

## Polyethylene Wrap for Thermoregulation in the Preterm Infant: A Randomized Trial

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We compared the response of temperature adaptation in preterm infants using the polyethylene wrap with and without previous drying *versus* the sterile preheated field. Both groups of polyethylene use achieved a mean axillary temperature of 36.5°C at 30 minutes compared with 75 minutes for the group of traditional care. At 120 minutes, the incubator temperature was higher in those using preheated field, compared with infants in the polyethylene wrap with or without previous drying, (35.15°C, 34.20°C and 34.20°C respectively;  $P = 0.0001$ ). No difference in axillary or incubator temperature was found between the groups using the polyethylene wrap.

**Key words:** Mexico, Polyethylene wrap, Preterm infant, Temperature, Thermoregulation.

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**H**ypothermia, particularly in preterm infants, is associated with increased morbidity and mortality [1,2]. The polyethylene wrap is a secure device to promote temperature adaptation in newborns and it does not interfere with the immediate newborn care or resuscitation [3]. However, its efficacy in promoting adequate thermoregulation, with or without prior drying of the newborn is unclear. Only one previous study has compared these two techniques; however, it was conducted in term neonates and was not randomized [4]. The aim of this study was to determine if the polyethylene wrap is equally effective for thermoregulation of preterm newborn, with or without pre-drying *versus* pre-warmed towels.

### METHODS

We performed a controlled clinical trial in a General Hospital in Celaya, Mexico. Infants of 28-37 weeks of gestation, and weighing 1000-2499 g at birth were included [5]. Infants suffering from loss of cutaneous integrity, or suspected congenital heart disease (based on inspection and auscultation findings such as the presence of cyanosis and abnormal heart rate, rhythm, regularity, and heart sounds) were not included. The study was approved by the Institutional Ethics Committee and informed written consent was obtained from the parents.

We considered 30 infants per group to detect a significant difference of 0.9°C in axillary temperature between preheated field and use of polyethylene bag, with  $\alpha=0.05$  and power of 90%.

Immediately after birth, all infants were kept under a radiant warmer at 36.5°C (Blosson, Series 900). In group I, infants were routinely dried with a sterile preheated field (heated under the radiant warmer for 10 minutes at 36.5°C), according to the International Guidelines for Neonatal Resuscitation [6], and wrapped with another preheated field until they were placed into the incubator where airway and vital signs were managed conventionally (traditional care). In group II, they were dried similarly and wrapped with a polyethylene bag. In group III without previous body drying (only the head was dried), they were wrapped with the polyethylene bag. Later, all infants were placed in a single walled incubator (Medix TR 306).

We estimated the time to achieve axillary temperature (AT) of 36.5°C and compared AT at 120 minutes from baseline at birth between all the groups. The incubator temperature was registered at baseline and every 15 minutes until two hours after birth. Glucose levels were determined with a (Optium Xceed) monitor and blood pressure was measured by the flushing technique.

For comparison of continuous variables between groups, ANOVA test and Sheffé's test were used. In case of skewed distribution, we used Kruskal-Wallis and chi-square tests. SPSS software (version 17) was used.

## RESULTS

Birthweight was higher in the preheated field group than the other groups without difference in other variables (**Table I**). No difference was found on heart rate, respiratory rate or blood pressure levels between groups.

Axillary temperature in the to groups at different time intervals is depicted in **Table II**. Both groups of polyethylene use achieved a mean AT of 36.5°C at 30 minutes compared with 75 minutes for the group of traditional care (**Table II**). However, no difference was found in AT between those newborns that were small or adequate for gestational age. Hypothermia was reported in 5 (16.6%) newborns in group I, and their gestational age was not different from the rest of the group (34.1±2.7 vs 34.7± 2.4;  $P=0.59$ ). One case of hyperthermia was found in the polyethylene bag without previous drying (37.7°C). None of the neonates in whom polyethylene

bag was used developed lesion of the skin or infection. Incubators in all cases started at 34°C. However, temperature of the incubator at 120 minutes, was higher in group I (35.15±0.89°C) than group II (34.20±1.14°C) and III (34.20±0.75°C) ( $P=0.0001$ ).

## DISCUSSION

We have confirmed that polyethylene occlusive skin wrapping immediately after birth in preterm infants provides better thermal protection in the delivery room than conventional drying, independently of previous body drying or not. The polyethylene bag was placed immediately after birth until two hours after birth in our study, compared with previous studies where the bag was placed at different times after birth [3,6-10]. Furthermore, all these studies only compared traditional care and one group of intervention (with or without previous drying), and studied infants of different birthweight and gestational age. Vohra, *et al.* [7] found better corporal temperature in the intervention group in those <28 weeks of gestational age (difference = 1.9°C,  $P<0.001$ ) but Duman, *et al.* [6] found this difference in both <28 weeks and >28 weeks of gestational age. In our

**TABLE I** CLINICAL CHARACTERISTICS OF STUDY NEWBORNS

Variable	Group I (n=30) Traditional care	Group II (n=30) Polyethylene bag with previous drying	Group III (n=30) Polyethylene bag without previous drying
Gender (females/males)	14/16	15/15	15/15
Gestational age (wks)	35.6 ± 1.68	35.2 ± 1.8	34.5 ± 2.6
Weight (g)*	2173 ± 275	2101 ± 319	1934 ± 456
Small for gestational age	9 (30%)	6 (20%)	8 (26.6%)
Adequate for gestational age	21 (70%)	24 (80%)	22 (73.3%)
Apgar score (5 min)	9.0 (5-9)	9.0 (7-9)	9.0 (7-9)
<i>Mode of delivery</i>			
Eutocic delivery	4 (13.3%)	9 (30%)	8 (26.7%)
Distocic delivery	1 (3.3%)	1 (3.3%)	1 (3.3%)
Elective Cesarean delivery	14 (46.7%)	9 (30%)	9 (30%)
Urgent Cesarean delivery	11 (36.7%)	11 (36.7%)	12 (40%)
<i>Complications</i>			
Gestational diabetes mellitus	–	–	1 (7.1%)
Preeclampsia/Eclampsia	3 (37.5%)	2 (18.2%)	6 (42.9%)
Premature rupture of membranes	2 (25%)	6 (54.5%)	4 (28.6%)
Other	3 (37.5%)	3 (27.3%)	3 (21.4%)
Glucose at birth (mg/dL)	70.0 (56.0-98.0)	66.0 (49.0-77.0)	69.5 (56.2-81.2)
Glucose at 120 min <sup>#</sup> (mg/dL)	64.0 (48.5-79.0)	67.5 (47.5-99.0)	97.0 (58.0-159.0)

Data are shown as mean±SD, median (interquartile range) or as proportions according to the variable distribution; \*Significant difference between group I and III ( $P=0.04$ ); <sup>#</sup>of extrauterine life.

**TABLE II** COMPARISON OF AXILLARY TEMPERATURE BETWEEN GROUPS

Axillary temperature at	Group I Traditional care (n=30)	Group II Polyethylene bag with previous drying (n=30)	Group III Polyethylene bag without previous drying (n=30)	P value
birth	36.4 ± 0.51	36.3 ± 0.40	36.4 ± 0.41	0.49
15 minutes	36.2 ± 0.41	36.4 ± 0.33	36.4 ± 0.37	0.11
30 minutes	36.2 ± 0.41	36.5 ± 0.29	36.5 ± 0.36	0.01
45 minutes	36.3 ± 0.44	36.5 ± 0.32	36.6 ± 0.34	0.001
60 minutes	36.3 ± 0.44	36.6 ± 0.31	36.7 ± 0.38	0.001
75 minutes	36.5 ± 0.42	36.7 ± 0.33	36.8 ± 0.47	0.001
90 minutes	36.5 ± 0.41	36.8 ± 0.29	36.9 ± 0.46	<0.001
105 minutes	36.6 ± 0.39	37.0 ± 0.33	37.0 ± 0.39	<0.001
120 minutes	36.7 ± 0.37	37.1 ± 0.26	37.0 ± 0.31	<0.001

study, the thermal protection of the polyethylene bag was independent of the stratification of birthweight according to gestational age.

In addition to the more appropriate control of the temperature in those infants who used the polyethylene bag, none had hypothermia and only one had hyperthermia, contrary to the group with the traditional care where five infants had hypothermia. Previous reports also found higher proportion of hypothermia in infants with the traditional care, and a borderline increase in hyperthermia [3,9]. The risk of overheating is a potential concern when using the polyethylene wrap and it has to be monitored. Care should be taken to avoid hyperthermia, especially in those infants who are at risk of hypoxic ischemic encephalopathy [11]. The wrap procedure was well accepted by the neonatal staff and did not interfere

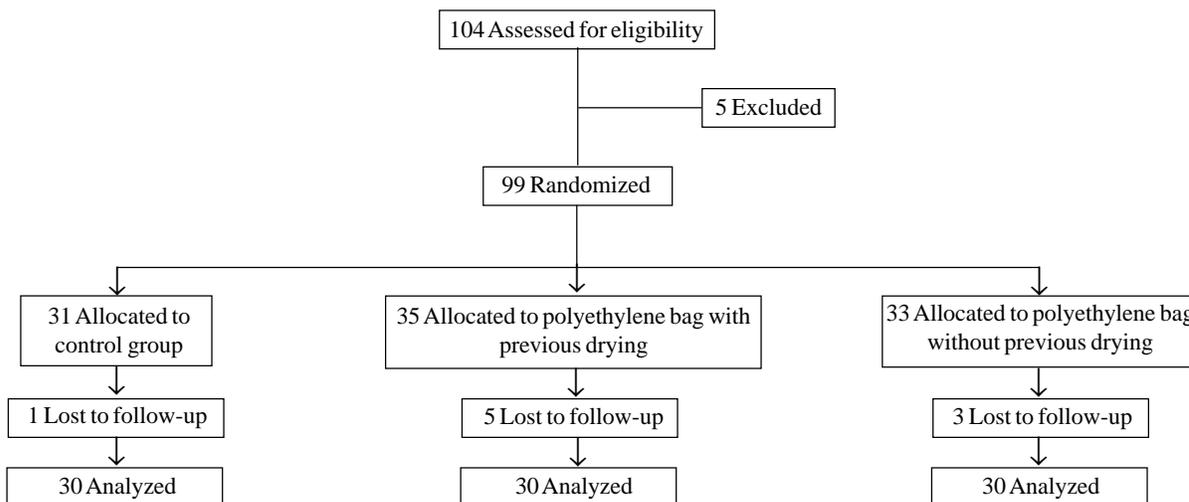
with resuscitation in the delivery room.

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**FIG. 1** Flow diagram depicting the distribution of newborns in the three groups.

**WHAT THIS STUDY ADDS?**

- Polyethylene film wrapping helps to correct hypothermia in preterm infants independently of previous body drying.

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