ORIGINAL ARTICLE: FERTILITY PRESERVATION

Uterus retrieval process from brain dead donors

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Objective: To describe the feasibility of human uterus retrieval after donation after brain death.
Design: Single-center, prospective study.
Setting: University hospital.
Patient(s): Female brain dead donors.
Intervention(s): The families of female brain dead donors were informed about consent to uterus donation. A specific organ retrieval procedure was performed. At the end of the procedure the uterus was removed together with the hypogastric vessels, parametria, and vaginal fornix. The tolerance of the uterus to cold ischemia was evaluated with histology and TUNEL reaction up to 24 hours.
Main Outcome Measure(s): Rate of uterus donation refusal.
Result(s): Between August 1, 2012 and July 31, 2013, seven uteri were retrieved from 14 female multiorgan donors. No refusal to uterus donation occurred. Our surgical protocol did not interfere with vital organ retrieval and was readily accepted by the other transplantation teams. The hypogastric vessels could be preserved in all cases but for one vein loss in the first retrieval. Histology studies did not find major morphologic changes after 24 hours of cold ischemia. Apoptosis was rare.
Conclusion(s): Uterus retrieval could be part of a reproducible multiorgan procurement procedure. Uterus donation seems readily accepted. This preliminary study is a necessary step before any transplantation project. (Fertil Steril® 2014;■:■–■. ©2014 by American Society for Reproductive Medicine.)
Key Words: Uterus, transplantation, fertility, surgery, donation after brain death (DBD), brain dead donor

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Uterus transplantation (UTx) is an alternative to gestational surrogacy and adoption for patients with uterine infertility. Over the last 12 years many animal research studies have been conducted on rodents (1–12), rabbits (13), pigs (14, 15), sheep (16–24), and nonhuman primates (25–31). Pregnancy after autotransplantations or syngenic transplantations in rodents, ewes, and nonhuman primates has demonstrated tolerance of the uterus to ischemia–reperfusion damage (4, 5, 10, 19, 30). Moreover, pregnancy in rats and ewes after allo-transplantation is proof that UTx could become real (9, 21). Now UTx is close to the clinical application phase. Choice of donor is a major question before human UTx can be thought of. Would-be donors include both living donors, as in the Swedish project carried out by Brännström's experienced team (32), and dead donors, as described in a recent Turkish case (33). Cadaveric donors incur no risk, in contrast to living donors, who run the risk of surgical complications (32). Additionally, decreased quality of life and psychological consequences are also potential concerns in a population without any initial negative symptom (34). Uterus retrieval from a dead donor allows the procurement of large vessels to make anastomosis easier and to preserve the vasculature of the uterus. Uterus retrieval from living donors seems difficult owing to the complexity involved in preserving the uterine arteries and veins undamaged. The uterus is a nonvital organ, and the UTx success rate is still unknown.

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For the aforementioned reasons, our team thinks it more prudent to use brain dead donors for the first attempts at human UTx.

However, uterus retrieval in a multiorgan procurement context needs to be assessed. It seems essential to evaluate the feasibility of adding uterus retrieval to standard vital organ retrieval, to train surgeons to the procedure, and to assess the acceptance of uterus donation before planning to try UTx from dead donors. Information about how the human uterus tolerates long cold-storage time is also needed.

We report a preliminary local study of uterus retrieval from multiorgan, heart-beating, brain dead donors for scientific purposes.

MATERIALS AND METHODS

Both the French Biomedicine Agency and Limoges University Hospital's medical research ethics committee approved the study for a 1-year period.

This study concerned uterus retrieval only for scientific purposes and with no view to any transplantation. Consequently, inclusion criteria were large. Donor inclusion criteria were heart-beating brain death confirmed by two encephalograms, age >18 years, no ongoing pregnancy confirmed by negative hCG sample, and family consent. The exclusion criterion was the absence of the uterus.

Organ donor network coordinators informed families about consent to organ donation and decided whether to include information about consent to uterus retrieval. Information about uterus donation was given only when coordinators thought there was no risk of compromising vital organ donation.

French law does not require written consent in case of organ donation, whatever the purpose—transplantation or scientific research. Only oral consent is required. After oral consent to both organ donation and uterus donation was obtained, procurement surgery was organized. A pelvic ultrasound scan or a tomodensitometry scan and a Papanicolaou smear were systematically performed before surgery. Cervical smear results were not an obstacle to uterus retrieval for scientific purposes. Obviously, in case of UTx, an abnormal test result would be an exclusion criterion.

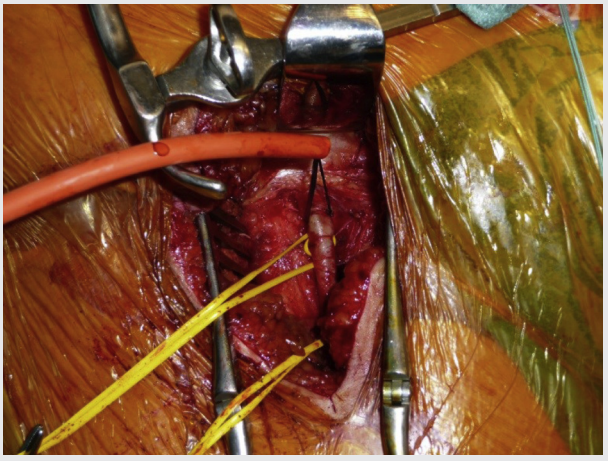
Multiorgan Retrieval Procedure

The donor was in a supine position. To flush the abdominal organs and uterus, bilateral femoral artery catheters were put in, which was the major modification to the standard multiorgan retrieval procedure. Femoral catheters replaced the abdominal aorta catheters commonly used in abdominal organ retrieval such as kidney, liver, or pancreas retrieval. Thus, the first step of the procedure was the dissection of the femoral vessels through two inguinal incisions (Fig. 1).

Next, a midline incision was made from the pubis to the sternotomy to allow the usual multiorgan dissection, except that of the uterus. The abdominal vena cava and one femoral vein were prepared for later catheter placement to allow venous discharge.

When all retrieval teams (thoracic and abdominal) were ready with all the organs satisfactorily dissected, the usual bolus of heparin (3 mg/kg) was given. Femoral artery catheters were put in, and the femoral arteries were ligated distal from catheter position. Two discharge catheters were also placed respectively in the abdominal vena cava and in one femoral vein.

FIGURE 1



Femoral artery dissection and catheter site preparation.

Gauthier. Uterus retrieval after DBD. Fertil Steril 2014.

During thoracic aorta cross-clamping and coeliac aorta clamping, flushing with Celsior solution (Genzyme) at 4°C through the femoral artery catheters was continued in all the abdominal and pelvic area, and the venous discharge catheters were opened. The thoracic, abdominal, and pelvic cavities were filled with sterile ice. Flushing was stopped once the discharge fluid was clear. Vital organ retrieval began in the following order: heart, liver, then kidney retrieval. In the case of liver retrieval, the external and common iliac vessels were removed by the organ team above the anterior internal iliac vessels to optimize hepatic anastomoses. The uterus was removed last.

Uterus Retrieval Procedure

The aim was to preserve uterus vasculature. The round ligaments were cut close to the pelvic side wall. The ovaries and fallopian tubes were separated from the uterus and left in place. The paravesical and pararectal spaces were dissected to individualize the parametria. The vesicocervical and rectovaginal spaces were dissected well below the vaginal fornix. No attempts were made to identify the uterine vessels. The ureter was cut just below its crossing with the iliac vessels. It was not dissected in its parametrial part to avoid tearing the uterine vessels. Laterally, the internal iliac vessels were cut above their anterior division. The anterior internal iliac trunks were gently dissected from the pelvic side wall to preserve the cervix and the uterine arteries and veins. The goal was to secure the bilateral vascular internal iliac pedicles. The umbilical, bladder, and vaginal vessels were cut below the parametria. At the end of the procedure the explanted specimen consisted of the uterus and proximal vagina with the parametria attached to the anterior internal iliac vessels.