

Impact of Flexible Polyurethane Foam Cocoon on Premature Babies of Mothers with Pathologic Pregnancies

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Proper positioning of premature babies resulting from different maternal chronic conditions before pregnancy and hypertension induced during pregnancy can promote normal balanced development with maximizing the sleeping conditions and minimizing the gastric reflux. We conducted a retrospective study on data from Bega Clinics – Obstetrics and Gynecology and Neonatology for 2012-2013 about premature babies of mothers with pathologic pregnancies. Part of the newborns was positioned in a flexible polyurethane foam cocoon and clinical observations on sleeping states and the presence of gastric reflux were noted. In our study, 453 (10.5%) cases of women with different pathological conditions out of 4,312 cases were encountered. Most of them (48%) had a diagnosis of chronic hypertension, followed by chronic renal diseases (34%). Hypertension developed during pregnancy for both years, happened in 340 (7.88%) cases. Severe forms of hypertension were noted in 57.05% of them. Incidence of preterm birth babies was 11.22% (484 cases), of which 12 cases (8.67%) resulted from pregnancies with different forms of hypertension. Clinical observations stated that sleeping quietly and awake and quiet have increased the most when compared with babies positioned in the cocoon (44 babies) compared with babies (45) out of cocoons. Only 8 (18.2%) babies positioned in the cocoon experienced gastric reflux comparatively with 41 babies that were positioned in regular conditions.

Keywords: polyurethane foam, cocoon, preterm baby, pathologic pregnancy

Chronic diseases can influence the course of pregnancy and may have lasting effects that manifest at and after birth [1]. Some chronic conditions such as diabetes, thyroid disease, seizure disorders, and kidney disease can have adverse outcomes for pregnant woman such as gestational hypertension, preeclampsia, and maternal mortality [2]. In addition, chronic illness can have adverse outcomes on infants, including premature births, intrauterine growth restriction, and neonatal mortality [3-5].

Women who have hypertension during pregnancy or who develop pre-eclampsia (high blood pressure with protein in the urine or other organ systems involvement, or both) can develop serious complications. Potential complications for the mother are worsening of pre-eclampsia, development of seizures and eclampsia, HELLP syndrome (haemolysis, elevated liver enzymes and low platelet count), detachment of the placenta, liver failure, renal failure, and difficulty breathing because of fluid in the lungs [6,7].

Premature infants are at risk for developmental delays. Due to immaturity, they often lack adequate muscle tone and are at risk for developing abnormal movement patterns as well as skeleton deformation [8]. Some delays are related to improper body mechanics rather than neurological impairment.

Proper position of premature infants may promote normal motor development while minimizing development of abnormal movement patterns. Craft work and commercial products are available in different countries to assist the positioning of the newborn and promote postural stability and motion of flexion and semi-flexion positions.

This study aimed to analyze the impact of positioning of the premature newborn by means of flexible polyurethane foam cocoon aiming at its application in neonatal intensive care units.

Experimental part

Materials and methods

Data from Bega Clinics -Obstetrics and Gynecology and Neonatology related to years 2012-2013 were obtained by analyzing observation sheets, registers of birth, caesarean sections sheets and registers of newborn neonatology department.

Indicators that have been took into account were: number of chronic diseases before pregnancy, number of cases of hypertension induced during pregnancy, total number of births, number of prematures, weight at birth, management of hypertensive disorders in pregnancy delivery method.

In case of hypertension induced by pregnancy, the values ≥ 140 mm Hg for systolic blood pressure, and ≥ 90 mmHg for diastolic blood pressure measured for the first time during pregnancy occurred after 20 weeks of amenorrhea in a normotensive patients have been used for diagnostic.

In the intensive care unit of Neonatology, part of the newborns was positioned in a flexible polyurethane foam cocoon that has been donated to the clinic by a NGO. The cocoon allows baby to lie on his back in a semi-foetal position. It includes a Tummy Band which retains baby in place, keeps him or her in the correct position.

Each newborn was observed for three days in six states: sleeping quietly; sleeping in activity; transition when awake and active; awake and quiet; annoyed, or crying. The results

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Fig. 1. Flexible polyurethane foam cocoon ready to use

Table 1

WOMEN PATHOLOGICAL CONDITIONS BEFORE PREGNANCY IN THE STUDIED YEARS

Pathological condition	No cases/2012	No cases/2013	Total cases (%)
Chronic hypertension	107	112	219
Diabetes	20	22	44
Obesity (BMI >30)	17	17	34
Chronic renal disease	79	77	156

were compared with newborns of the same weight and delivery time. The reflux frequency was also noted.

Results and discussions

Total number of births was 2,117 for 2012 and 2,195 for 2013, irrespectively 4,312 for both years.

Number of women with pathological conditions before pregnancy is detailed in table 1, as well as cumulative per both years.

In total there were 453 cases of women with different pathological conditions. Figure 2 is showing the distribution of women pathological conditions before pregnancy.

It is observed that chronic hypertension followed by chronic renal diseases were the most frequent.

Considering the hypertension developed during pregnancy in 2012 a number of 202 (9.54%) were diagnosed. In 2013, a number of 138 (6.28%) developed hypertension. For both years, 340 (7.88%) pregnant women had induced hypertension.

We could notice different forms of pregnancy-induced hypertension as following:

- 194 (57.05%) severe
- 87 (25.58%) mild and medium
- 3 (9.11%) preeclampsia
- 14 (4.11%) HELLP syndrome
- 14 (4.11%) premature detachment of a normally inserted placenta (PDNIP)

Figure no 3 is showing the distribution of pregnancy-induced hypertension forms. More than half were re

From the group of mothers with induced hypertension during pregnancy 351 newborns were delivered, out of which 340 with single fetus and 11 of multiple fetuses: 4 twins and one triplet.

Management of hypertensive disorders in pregnancy at or near term (from 34 weeks onwards) has been a planned early delivery by induction of labour or caesarean section.

Maternal pathology before pregnancy

■ chronic hypertension ■ diabetes ■ obesity ■ chronic renal diseases

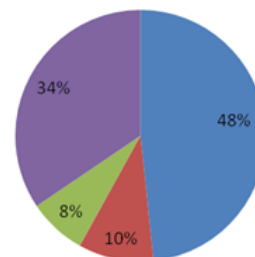


Fig.2. Distribution of pathologic conditions before pregnancy

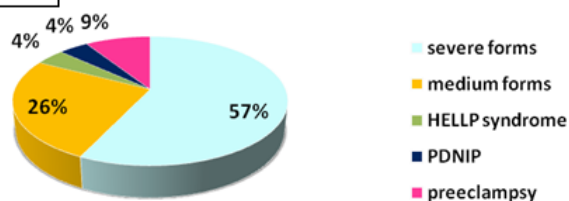


Fig.3. Distribution of pregnancy-induced hypertension forms

In some cases of caesarian section, the patients were operated by an enlarged team including a general surgeon in order to mitigate the risk of further complications (i.e., incisional hernia) which are correlated with of quality-of-life [9].

Table 2 is summarizing the number of pregnancies for each situation.

The incidence of preterm birth from the studied period was 11.22% accounting for 484 cases, of which 12 (8.67%) resulted from pregnancies that have evolved with different forms of hypertension. In 4 cases (1.98%) delivery was at 24-28 weeks of pregnancy.

Depending on the weight at birth newborns repartition was as following:

- Less than 2500g, 21.6 % including those with extreme prematurity and out of this bellow 1000g 1.54% .
- between 2500- 3500 g , 56.69%
- more than 3500g, 21.71%

Figure no 4 is showing the distribution of weight at birth considering all the weight values.

89 children had a weight between 2000-3500 g. For half of them, meaning for 44 babies a polyurethane foam cocoon was used for three days in six states: sleeping quietly; sleeping in activity; transition when awake and active; awake and quiet; annoyed, or crying. The observations were compared with babies that were managed in usual position.

Management of hypertensive disorders in pregnancy	2012	2013	Total
Pregnancy-induced hypertension	202(9.54%)	138(6.28%)	340(7.88%)
Caesarean section	144(56.43%)	80(57.97%)	194(57.05%)
Early delivery by induction of labour	88(43.57%)	58(42.03%)	146(42.95%)

Table 2
MANAGEMENT OF DELIVERY IN HYPERTENSIVE DISORDERS IN PREGNANCY

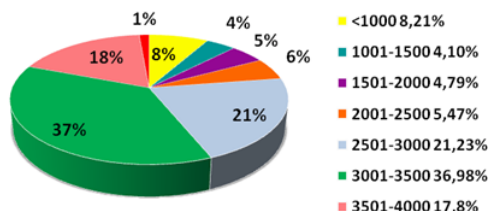


Fig. 4. Distribution of weight at birth



Fig. 5. Premature, 1580g, 13 days.

Clinical observations stated that sleeping quietly and awake and quiet have increased the most when compared with babies out of cocoons. Actually the quality and length of sleep improved which are signs of a better comfort due to physiological flexion realized by positioning the baby into cocoon. Premature babies most likely do not develop this physiological flexion. In this case the cocoon is extremely helpful.

The other parameter, the gastric reflux was reduced very much. Only 8 (18.2%) babies experienced it.

Maternal medical diseases increase the risk of preeclampsia and, thus, the risk of indicated preterm birth. In a cohort of more than 70 percent white women, Sebire and colleagues [10] noted a decreased frequency of delivery at less than 32 weeks of gestation among women with BMIs greater than or equal to 30 compared with that among women with BMIs less than 30. Those investigators did not differentiate spontaneous from indicated preterm birth.

It is well known that there is an increase in perinatal mortality in pregnancies complicated by pre-gestational diabetes – both type 1 and type 2 diabetes. The magnitude of this risk has decreased dramatically in the past several decades but is still in excess of that found in non- pre-gestational diabetes pregnancies [11,12].

Hypertensive disorders in pregnancy are significant contributors to maternal and perinatal morbidity and mortality in low-, middle- and high-income countries [13].

In our study, 453 (10.5%) cases of women with different pathological conditions out of 4312 cases were encountered. Most of them (48%) had a diagnosis of chronic hypertension, followed by chronic renal diseases (34%). Hypertension developed during pregnancy for both years, happened in 340 (7.88%) pregnant women. The most frequent were the severe forms of hypertension (57.05%). The incidence of preterm birth babies from the studied period was 11.22% accounting for 484 cases, of which 12 (8.67%) resulted from pregnancies that have evolved with different forms of hypertension.

Newborns who need intensive care or invasive maneuvers must adapt to different conditions from intensive care units: exposure to hyper stimulation with lights, alarms and medical maneuvers. A proper positioning of the premature newborn may contribute to the decrease of physiological and motor stress [14].

Positioning of preterm infants as a basic neonatal nursing care include usually supine, prone, side-lying, and head up



Fig. 6. Newborn, 3280, 1 day

tilted position. Several studies demonstrated a variety of outcomes affected by different body positioning of preterm infants. In addition, several studies indicated a strong association between prone sleep position and Sudden Infant Death Syndrome [15,16].

Furthermore, some studies found that preterm infants in a prone position compared to those in a supine position have early motor milestone, decreased energy expenditure, more rapid gastric emptying and less gastric reflux [17, 18].

A comprehensive literature review during 1966–2000 by Monterosso et al. (19) found that the prone position is preferred for very low birth weight infants because it promotes development of pulmonary, cardiovascular, sleep state organizational and gastrointestinal functions. Although research shows advantages and disadvantages for both supine and prone position among preterm infants to their physiological outcomes, there is a trend remains toward keeping preterm infants in a supine position; mainly for ease of observation and handling [19].

As babies develop and grow in the uterus a so called physiological flexion is creating. Premature babies most likely do not develop this physiological flexion. It is common that babies are lying with their arms and legs spread out because of gravity. This is why positioning that promotes physiological flexion can help premature babies to develop the position they had in the uterus.

The flexible polyurethane foam cocoon is assuring a semi-foetal position, in which baby is as if contained and in a slightly curved posture that soothes and reassures him.

In order to analyze the impact of positioning the baby in polyurethane foam cocoon, clinical observations of our study were concerned on sleeping activity and on the presence of gastric reflux. Three consecutive days a number of six states namely sleeping quietly, sleeping in activity, transition when awake and active, awake and quiet, annoyed, and crying were noted to 44 babies positioned in polyurethane foam cocoon comparative with 45 babies positioned in regular hospital conditions. Clinical observations stated that sleeping quietly and awake and quiet have increased the most when compared with babies out of cocoons. Quality as well as length of sleep improved. These are signs of a better comfort due to physiological flexion realized by positioning the baby into cocoon. Considering the gastric reflux this was reduced very much. Only 8 (18.2%) babies experienced it comparatively with 41 babies that were positioned in regular conditions.

Conclusions

Pathologic pregnancies due to maternal chronic conditions and the hypertension induced during pregnancies can have adverse outcomes on infants, including premature births, intrauterine growth restriction, and neonatal mortality. After delivery the complex care of

a premature baby is taking into consideration a multitude of actions and medical decisions. Positioning of preterm infants is a basic neonatal nursing care. Positioning the preterm babies in a polyurethane foam cocoon presents many advantages due to creation of physiological flexion position. Quality as well as length of sleep improved together with the drastic reduction of gastric reflux.

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Manuscript received: 21.08.2018