neonatal laminar flow unit, due to its higher air speed compared to the incubator (0,45 m/s vs. 0,1 m/s), since the two groups had the same level of hydration; positive weight variation can be observed between in the two groups as seen in the graph 4 below, nearly maintaining the proportional difference in weight average from day 0 to day 13 between the two groups; this indirectly corroborates the notion of an absence of increase in insensitve losses with the use of the Neonatal Laminar Flow Unit.



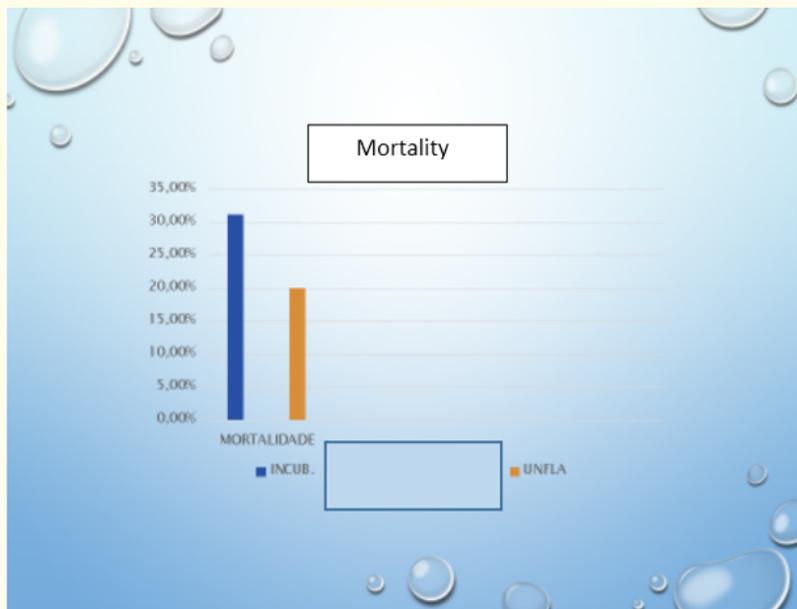
Graph 4: Weight variation between day 0 and day 13 of life.

As for the incidence of late sepsis (sepsis diagnosed after 7th day of life by the clinical picture and changes in CBC, CPR and eventual confirmation by blood culture) there was a significant decrease of its incidence in the neonatal laminar flow unit group (25%) as opposed to an incidence of 50% in the incubator group ($p < 0,05$), as seen in the graph 5 below.

There was no significant difference in relation to the mortality rate in the two groups, which was of 20% in the neonatal laminar flow unit and 31.2% in the incubator group; as seen in the graph 6 below.



Graph 5: Late sepsis.



Graph 6: Mortality.

Discussion

Neither group presented differences in weight or gestational age or axillary temperature at the beginning of the study; follow up of the evolution in axillary temperature shows a difference in favor of the neonatal laminar flow unit group as compared to the incubator group, which can be explained by the unit's higher air speed of 0,45 m/s with respect to 0,1 m/s of the incubator, which favors a faster heat transmission response by the neonatal laminar flow unit [9].

Said greater air speed could cause an increase in insensitive losses in the neonatal laminar flow unit group, however, upon analysis of the weight variation, there is no statistically significant difference between the two groups; whereas the hydration volume was the same in both groups. This can be explained by the humidity supply, between 70 and 80%, that the neonatal laminar flow unit is capable of delivering, which balances the possible insensitive losses due to higher air speed [10].

Finally, in relation to the incidence of late sepsis, there was a significantly smaller number in the neonatal laminar flow unit group (25%) versus 50% of the incubator group. Regarding the mortality rate, despite presenting a somewhat smaller number in the neonatal laminar flow unit group in comparison to the incubator group (20% versus 31,2%), this was not a significant number.

Conclusion

In this study on preterm newborns, the neonatal laminar flow unit proved more effective than the intensive care incubator in body temperature control and in control of incidence of late sepsis.

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