Abstract

Hybrid Cord Blood Banks May Be Advantageous for Scientific As Well As Economic Reasons

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Introduction

Public cord blood banks have thresholds for accepting cord blood collections for processing based on economic models developed using surrogate markers of suitability, i.e. volume and total nucleated cell count (TNCC). Only after processing has it been possible to look at CD34+ cell numbers and Colony forming unit (CFU).

Since as few as 0.52 x10^5 CD34+ cells can be expanded in vitro and used successfully for transplant (Lancet Haematol on line Nov 5, 2019; doi.org/10.1016/S2352-3026(19)30202-9), it is important to understand what is in the smaller collections that public bank guidelines currently prevent from being processed. Hybrid public/private cord blood banks permit economic support from the private bank to help support the public bank. They also offer an opportunity to evaluate products outside public banking thresholds because all collections are processed. Here we present data from the first 72 private cord blood unit (CBU) collections processed for the Cord Blood Bank of Arkansas, showing the relationship between collection volume, TNCC and CD34+ cell numbers.

Methods and materials

The CBBA is a hybrid bank, providing cord blood banking for public, private and research use. Parents are informed of the different options for banking available, document their informed consent, and then receive a collection kit to bring to the delivering obstetrician. Cord blood is collected with the placenta in utero using Pall model # 791-08 collection kits. Collections are processed within 72 h of collection at a central site with plasma and red cells removed. Pre-processing TNCC are performed with a Beckman Coulter Ac.T Diff2 cell counter and TNCC determined as follows: actual cord blood weight x WBC 10^3/100=TNCC.

Flow cytometry is performed using the ISHAGE technique with a Beckman Coulter CytoFLOW.

Results

Mean maternal age for CBU was 34y (range 26-45). Of 72 CBU donated (37 male, 35 female), delivery route was spontaneous vaginal for 50 (69.45%) and caesarian section for 22 (30.55%). Mean birth weight was 3341.5 g (median 3355; range 2296-4337). Mean gestational age was 38.92 weeks (median 39; range 36-41.14).

Table 1 CBU variables; TNCC is pre-processing and CD34 post-processing

N=72	Mean	Median	Range
Collection Volume (mL)	77.40	78.5	27-164
TNCC ($x10^9$/unit)*	0.74	0.68	0.13-2.38
CD34+ cells $x10^6$	2.79	1.92	0.09-23.94
Viability (%)	94.44	95.5	88-99

* Pre-processing TNCC was not available on 2 CBU and they were excluded from analysis

Table 2 Correlation between collection volume and post-processing CD34+ cells

		Collection Volume (mL)		
		<60 (n=23)*	**60-100 (n=34)**	**>100 (n=15)**
CD34 $x10^6$	Mean	1.49	2.68	5.06
	Median	1.39	2.19	3.03
	Range	0.09-3.84	0.15-8.38	1.31-23.94

*Threshold

Table 3 Correlation between pre-processing TNCC and CD34+ cells

		TNCC ($x10^9$/unit)			
		<0.5 (n=14)	**0.5-1 (n=29)**	**1-1.5* (n=20)**	**>1.5 (n=7)**
CD34 $x10^6$	Mean	1.09	1.95	3.47	8.10
	Median	1.02	1.49	3.31	8.10
	Range	0.09-2.59	0.15-5.97	1.31-8.38	2.58-23.94

*Threshold

Summary

Data on hematopoietic potential of low volume/TNCC products are currently available only from a hybrid or private bank. Here we show that CBU below threshold TNCC and volume for public banks can have a significant number of CD34+ cells available for expansion and use in transplant.