Umbilical cord blood application analysis of Guangdong Cord Blood Bank

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To the Editor: With the development of clinical research and the application of cord blood, the clinical value of umbilical cord blood (UCB) has drawn more and more attention. UCB has been increasingly applied to treatments of hematological diseases, autoimmune diseases, and malignant tumors in children and adults [1] and has achieved high overall survival.[1–3] UCB contains substantial amounts of various stem cells, including hematopoietic stem cells (HSC), mesenchymal stem cells, endothelial progenitor cells, and so on[4]; among them, HSC are most widely used in study and clinical application. Transplantation, where UCB HSC are implanted into patients, requires ruining the immune system and hematopoietic system before the procedure. Another therapeutic method is UCB infusion, where UCB is regarded as a nutrient, to improve the outcome of peripheral blood HSC transplantation[5] or symptoms via paracrine pathway of UCB stem cells.[6] In addition to the application of allogeneic UCB, autologous UCB has also been used in clinical treatment research. Autologous UCB is not limited to treating hemopathy, but also used to treat non-genetic metabolic disease, immune disease, and nervous system injury.[6]

Here, we report and analyze the data of UCB clinical application from Guangdong UCB Bank from 2007 to 2018. All activities of the Guangdong UCB Bank are conducted in accordance with Chinese laws and regulations. This study has been approved by the Guangdong UCB Bank Ethics Committee. The authors certify that they have obtained all appropriate patient consent forms. The data of 1350 cases of UCB application were processed (public bank, 1173 cases, and autologous [private] bank, 177 cases). The application characteristics of public UCB bank samples are shown in Table 1. The data showed that treatment of hematopathy is the main application of UCB. UCB is used not only for transplantation, but also as a nurse cell assist in peripheral blood or bone marrow HSC transplantation. The various stem cells in UCB have been increasingly used to treat various kinds of refractory diseases, which has dramatically expanded the potential clinical applications of UCB. The results of patient age and total nuclear cell (TNC) count suggest that immunodeficiency and metabolic diseases are primary diseases requiring UCB transplantation, which are typically urgent and UCB transplantation is required to be performed shortly or immediately after disease detection. In order to achieve a better treatment outcome, a higher UCB TNC count is required for immunodeficiency and metabolic diseases. There were significant differences in TNC count between different disease types ($P < 0.001$). The mean cryopreservation time of UCB in clinical treatment was 3.6 ± 2.7 years, and 99% of patients who needed a UCB transplantation could find a UCB match with no more than two antigen mismatches. Not considering the "other disease" category, Guangdong UCB bank has provided 1034 UCB to clinical treatment.

Totally, there were 537 cases with recorded overall survival data for 100 days, half-year, 1-year, or 2-year. Using Pearson correlation analysis, we found that there was no strong correlation ($P > 0.05$) between overall survival data of 100 days, half year, 1 year, or 2 years and human leukocyte antigen (HLA) matched condition or TNC. However, HLA-matched condition was important to transplantation outcomes. In practice, in order to achieve a better transplantation outcome, a growing number of hospitals required HLA-C, HLA-DQB, HLA-DPB, and killer-cell immunoglobulin-like receptor matched condition for UCB.

The treatment of non-malignant hematopathy is the main clinical application of Guangdong UCB private bank, and most UCB in the private bank is used for siblings.

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Table 1: Application characteristics of public UCB bank samples.

Characteristics	Disease types						HLA-matched condition (excluding other diseases)			
	Non-malignant hematopathy (n=339)	Malignant hematopathy (n=615)	Metabolic disease (n=22)	Immunodeficiency disease (n=58)	Other diseases (n=139)	P	4/6 (n=278)	5/6 (n=536)	6/6 (n=220)	P
Patient age (years)	21.3±18.3	22.2±15.4	4.8±3.0	2.8±3.0	57.1±21.1	<0.001	24.7±15.8	20.2±17.0	15.7±15.4	<0.001
TNC ($\times10^8$)	15.4±4.6	16.5±5.1	15.7±5.6	13.3±3.9	8.0±2.7	<0.001	18.1±5.7	15.7±4.6	13.8±3.8	<0.001
TNC/kg ($\times10^7$/kg)	3.8±2.5	3.7±2.3	8.4±4.4	9.2±4.5	1.6±2.7	0.142	3.4±2.3	4.3±3.2	4.5±3.1	<0.001
Recovery activity (%)	88.9±5.4	88.9±5.5	90.3±4.0	88.0±5.9	92.2±4.2	<0.001	89.0±5.5	88.9±5.4	88.7±5.7	0.639
Cryopreserved time (years)	3.5±2.7	3.5±2.7	4.3±2.7	3.5±2.2	3.0±2.6	0.111	3.1±2.3	3.6±2.8	3.6±2.8	0.044
Treatment type						<0.001				<0.001
Transplantation	160 (47.2)	400 (65.0)	22 (100.0)	54 (91.1)	2 (1.4)		142 (51.1)	343 (64.0)	151 (68.6)	
Infusion	179 (52.8)	215 (35.0)	0 (0.0)	4 (8.9)	137 (98.6)		136 (48.9)	193 (36.0)	69 (31.4)	

Values are mean ± standard deviation or n (%). HLA: Human leukocyte antigen; TNC: Total nuclear cell; UCB: Umbilical cord blood.

Guangdong UCB bank has also cooperated with Guangdong Women and Children Hospital and Shenzhen Children's Hospital to carry out a clinical trial using autologous UCB to treat cerebral palsy and brain injury. Totally, 50 patients with cerebral palsy had been treated with autologous UCB, and the treatment outcomes showed promise (data not shown).

Our data showed that nearly half of UCB applied clinically was used as infusion treatment, because UCB contains substantial amounts of various stem cells and cytokines and can be used as an adjunct to stem cell therapy for different diseases.[7] Moreover, UCB infusion could also be beneficial for other diseases through a paracrine effect.[8] We believe with more and more in-depth studies on clinical application of UCB, UCB will be widely applied in clinic, and patients will have more options for treatment using UCB.

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Conflicts of interest

None.

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