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### III. 研究成果の刊行物・別刷

# Chapter 1

## History of Marginal Donors in the World

Norihide Fukushima

### 1.1 Introduction

Cadaver organ transplantation was started with donation after cardiac death (DCD). As determination of brain death was not established until 1968, the first liver transplant by Starzl et al. [1] in 1963 and the first heart transplant by Barnard [2] in 1967 were performed with DCD donors whose organs were procured under cardiopulmonary support (CPB). After the Harvard ad hoc committee [3] published the Harvard criteria for brain death in June 1968, organ donation from brain-dead persons has become the main current of cadaver organ transplantation. However, in Japan, only uncontrolled DCD kidney transplantation has been done since the 1960s, because brain-dead organ transplantation was not permitted for a long time.

As organ transplantation rapidly increased and organ shortage became more remarkable, DCD have been widely introduced in the clinical practice and the use of organs, especially kidneys, from DCD donors has been reported in multiple series [4] since the late 1980s in the developed countries. At that time, controlled DCD was the main current. Therefore, organs were harvested after cardiac death induced by extubation of the donor.

As percutaneous cardiopulmonary support (PCPS) was introduced in the clinical settings in the late 1980s, uncontrolled DCD using PCPS was initiated in Spain [5]. In 2000, Steen et al. [6] started uncontrolled DCD lung transplantation in Sweden (Table 1.1).

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**Table 1.1** History of organ transplantation

	Animal experiment and xenotransplant	Clinical experiences in the world	Clinical experiences in Japan
1902	Ullmann (Austria): animal experiments of RTx		
1905	Carrel (USA): animal experiments of HTx and RTx		
1906	Jaboulay (France): renal xenograft (sheep and pigs)		
1910	Sainai (Kyoto University): animal experiments of RTx January 5 Unger: renal xenotransplant (primates)		
1923	Neuhof: renal xenotransplant (lambs)		
1933		April 3 Voronoy (Ukraine): DCD RTx	
1940s	Medawar (USA): elucidation of mechanism of rejection		
1952	Dausset (USA): elucidation of human leukocytes antigens		
1954		December 23 Merrill and Murray (USA): successful RTx between identical twins	
1956			Kusunoki, Inoue (Niigata University): living RTx
1959		January 24 Merrill and Murray (USA): successful allogeneic RTx	
1961		March Calne (UK), Murray (USA): use of azathioprine in RTx	
1962		April 6 Murray (USA): successful DCD RTx	
1963	Reemtsma (USA): renal xenotransplant (chimpanzees and baboons)	March 1 Starzl (USA): lung Tx from uncontrolled DCD donor using CPB June 3 Alexandre (Belgium): first RTx from brain-dead donor June 11 Hardy (USA): lung Tx from uncontrolled DCD donor	