The Mirage of Long Term Vital Benefice – Risk for the Beginning of Life?

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ABSTRACT

Introduction: Cord blood is the “life” of the fetus until birth. After delivery, the newborn is “single” and forced to adapt to live using the latest resources provided by the mother. Those who believe that a newborn is just a miniature independent adult are just trusting one of the illusions of secular medicine.

Cord blood contains precious cells, stem, red and white blood cells. T cells as a part of white blood cells prevent infections and other illnesses. Cochrane Database 2013 published a study reporting the role of delayed umbilical cord clamping for the benefit of infants. Harvesting of stem cells increases early clamping. So, is prevention better than treatment, speaking about possible pathologies that can occur throughout life?

Material and methods: A prospective study of newborns in “Alessandrescu-Rusescu” National Institute for Mother and Child Health, Bucharest, Romania, was monitored by their adaptation to extrauterine life, depending on time and technique of clamping. The impact of harvesting stem cells after birth was explored.

Results: Of all babies, 8.23% were premature. Maternal pathology (arterial hypertension, diabetes mellitus, infections, thrombophilia) was present in 31.76% of cases. Of the 85 newborns with harvested stem cells, 47% needed assistance in the neonatal intensive care unit (NICU). Birth asphyxia (SA≤7) was present in 10.58% of cases.

Conclusion: Two protocols with strong recommendations about umbilical cord clamping and harvesting stem cells, respectively, are necessary.

Keywords: delayed clamping, early clamping, stem cells, term newborn, preterm infant, extrauterine life transition.
INTRODUCTION

Modern societies have the duty to choose from technologies that offer them support and the chance to improve their lives (2). In 1997, the cloning of Dolly opened up “the debating of cloning” for discussion. At the present time we have shifted the discussion towards “debating stem cells” (3).

Stem cell therapy is a way towards regenerative medicine.

Normally a skin cell remains a skin cell forever, a nervous cell remains a nervous cell until it dies, and so on (4).

Stem cells can transform into different types of cells such as cardiac, nervous, muscle cells, etc. They play a crucial part in the development and maturing of many systems and organs (e.g., the nervous, respiratory, cardiovascular, hematologic, endocrine and immune systems) long before birth (5-7).

The concentration of stem cells in circulating blood is higher during the fetal period than in any other period of the life course (8). They are able to be “instructed” towards certain functions, which makes them useful in treating some medical ailments (3).

The first stem cells transplant – the nature’s transplant – occurs at birth when the placenta and the umbilical cord begin contracting and pumping blood towards the newborn. After the blood has been distributed to all the compartments, blood flow stops and the cord also stops pulsing. The process occurs in most mammals, and this blood transfusion is allowed to end physiologically in most species, except in human beings (8). The latter manipulate the transition from intrauterine to extrauterine life through the moment when the umbilical cord is clamped. If it occurs untimely, the first stem cells transplant is reduced quantitatively, depriving the newborn of the cells that belong to him (4).

The etiology of many affections in the neonatal period is linked to a delayed adaptation to extrauterine life and to immaturity (4). Moreover, the maturation of each system and organ continues after birth (Tables 1 and 2). In this context, depriving a newborn of the cells that are actually his (hers) could have an impact on subsequent development.

<table>
<thead>
<tr>
<th>Confirmed by studies (4)</th>
<th>To be confirmed (4)</th>
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</thead>
<tbody>
<tr>
<td>Respiratory distress syndrome</td>
<td>Chronic lung disease</td>
</tr>
<tr>
<td>Anemia of prematurity</td>
<td>Retinopathy of prematurity</td>
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<tr>
<td>Intraventricular haemorrhage</td>
<td>Ulcerative necrotizing enterocolitis</td>
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<td>Periventricular leukomalacia</td>
<td>Ductus arteriosus</td>
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<td></td>
<td>Childhood anemia (9)</td>
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<td></td>
<td>Hypoxic-ischemic encephalopathy (9)</td>
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<td></td>
<td>Cerebral palsy (9)</td>
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<td></td>
<td>Mental deficiency (9)</td>
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<td>Cognitive and behavioral impairments (9)</td>
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**TABLE 1.** Neonatal affections induced by the delayed adaptation to extrauterine life and by the immaturity of systems and organs

The placenta and the umbilical cord can contain up to 200 mL of blood carrying hematopoietic stem cells and important supplies of iron (10). According to a UC Davis study carried out at an obstetrics hospital in Mexico City, a two minute delay in clamping the umbilical cord increases a child’s iron store by 27-47 mg of iron, which is equivalent to approximately two months of infant iron requirements. This fact could help prevent iron deficiency anemia until the age of 6 months (10).

After the placenta has finished transferring blood to the child, it is difficult to collect even a few milliliters of blood to determine the blood type. The large umbilical vessels are empty and blood in the small vessels begins to coagulate. The minimum necessary for collecting umbilical cord blood is 45 mL (11).

The blood from the umbilical cord represents “the life” of a baby until birth. It contains a lot of valuable cells such as stem cells, red blood cells and leukocytes, including T cells (12).

“Most of the transplants performed by using privately banked blood are done for the donor’s siblings”, explains Morey Kraus (13).

Regarding harvesting stem cells after birth, a volume of approximately 150 mL of blood is collected from the umbilical cord. In this purpose, clamping must take place immediately after birth (first seconds), so that about 50 mL of blood still
remain in the placenta. Therefore, stem cell harvesting can be done only by depriving the child of one third of his blood volume (9).

Immediate clamping of the umbilical cord is the equivalent of removing one third of an adult’s blood, such a process being classified as severe hemorrhage (9).

From a newborn weighing 3.6 kg, with a blood volume of approximately 280 mL, a maximum of 14 mL could be collected from the umbilical vessels. The lowest blood quantity which is acceptable for collecting is 45 mL, whereas the highest limit is 215 mL (11).

A “vampire midwife” declares that, in the majority of the cases, she filled at least half of a blood container (i.e., 90 mL). It is suggested that, in this situation, parents must be adequately informed if they are to make the decision of collecting stem cells by drawing a significant amount of blood from their child’s blood volume (11).

They have to weigh the advantages of collecting whole blood at birth compared to a possible treatment for a slightly probable future disease. The blood from the umbilical cord is the infant’s blood (11). One of the first treatments applied to a newborn requiring neonatal intensive care is intravenous infusion of a bolus of saline solution 0.9% or blood. We consider that it is desirable to let the nature do its own transfusion (Figure 1).

According to Dr. Sarah Buckley, the probability that the newborns would need their own cells stored was estimated at 1:20,000.

The blood from the autologous umbilical cord is suitable for infants who develop solid tumors, lymphomas or autoimmune disorders. Any other purposes are speculative (12).

Considering this, the question arises why would we deprive a child of these cells at birth as long as there are extremely small chances to receive them back?

Another question may be whether there is a connection between the deprival of stem cells at birth and the occurrence of certain illnesses for which we use stem cells treatment.

Delayed umbilical cord clamping has a great immediate value and stem cells from umbilical cord blood can provide long term protection for the newborn.

The main benefits of delayed umbilical cord clamping are (12):
- higher levels of iron
- lower risk of anemia
- fewer blood transfusions
- lower incidence of intraventricular bleeding.

Iron is an essential trophic needed in processes that depend on oxygen consumption. Therefore, it plays a key role in the function of vital cells. Compared to other organs, the brain has the highest oxygen consumption, oligodendrocytes being the predominant iron-containing cells. The importance of iron in myelin production has been demonstrated by studies that show the connection between low amount of iron and low myelinisation (14).

Up to 50% of children from developing countries become anemic until the age of 1, a negative situation in which impairments on psychomotor-development could be an irreversible effect (15). Therefore, prevention is certainly more efficient than treating the infant, and it will be better while keeping what is rightfully his.

According to the European Group on Ethics in Science and New Technology, there are several essential ethical principles which can be considered relevant:
- the principle of respect for human dignity and integrity, that state/declare the principle of non trading the human body;
- the principle of autonomy or the right of self-determination on the basis of complete and correct information;
- the principle of justice and solidarity in rightfull healthcare accessibility;
– the principle of beneficence, or the obligation to do good, especially in health care protection;
– the principle of nonmaleficence, or obligation to do no harm, including the obligation to protect vulnerable groups and persons, in order to respect the confidentiality and their private lives;
– the principle of proportionality, that requires a balance between means and objectives.

METHOD

The study analyzed the infants whose stem cells were harvested between 1 January and 31 March 2014, in “Alessandrescu-Rusec” National Institute for Mother and Child Health. We watched the evolution of pregnancy and monitored labor, delivery, type of newborns and their transition to extrauterine life. Umbilical cord clamping was done below 30 seconds after delivery and 100-120 mL of placental blood were harvested. The Apgar score was given at 1 minute after birth and neonatal resuscitation was initiated before 1 minute.

RESULTS

In all cases with stem cells harvested, the umbilical cord was clamped below 30 sec. Of 3094 births (2013-year previous to this study), 16.58% were harvested stem cells. The first three months of 2014 (January 1 to March 31) stem cells were harvested to 12.46% (682) of all births; maternal age was mainly 31-35, with no significant differences between primiparous vs. multiparous, and 78.82% of all mothers where from urban areas.

There were 8.23% preterm infants (Figure 2) and the distribution by gender was roughly equal.

Maternal pathology (arterial hypertension – 1.17%, diabetes mellitus – 1.17%, infections – 32.94%, thrombophilia – 8.23%) was present in 31.76% of these births. The delivery mode was 67.05% by caesarean section. Birth asphyxia (Apgar score ≤7) was present in 10.58% of cases.

Of the 85 newborns in which stem cells were harvested, 40 (47%) needed NICU hospitalisation (Figure 3).

We monitored extrauterine transition of newborns by heart rate, oxygen saturation, haemoglobin and hematocrit level (Figure 4). Anemia was considered when haemoglobin level fell under 14 g% and the hematocrit was <45%, hypoglycemia when blood sugar level was <40 mg%, and hypocalcemia <8 mg/dL or <1.1 mmol/L.

Of all newborns, 15.29% had arterial hypotension requiring volume replacement with NS 0.9%.

The risk of infection was mostly increased by labor with ruptured membranes from 16 hours and presence of pathogens in maternal cultures (vagina, urine) during the last trimester (Figure 5).

Birth asphyxia and anemia was registered in the first 24 hours (Figure 6).
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The following findings show the pathology of newborns described in literature.

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TABLE 2. Neonatal diseases induced by delay in adapting to extrauterine life and immaturity of systems and organs in the cases studied in our clinic

Although anemia is diagnosed in the first 24 hours, probably consecutive to harvesting the stem cells, at discharge only 1.17% of the neonates have anemia of prematurity, showing that good nutritional care has been provided.

The neonatal resuscitation team should know that stem cells have been harvested, so that they should have an effective emergency intervention for correction of hypovolemia.

DISCUSSION

In the selected group explored by us, the umbilical cord was clamped below 30 seconds in all cases with stem cells harvested to obtain more milliliters of blood. This procedure has been seen more often lately. In the three months of our study, stem cells were harvested in 75% of the total harvested in the previous year.

The mothers aged 31 to 35 years were mainly from urban areas (78.82%), with no significant differences between the primiparous and multiparous ones.

31.76% of the mothers presented pathology (arterial hypertension 1.17%, diabetes mellitus 1.17%, infections 32.94%, and thrombophilia 8.23%).

Of the 32.94% women with infectious risk, we found out that the risk was mostly induced by labor with ruptured membranes more than 16 hours and presence of pathogens in maternal cultures (vagina, urine) in the last trimester (Streptococcus B 34.48%; Escherichia coli 44.82%; Staphylococcus aureus 6.89%).

Most infants were at term, 8.23% were premature, and the distribution by gender was roughly equal.

The caesarean section was performed in 67.05% cases; 10.58% of them were with birth asphyxia (Apgar Score ≤7).

Anemia was registered in the first 24 hours and was present in 1.28% of term infants and 28.57% of preterm infants.

Neonatal intensive care unit admission was required in 47% of cases and the treatment consisting in termic neutral point, oxygenotherapy, treatment of hypovolemia was tailored to the needs of each newborn.

Newborn outcome was mainly dominated by early infectious signs. Clinical assessment revealed presence of metabolic disorders (hypoglycemia 10.58%, hypocalcemia 23.52%) and cardiovascular signs (arterial hypotension 15.29%, bradycardia 8.23%).

Newborns with arterial hypotension requiring volume replacement with NS 0.9% were 15.29%.

The literature showed that the delay in transition to extrauterine life and immaturity of systems and organs could be expressed in neonates by respiratory distress syndrome (RDS) and anemia of prematurity. In our study, we found 4.70% of cases with the RDS and 1.17% with anemia of prematurity.
CONCLUSION

Harvesting stem cells is a common practice in developed countries; the statistical analysis shows that it can become more common in Romania as well.

Early clamping of the umbilical cord is usually done no later than 30 seconds after birth, even though there is no protocol to implement this practice.

47% of all newborns who had stem cells harvested needed NICU assistance for arterial hypotension induced or correlated with anemia and asphyxia accompanied by bradycardia.

We believe that hypotension was determined by correlating several factors (anemia, perinatal asphyxia and bradycardia). Anemia, perinatal asphyxia and bradycardia are evidence of cardiac impairment and required volume expander and oxygen. A particularity of this group was that 31.76% of newborns came from risk pregnancies (arterial hypertension, diabetes mellitus, infections, thrombophilia).

The harvesting was done predominantly at cesarean section because that was the predominant way of delivery (67.05%) for both term and preterm newborns.

A well-prepared neonatal resuscitation team is required every time a stem cell harvesting procedure is performed. As a result, we can anticipate that the chance of the newborn requiring neonatal resuscitation is needed.

The parents have to be informed about the potential complication of stem cells harvesting procedure before practicing it.

More investigations are necessary to explain the high incidence of anemia in preterm group compared with term infants.

Current evidence is insufficient to decide whether the long-term potential benefits of this practice outweigh the short-term damage done by blood deprivation.

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REFERENCES