

# The Ethics of Uterus Transplantation

by  
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Thousands of women experience uterine factor infertility (UFI).<sup>1</sup> Some are born without a womb (Müllerian agenesis)<sup>2</sup>; others have had a hysterectomy for a myriad of uterine-related pathologies. Many of these women, whether suffering from congenital or acquired uterine infertility, retain a strong desire to be able to bear their own biological child.<sup>3</sup>

Currently, the only clinically tested option to motherhood for women without wombs is gestational surrogacy, an immoral procedure in which eggs from the infertile woman and sperm from her husband are fertilized *in vitro* and then transferred to the womb of a surrogate for gestation. Now, however, transplantation of the uterus—an alternative treatment for UFI—is on the medical horizon.

Here I will assess the ethics of two proposed models of human uterus transplantation (UT) to determine whether either approach is a morally superior alternative to gestational surrogacy. In what follows, I will defend my conclusion that the first approach, the Del Priore model,<sup>4</sup> developed by Dr. Giuseppe Del Priore and his transplant team at New York Downtown Hospital (New York City), is immoral. But the second approach, the Bränström model<sup>5</sup> emerging from the research efforts of Dr. Mats Brännström and his colleagues at Göteborg University (Gothenburg, Sweden), *could* be moral.

## Background

In 2000, doctors in Saudi Arabia attempted the first uterus transplant on a 26-year-old recipient who lost her uterus after a post-partum hemorrhage.<sup>6</sup>

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The donor uterus came from a 46-year-old woman who had undergone a hysterectomy for a benign ovarian disease. The transplant remained in place for 99 days,<sup>7</sup> but was then removed due to massive uterine necrosis from vascular thrombosis.<sup>8</sup> Curiously, the recipient's fallopian tubes remained viable and evidenced no rejection. Even though pregnancy was never achieved, the transplant procedure itself was declared a technical success.

In 2006, Del Priore announced that, in preparing for the first human uterine transplant in the U.S., he had already identified prospective recipients and postmortem organ donors.<sup>9</sup> Because Del Priore's team plans to use allografts, i.e., cadaveric uterine transplants from women who are not close tissue matches to the recipients, they will, first, place the uterine recipient on an immunosuppressant drug regimen to prevent organ rejection; second, achieve pregnancy in the stabilized transplanted uterus by transferring the recipient's previously cryopreserved *in vitro* embryos and; third, remove the uterus after one pregnancy (or after two years with no pregnancy) to prevent prolonged exposure to adverse effects associated with anti-rejection drugs. Given the post-partum hysterectomy, Del Priore describes his approach as a *temporary* uterus transplant.<sup>10</sup>

Contemporaneously, Dr. Mats Brännström and his team are also preparing to apply the research data they have gleaned from animal uterine transplant studies to human trials.<sup>11</sup> What sets their program apart from that of Del Priore is procurement of uterine grafts from living donors (mother or sibling, e.g.) who are closely related to the recipient and possibly a close tissue match to the donor. With such a graft, the uterine recipient, first, would avoid some of the risks associated with anti-rejection drugs, second, could attempt to conceive naturally<sup>12</sup> and, third, would not require a post-partum hysterectomy. Theoretically, Brännström's approach is commensurate with a *permanent* uterine graft.

### Ethics Analysis

As described, uterine transplantation represents an intersection of two medical specialties, reproductive medicine and transplant surgery. Ethics analyses of human UT typically concentrate on the risk/benefit ratio of the transplant technique itself and of exposure to anti-rejection drugs for the woman and the developing baby should pregnancy occur. Unfortunately, these studies gloss over discussion of other important moral issues—some arising from UT as a treatment for infertility, others from its transplant dimensions—that deserve consideration in the current debate on the ethics of UT.

Appeal to relevant infertility treatment and organ transplant norms provides an analysis of the ethical issues arising from each phase of the uterus transplantation protocol. The first set of moral principles (1 through 5) tests

whether, as a treatment for infertility, either model of UT respects the relevant values of life and procreation.<sup>13</sup> The second set of moral guidelines (6 through 14) adjudicates whether, as a nonvital organ transplant, UT fulfills the moral requirements of altruistic organ transplantation.

## **I. Guiding Principles for Uterus Transplantation as a Morally Licit Treatment for Infertility**

No couple has a right to a baby. Couples do, however, have a right to marital acts and, with that right, the corresponding duty to collaborate *responsibly* with “the fruitful love of God.”

The small-c catholic norms that I will use to adjudicate the morality of uterine transplantation for uterine factor infertility have certainly not developed in a vacuum. They follow directly from the Church’s comprehensive vision of the human person and human nature which is rooted in reason and confirmed by faith. Thus, couples experiencing UFI and seeking to realize their good goal of wanting to conceive a baby of their own can use these norms as guideposts to help them evaluate whether UT promotes conception in a way that respects the relevant values of life and procreation.

### ***The Good of Human Life***

The life of every human being is a gift from God, the way God shares with each of us “his breath of life,” “his image and imprint.” “Shares” is the operative word here. God does not surrender his Lordship over life, but entrusts life to every human being as a proprietor would his household to a steward.

Thus, God alone is the Lord of life from its beginning until its end: “no [human steward] can, in any circumstance, claim for himself the right to destroy directly an innocent human being.”<sup>14</sup> Absolute respect for the integrity of new human life follows from natural truths about the human person. First, the human being, unlike plants and animals, is created in God’s image and likeness. This means that, of all material creatures, the human being alone is rationally intelligent and free. It is the dignity of personal intelligence and freedom—that capacity of the composite human being to reveal his person through his body and bodily actions—that defines the human being as a creature who is an end in himself, a being whom God created not to be used by others merely as a means to their own ends, but someone to be valued and loved in and for him or herself.

Second, as a being whose rational soul is infused by an immediate, creative act of God, the human person stands in an irrevocable relationship with his Creator. The human person, nuptially related to God, receives all of creation, including his or her life and embodied existence—as well as those

of other persons—as gift. The covenant between the human being and God that is begun in the act of conception is destined to be consummated in an “eternal life of beatifying communion with God.” The vocation to give self and to receive the other as gift resounds, then, in the nature of every human being who is made in the image of the Person of God, the Radical Giver. Three norms, pertinent to UT, follow from this vision of human life:

(1) *Infertility interventions must respect the inviolable integrity of a newly developing human life in vitro and/or in utero.*

Since the Del Priore team plans to use allografts—transplant organs that do not match the genotype of the recipient, they want the uterine recipient to achieve pregnancy as quickly as possible, post-transplant, to avoid the adverse sequelae of long-term exposure to anti-rejection drugs. To expedite conception, the Del Priore model specifies that, before her scheduled uterus transplant, the recipient must have several of her genetic IVF embryos cryopreserved and ready for transfer.<sup>15</sup>

The first line of risks to the child conceived under the Del Priore plan, then, are those associated with IVF. Prior to the embryo transfer process, the IVF specialist arrogates to himself the right to instruct the couple which of their embryos will be transferred, which surrealistically suspended through cryopreservation as “back-up,” which donated to destructive embryonic research, and which discarded because of developmental abnormalities.

Moreover, usurpation of dominion over the life and death of *in vitro* embryos is not limited to decisions to transfer, to cryopreserve, or to destroy. It also extends to serious endangerment of the baby’s post-natal life and health. The higher rate of multiple births that occur within IVF brings a commensurate higher risk for premature birth with low and very low birth weight, fetal distress, and low Apgar scores. Prematurity, in turn, compromises the child’s chances for normal motor and mental development.

Then, the IVF specialist is confident that, should second trimester difficulties arise (or even before they arise), the woman’s obstetrician or perinatologist will suggest that the mother reduce the pregnancy from triplets to twins, for example, by selecting the least healthy baby for “termination.”

The second line of risks for a developing baby under the Del Priore model of UT comes from fetal exposure to immunosuppressant drugs. Most agree that more research is needed to determine whether immunosuppressants have an adverse effect on the implantation of human blastocyst embryos.<sup>16</sup> As far as their adverse effects on fetal development is concerned, there is a general research consensus that babies conceived by women who have received organ grafts do not experience more fetal risks than those of pregnant women not exposed to immunosuppressants.<sup>17</sup> Dr. Vincent Armenti

who oversees the national registry of female organ recipients with subsequent conceptions concludes: “The consensus of the community, supported by registry data, is that pregnancy can be safe in this population [organ recipients].”<sup>18</sup> What is especially clear to those working to optimize human UT, however, is that, before transplant teams can devise a safe immunosuppression regimen for babies who implant/gestate *post-UT*, a more detailed study of the effects of these drugs *within the context of a gravid uterus that has been grafted* is needed.<sup>19</sup>

Furthermore, when the transplant organ is the uterus, the question of risks to the developing fetus is exacerbated by dangers from the stress that a pregnancy, especially a higher order pregnancy, would put on the uterine graft itself. Consider three gestational perils vis-à-vis a uterine graft: the dramatic growth the uterus undergoes during gestation, the complexity of its blood vasculature, and the fact that the uterine blood vessels are stretched three times their size during pregnancy.<sup>20</sup>

The Brännström approach to UT, allowing for natural conception and syngeneic grafts, would (1) eliminate the need for IVF and ET with their associated risk of multiple pregnancies and (2) reduce the adverse effects of immunosuppressant drugs on implantation and fetal development.

As for the added dangers of babies developing within uterine grafts, it is one thing to cite the national registry of pregnancies achieved in women who have a transplanted kidney or liver, it is another to simply extrapolate that data and apply it straightforwardly to the safety of developing babies being gestated *within* the transplanted organ. Because of this discrepancy, Brännström argues that researchers need to achieve a pregnancy in another primate *before* attempting human UT. To omit this important step is, in Brännström’s opinion, to put mother and developing baby at unnecessary risk.<sup>21</sup> Although Dr. Del Priore hopes to pursue more research with pregnancy in primate uterine grafts, he does not think this further study is strictly necessary.<sup>22</sup>

(2) *Spouses do not have a right to a child. Children are, and must be viewed as, a personal gift, “the supreme gift of marriage.”*

A couple with UFI must discern not only whether they understand that children cannot be had on demand, but whether the fertility specialists with whom they are working also respect this insight. Because the Del Priore model includes IVF and ET, I would predict that the involved clinicians take an overtly utilitarian outlook in championing an infertile couple’s right to reproduce—the right to have a baby—in any way they please and in the most expedient manner they can. In other words, implicated as it is with the individualistic ethos of IVF, the Del Priore approach to UT systemically excludes the notion of child-as-gift.

With the possibility of natural conception within the Brännström model of UT, however, it is plausible to suggest that, at the very least, its transplant team would not be able to impose expedient baby-making—with its concomitant reduction of the baby to an end-product controlled by scientific technology—on the couple contemplating UT.

*(3) A child has the right to be conceived within marriage.*

To date, I have not found a serious discussion within the mainstream fertility community referencing *any* rights of an IVF child—to say nothing of whether he/she child has a right to be conceived in a natural way. Nor do I expect to see such a work any time soon. In the world of IVF and ET, the rights of parents trump all. Thus, the Del Priore approach, and the essential place it assigns to the production, cryopreservation and transfer of *in vitro* embryos, also fails to honor the right of children to be conceived within the protection, security and, yes, intimacy of their parents' bodily union.

Couples who have the opportunity to conceive naturally, post-UT, on the other hand, would honor their child's right to be conceived within their own acts of sexual love.

***The Good of Human Procreation***

God calls a husband and wife to image his Divine family life through the language their bodies speak in the act of marital intercourse. The spousal meaning of a couple's vocation to procreate is *inscribed* in the meaning of their vocation to love—the mystery of their personal communion.

But what does it mean for the Church to say that the act of giving life to a new human being is inscribed—that is, indelibly engraved—within the very act of giving love? To my mind, the Church invokes this powerful image to help an infertile couple better grasp how the procreative meaning of their sex acts *defines*, *activates*, and *demands* its love-giving or unitive counterpart.

The following two norms, pertaining to the infertility treatment of UT, follow from this view of human procreation:

*(4) Infertility treatments must assist, not replace, the conjugal act.*

There is no possibility for natural conception within the Del Priore model of UT. It follows, then, that the *in vitro* fertilization of gametes required in this approach necessarily replaces the conjugal act.

With the possible option of natural conception, the Brännström approach to UT could be viewed as a technology that assists the infertile couple's marital act to achieve its natural end.

*(5) The dignity of conceiving a baby demands the sexual complementarity, the “two-in-one-flesh” union, of husband and wife.*

In addition to replacing a heterosexual couple's acts of sexual love, the IVF dimension of the Del Priore model of UT could be open to other kinds of moral abuse. Del Priore's screening criteria stipulate that the prospective uterine recipient be in a stable family situation.<sup>23</sup> I would wager that the New York Downtown Hospital would be legally accused of discrimination if they refused UT to a lesbian woman who lacks a womb. As we have recently witnessed in the IVF and adoption arenas, lesbian "couples" define themselves, and expect to be viewed as, an alternative familial structure that is neither more nor less stable than heterosexual marriage.

Furthermore, if UT gets through the experimental stage and is ready for prime time, so to speak, what or who could stop a gay man from wanting a uterus so that he could gestate embryos fertilized with donor eggs and his own or partner's sperm?<sup>24</sup>

In these gay or lesbian contexts, UT would be immoral on grounds that it fails to respect the sexual complementarity demanded by the conception of a new human being. Unfortunately, if IVF/ET were the chosen method of impregnation post-transplant, there would be nothing to protect the Bränström model of UT from the immoral procreative scenarios just described.

## **II. Guiding Principles for Uterine Transplantation as a Morally Licit Organ Transplant**

### ***The Good of Life and Health and the Common Good— Love and Solidarity***

Since Pius XII, the Church has recognized the moral licetity of *post mortem* and *inter vivos* organ donation based on the principles of fraternal charity and concern for the common good. John Paul II confirmed these principles by describing organ donation as a loving way to serve the life and well-being of an individual and, at the same time, to serve the entire human family by showing solidarity with "the fundamental good" of human life.<sup>25</sup> The principles of charity and solidarity, then, preclude the buying/selling of a human organ as well as any consideration other than medical need when adjudicating the suitability of a particular candidate for organ transplantation. The following guidelines further explicate the demands of altruistic organ donation:

- (6) *Organ transplantation extended to organs that do not directly save a life can, under certain circumstances, be ethically justified.*

Extended organ donation includes the gift of nonvital organs or organs whose function can be mechanically maintained. Hence, donation of these organs do not rescue the recipient from a life-threatening situation. Pope John Paul II signals tacit approval for extended organ donation when he

describes organ sharing as the gratuitous decision to offer a part of one's body "for the health and well-being of another person."<sup>26</sup> Kidney donation, for instance, stands outside the norm for vital organ transplants where the life of a recipient is preserved *only* because of organ donation (in the case of the body's single organs: heart, liver, pancreas). The person suffering acute renal failure can stay alive with the mechanical means of hemodialysis. But persons on dialysis typically attest that a kidney graft would vastly improve the quality of their overall health and well-being. As long as the kidney donor maintains his/her functional integrity (i.e., has a second, normal kidney), and all other moral transplant requisites are met, the Church has no objection to kidney donation.

UT is another example of non-vital organ donation.<sup>27</sup> While a woman does not die from lack of a uterus, she is deprived of a functional procreative capacity that is central to her feminine psyche and person. With the possibility of UT, this personal procreative capacity could be restored and, with it, her reproductive health and well-being. *If all other conditions for morally licit UT outlined here are fulfilled*, I would argue that the Church's implied approval—or lack of explicit condemnation—of non-vital organ donation to date (kidney, face, arm, hand, larynx and trachea, e.g.) would also apply to uterine transplants.

(7) *Organ transplantation must not alter the psychological or genetic identity of the recipient.*

The transplantation of human gonads (ovaries, testes), even if feasible, is immoral since it alters the genetic identity of the recipient in the sense that the DNA the recipient subsequently contributes to progeny would diverge from his or her own. Transplantation of the encephalon is also morally wrong, since doing so would alter the psychological identity of the recipient.<sup>28</sup>

UT would not alter the genetic identity of the uterine recipient. It would, however, alter her psychological/emotional self-understanding in the sense of *improving* the recipient's relation to, and appreciation of, her sexuality and restored procreative capacity. Ideally, the uterine recipient's newfound appreciation of fertility could help her understand, first, the richness of motherhood symbolized by the uterus<sup>29</sup> and, second, why motherhood/gestational capacity is the basic symbol or analogy for the material cause of the child.<sup>30</sup> In contrast to paternity, a symbol for the efficient and, hence, also for the formal and final causes of a child, the mother's efficiency is indirect and consists in her supplying an ovum containing half the child's genome (the developmental program or formal and final causes of the child) and the cytoplasm that will nourish the embryo (material cause) up to implantation. Thereafter, the mother continues to nourish the child through the umbilical cord and, post-delivery, by breast feedings. The mother, then, is

‘what the child is made of’ and the child experiences his mother as ‘the one out of which he came.’ Simply understood: the father is the efficient cause or impregnator; the mother is the feeder or material cause. As a consequence, the father sees his child as *other*, as someone who is coming to be. But the mother sees her child, the “fruit of her womb,” as a part of her, the *same* as she is, someone who will, for a long time, in fact, be dependent on her for nutrition and protection.

(8) *Organ transplantation, while depriving the living donor of anatomical integrity, must not compromise his/her functional integrity.*

This principle applies only to living uterine donors, that is, to the Bränström approach of UT, and must be understood within the context of the principle of totality and integrity.<sup>31</sup> Authentic self-love demands that every human being show proper care for his/her personal body with its complex system of bodily functions. True love of one’s bodily person means that one may never sacrifice a basic human function (a part of the person) unless doing so is the only way to preserve one’s health/life (the integral whole of the person).

Since *inter vivos* organ donation necessarily involves sacrificing a bodily function associated with the donated organ, the question arises whether the donor of non-vital organs is maintaining his/her bodily integrity. This question led to further parsing of the principle of totality by distinguishing between functional and anatomical integrity. *Inter vivos* organ donation that maintains the donor’s functional integrity—that is, the systematic efficiency of the donor’s body—is morally permissible, even though it destroys the donor’s anatomical integrity. Organ donation, then, is morally permissible when the body of the living donor, though lacking anatomical integrity, is still in tact in the sense of continuing to be functionally efficient. For this reason, an individual with a functional second kidney may donate his other kidney to a person with renal failure. The kidney donor, though lacking anatomical integrity, maintains his functional and, therefore, bodily integrity because his second kidney operates efficiently. But when a live donor gives up one of his cornea, even though the other cornea is working normally, he would lose both anatomical and functional integrity, since his loss of sight in one eye seriously compromises his “in depth” vision. *Inter vivos* donation of a cornea, then, is immoral by virtue of causing mutilation<sup>32</sup> of the donor’s body, that is, by sacrificing its functional integrity.<sup>33</sup>

Applying the principle of integrity and totality to UT, the question is: Does uterus donation from a close relative constitute mutilation (loss of the donor’s functional integrity) or licit donation (preservation of the donor’s bodily integrity)? The donation of a uterus would be directly sterilizing and,

therefore, immoral if the donor-mother or donor-sibling were still of reproductive age. Even though both of these donors would have a good end—giving their uterus to provide their barren sister/daughter the possibility of procreation, they would be pursuing a bad means to that good goal. A mother/sister who is still fertile and who donates her uterus fails to exhibit genuine self-love by sacrificing her own basic human function of procreation/fertility (and, therefore, her functional integrity) without the necessity of preserving her health/life.

I can think of two scenarios in which the donation of a uterus would not be mutilation (not be immoral): If the relative who is a close tissue match to the woman suffering from UFI were menopausal or if a donor/relative were required to undergo a hysterectomy that is not directly sterilizing.

*(9) Organ transplantation must represent  
a wise use of health care resources.*

The estimated cost of UT in the U.S. is upwards of \$500,000. Since it is still in the research or experimental stage, a uterus transplant would not qualify for Medicare and managed care payment.<sup>34</sup> Furthermore, successfully executing a uterus transplant requires the cooperation of a formidable team of experts: a clinical research coordinator; a transplant social worker; a transplant dietician; nurses and clinical coordinators; a transplant psychiatrist; a transplant infectious disease physician; transplant gynecologic surgeon; surgeons who have done UT in primates, and fertility specialists trained in IVF and ET, to name just some of the required specialists.<sup>35</sup>

While it is true that vital organ transplantation (heart, pancreas, liver) is also pricey and demands a medically diversified transplant team, the benefit—rescuing the recipient from death by fulminant liver failure, hepatorenal syndrome, or end-stage congestive heart failure—is undeniably proportionate. Likewise, a kidney transplant, the most common kind of extended organ transplantation also warrants its steep monetary and healthcare personnel costs given the decided enhancement accruing to the recipient's life, health and well-being. Face, hand, arm, or larynx/trachea transplants, more recent kinds of extended transplantation, could yield, after a case by case analysis, similar restoration of health and well-being. But can the same be said of UT?

The answer is ‘perhaps.’ Del Priore’s team hopes to limit the public health care costs of UT, for example, by appealing to the private sector—charities that support infertility research, the patient, and any private insurers that cover infertility treatment.<sup>36</sup> The shared funding proposal does blunt the argument that the benefit of human UT simply does not merit the huge output of requisite public resources. With some ethical merit towards resolv-

ing the scarce medical resource question, others have also argued that, due to the small percentage of infertile women afflicted with UFI and perhaps the even fewer number of those interested in using UT to resolve their infertility, there should be a correspondingly limited number of medical centers in any given country dedicated to the procedure.<sup>37</sup> If the drain on public health care resources are kept to a minimum through the two measures just discussed and all other moral requisites have been met, especially that of providing a uterine graft that is permanent, then I would argue that the possible benefit of the procedure—the restoration of a woman’s procreative capacity—warrants the cost of doing so.

*(10) The risk incurred by the organ donor must be proportionate to the benefit experienced by the organ recipient.*

The benefit of UT is the restoration of the recipient’s ability to procreate and to function as a fertile human being. Since the procreative capacity of the donor is as precious as that of the recipient, to donate one’s uterus when one is still cycling is to directly sterilize one’s self and, as such, represents a moral deficit disproportionate to the benefit accrued by the uterine recipient. In fact, doing so, would be an example of twisted logic: to restore another’s procreative function by destroying one’s own.

On the other hand, if a woman were to donate a womb removed because of its involvement with fibroids or ovarian reproductive pathologies, the hysterectomy, whether alone or in conjunction with other surgical procedures, is subject to the same risks as any major surgical procedure. Since the risks for a woman who decides to donate her uterus after a medically indicated hysterectomy would exist whether or not the woman opted for uterine donation, I would argue that those donor risks are proportionate to the benefit enjoyed by the uterine recipient.

*(11) The risks of the organ transplantation procedure (comprehensively understood) must be proportionate to its benefit for the organ recipient.*

Perhaps the most contested moral issue associated with human UT is whether the benefit for the recipient is proportionate to the health/life risks she would incur, first, in undergoing the transplant procedure itself and, second, in exposure to immunosuppressant drugs.<sup>38</sup> Risks from exposure to anti-rejection drugs are necessarily a consideration for the allograft recipients who are accepted for the Del Piore project. However, because the women’s exposure would not exceed 24 months, it is possible that they would also avoid the health dangers—infection, cancer, and diabetes—associated with long-term use of immunosuppressants. The uterine recipient fortunate enough to find a close tissue match graft, on the other hand, has a reduced need for, and therefore, would suffer less risk from, anti-rejection drugs.

Acknowledging the gravity of the risk/benefit question, the Del Priore team has repeatedly pledged that it will attempt human UT only after the procedure receives a thorough vetting by independent transplant experts. The president of Del Priore's hospital, Dr. Bruce Logan, highlights this promise when he cites patient safety as the number one concern and that "every step in the long [UT] research process [will] be handled in a measured, prudent manner."<sup>39</sup> Del Priore's team has an extensive record studying UT in animal models that recently culminated in the successful transplantation of a uterus in a rhesus monkey.<sup>40</sup> But Del Priore's contention that further research of a primate pregnancy in a grafted uterus is not strictly necessary has come under criticism from other UT experts.

I would argue that Del Priore's position only makes good ethical and research sense to the extent that his successful UT in a rhesus monkey may have sufficiently resolved some of the myriad of medical issues associated with the uterus transplant procedure itself. It might help, for example, to: select the most feasible surgical technique for vascular reanastomosis of the uterine graft;<sup>41</sup> establish the best method of reperfusion: getting an adequate blood supply to a transplanted organ whose vasculature is extremely complex; find ways to prevent necrosis of the uterus due to thrombosis,<sup>42</sup> and identify the rejection mechanisms of the uterus.<sup>43</sup>

But what about the need to find answers to all the challenges surrounding pregnancy in a uterine graft? Because it fails to study the problems endemic to a *gravid* uterine graft, Del Priore's refusal to study uterine graft pregnancy in primates before attempting it in humans does not conform to the canons of human subject research. It leaves critical questions—whether the transplanted uterus will be capable of sustaining the growing fetal demand for blood supply; whether common immunosuppressant agents, (azathioprine, cyclosporine, prednisone) are conducive to a safe uterine graft pregnancy; whether offspring gestated in a transplanted uterus develop into normal fertile adults and, ultimately, whether or how the transplant team can help the developing fetus and mother to survive adverse effects of immunosuppressant drugs—unresolved.<sup>44</sup>

In 2002, Brännström performed the world's only successful UT that led to a successful pregnancy and that was in mice.<sup>45</sup> Conducting rodent studies in UT led Brännström to conclude—I think rightly—that, before optimizing the procedure to the level required for human UT, more work needs to be done with *gravid primate* uterine grafts. Transferring a uterus to a woman before getting a primate pregnant, he avers, would subject a human uterine recipient (and her baby) to unnecessary risks.<sup>46</sup> Not to mitigate such risks, I would contend, is a breach of research ethics.<sup>47</sup>

*(12) The consent of both organ donor and recipient must be free and informed.*

In order for the uterine recipient to give free and informed consent to UT, she must understand the procedure's known risks and be aware that there will be unknown dangers. Then, she must carefully consider the moral status of her treatment options (namely, she must understand why gestational surrogacy is immoral and adoption is moral) as well as analyze the moral issues that surface when UT is comprehensively examined.

If the donor is related to the recipient, care should be taken that her donation is completely free and without emotional coercion of any kind. The live uterine donor who is a good HLA-tissue and blood group match to the recipient must also be aware of her responsibility to maintain the functional integrity of her body, so that her donation is neither misguided sentiment nor bodily mutilation/sterilization.

*(13) Post-mortem organs should not be removed until the organ donor has died; the physician determining death should not be a member of the transplant team.*

The same principle governing post-mortem organ transplants applies to cadaveric uterus transplants. In other words, you cannot remove the uterus until the organ donor has died. That means the physician involved must first declare the patient to be dead either by cardio-pulmonary criteria—complete cessation of the person's heart and lung functions—or through brain criteria (complete cessation of all brain function, including that of the brain stem). Although this principle is critical in determining when vital organs may licitly be removed, it also applies to the removal of a uterus from an unconscious, ventilated donor/patient. The transplant team and the physician responsible for the donor must demonstrate absolute respect for her life and for her decision to donate her uterus, and other organs, *post-mortem*.

Before UT appeared on the medical horizon, the uterus was not included in the list of requested organs. This presented a problem for the Del Priore team in its preparatory research for human UT. They needed to find a clinically safe method to store the uterus between procurement and transplantation, particularly in terms of “the time limit and the most suitable type of preservation solution.”<sup>48</sup> As a result, his team approached 150 families of persons in the New York City area who had just lost a loved one (females between 20 and 42) to ask them if they were interested in donating the uterus of their deceased family member. 9 families said yes and 8 wombs were successfully removed and preserved.<sup>49</sup>

Understandably, Del Priore had to break with the precondition that the donor be allowed to specify, prior to death, whether, and which organs, she

is willing to donate. It is my understanding that, after they perfect their UT procedure, the Del Priore team plans to work with the New York Organ Donor Network to include the uterus on their list of organs appropriate for donation and transplantation.

*(14) Organ recipients and donors must be appropriately screened.*

All parties involved with ongoing research to optimize human UT appreciate the need for careful patient selection for the woman receiving the uterine graft. My first requirement would be that each woman contemplating UT should consult with an ethicist who can be trusted to walk her through the momentous moral considerations, including those that arise in the screening process, and evaluate them in light of the nature of the human person, the nature of what is being done at each phase of UT, and even the ethical climate of the particular UT program.

The New York Downtown Hospital ethics committee overseeing the Del Priore project will not only approve the actual medical procedure but also determine which UT applicants satisfy the recipient profile for a uterine graft.<sup>50</sup> The following screening requirements emerge from the Del Priore and Brännström programs.<sup>51</sup> First, applicants will be screened to see if they understand the known risks of UT and that there will also be unknown risks. Second, UT candidates will be required to thoughtfully consider the options to UT, namely, that of adoption and gestational surrogacy. Third, before selection, the candidate should be psychologically evaluated to see that she would make a good mother, has “an intense desire to get pregnant,” and is already in a stable family setting.<sup>52</sup> Post-transplantation, the uterine recipient must be given “continuous emotional support.”<sup>53</sup> Fourth, uterine recipients should have no genetic children, be under age 35, and have normal kidneys and normal blood pressure. It is of paramount importance that the uterine recipient be disease-free to eliminate the possibility of long-term morbidity from a preexisting disease. The healthier the woman is pre-pregnancy and the better the status of the transplanted organ, the less risk there will be “to the health of the mother, the fetus-newborn, and the transplanted organ” peri- or post-pregnancy.<sup>54</sup>

Selection criteria for the uterine donor would include a laparoscopy and hysterosalpingogram that show no abnormal uterine anatomy, an endometrial biopsy without atypia and no history of cervical dysplasia.<sup>55</sup> Age is not a factor for the uterine donor as long as she is either cycling or under hormone therapy.

## Conclusion

After careful scrutiny of the medical dimensions of both models of UT, the Del Priore model proves to be morally deficient based on several of its procedural aspects: post-implantation impregnation through IVF and ET; unavoidable risks to life and health of mother and baby from immunosuppressant drugs; the temporary nature of the transplant (suggestive of inappropriate use of scarce medical resources); a post-partum hysterectomy that is directly sterilizing, and disproportionate risks to mother and baby due to insufficient preliminary research in uterine graft pregnancy in primates.

With its proposal to find a living donor who is a relative/close HLA-tissue match to the recipient, the Brännström approach to UT could be morally licit under the following provisos. It must (1) allow the uterine recipient the option to conceive naturally (avoiding the damaging moral fallout of IVF); (2) dispense with the directly sterilizing intervention of a post-partum hysterectomy (making the uterus transplant permanent rather than temporary and, thus, a better use of scarce medical resources); (3) reduce the need for an anti-rejection drug regimen and its consequent possible disproportionate risks for life and health of mother and baby, and (4) delimit other known health risks with adequate preparatory study of gravid uterine grafts in primates and large animals. It should be noted, however, that the moral licity of UT following the Brännström model also depends on ancillary moral requirements: whether the particular case, (a) fulfills the requirements of proper self-love by not causing direct sterilization of the donor, (b) elicits proper consent from the recipient through her careful consideration of: (i) adoption as the unambiguously moral alternative for UFI, (ii) the unknown risks she incurs given the experimental stage of UT and (iii) the pro-life, pro-natural reproductive capacity of the Brännström model.

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## References

<sup>1</sup> It is estimated there are 15,000 women a year in Britain who suffer UFI. Given that the U.S. population is approximately five times that of Britain, there would be approximately 75,000 women in the U.S. in any given year who cannot become pregnant either because they are born without a womb or their wombs have been destroyed by fibroids/cancer treatment or are rendered non-functional because of disease.

<sup>2</sup> The congenital absence of a uterus and vagina is known as the Rokitansky-Kuster-Hauser syndrome. Before uterine transplantation can be attempted in a woman with Rokitansky syndrome a vagina should be constructed, ideally, in early adulthood. The special attention to arterial and venous angiography to plan anastomosis sites for uterine grafting would be especially critical in uterine recipients with Rokitansky syndrome due to typical vascular anomalies.

<sup>3</sup> Requisites for women hoping for natural conception within UT are well-functioning fallopian tubes and ovaries with oocytes.

<sup>4</sup> The salient features of the Del Priore model have been explained in the following media reports: Antony Blackburn-Starza, “New York Surgeons Announce Plans for Womb Transplant,” *BioNews* 392 (January 22–28, 2007); Heidi Nicholl, “New York Doctors Given Go-Ahead to Attempt Womb Transplants,” *BioNews* 384 (November 7–13, 2006); Julie Wheldon, “New York Doctor Given Go-Ahead for World’s First Womb Transplant,” <http://www.dailymail.co.uk/pages/live/articles/news/news.html>; Marilynn Marchione, “Uterus Transplant May Enable Pregnancy,” *Washington Post*, January 15, 2007, <http://www.washingtonpost.com/wp-dyn/content/article/2007/01/15>; Associated Press, “Hospital Plans to Offer Uterus Transplant,” January 15, 2007, <http://www.msnbc.msn.com/id/16637583>.

<sup>5</sup> Mats Brännström, Caiza Almen Wranning, and Randa Rachou El-Akouri, “Transplantation of the Uterus,” *Molecular and Cellular Endocrinology* 202 (2003): 177–184.

<sup>6</sup> W. Fageeh et al., “Transplantation of the Human Uterus,” *Int. J. Gynaecol. Obstet.* 76.3 (2002): 245–251. These clinical researchers practiced first on baboons and goats before attempting human UT. Rob Stein, “First U.S. Uterus Transplant Planned,” *Washington Post*, January 15, 2007, <http://www.washingtonpost.com/wp-dyn/content/article/2007/01/14>.

<sup>7</sup> Fageeh et al. reported that they successfully treated an episode of acute rejection on the ninth day after the uterus transplant with antithymocytic globulin. The uterine graft also responded well to combined estrogen-progesterone therapy with two episodes of withdrawal bleeding after cessation of the hormone therapy indicating good blood perfusion and viability of the uterosalpingeal graft. Fageeh et al., “Transplantation of the human uterus,” 248.

<sup>8</sup> As the abstract of Fageeh’s case report article explains: The blood clot (acute vascular occlusion) “appeared to be caused by an inadequate uterine structure support, which led to probable tension, torsion, or kinking of the connected vascular uterine grafts.” *Ibid*, 245.

<sup>9</sup> Marchione, “Uterus Transplant May Enable,” 1.

<sup>10</sup> Stein, “First U.S. Uterus,” 3.

<sup>11</sup> Mats Brännström et al. “Transplantation of the Uterus,” *Molecular and Cellular Endocrinology* 202 (2003): 178–81.

<sup>12</sup> The last two characteristics of what I have called the Brännström model of UT are less those of the researcher and more of my own extrapolation based on its unique goal of using live rather than cadaveric donors. Brännström, like Del Priore, stipulates that the uterine recipient must have a “satisfactory ovarian reserve” so she “can undergo IVF treatment with good chances of achieving fertilization.” However, since he hopes to use a live donor/relative who could be a close tissue match, there would definitely be less risks for the recipient from immunosuppressants. With less risk from exposure to these drugs, there would also be the possibility for the uterine recipient and her husband to take whatever time needed to achieve a preg-

nancy naturally, thereby escaping the moral and physical dangers of the expedient baby-making of IVF and ET. And, finally, with less risk from anti-rejection drugs, there would be less need to remove the uterine graft and to suppress the recipient's procreative capacity. Furthermore, if the graft could be retained without medical complications up to and including the first gestation, the uterine recipient may be able to achieve pregnancy more than once.

I am painfully aware, however, that the second and third characteristic phases of what I have called the Brännström approach, while theoretically plausible, will only be able to be practically implemented after the entire UT procedure is optimized. It is also possible that natural conception and permanency of the graft will never be viable options for women contemplating UT. Nonetheless, I would insist that, before UT would conform to the dignity of life, procreation and bodily integrity, a woman who has identified a uterine graft that is genetically friendly must also be able to opt for natural conception and permanency of the graft.

<sup>13</sup> I have also applied these principles in a comparative study of the medical-moral effectiveness of IVF and NaProTechnology in treating infertility. Cf. Edward J. Furtun, ed., *Live the Truth: The Moral Legacy of John Paul II in Catholic Health Care* (Philadelphia: National Catholic Bioethics Center, 2006), 203–231.

<sup>14</sup> Congregation for the Doctrine of the Faith, (*Donum Vitae*) *The Gift of Life: Instruction on Respect for Human Life in Its Origin and on the Dignity of Procreation* (Boston: National Catholic Bioethics Center, n.d.), intro., n. 5.

<sup>15</sup> Marchione, "Uterus Transplant May Enable," 2.

<sup>16</sup> Brännström. Transplantation of the Uterus. 182.

<sup>17</sup> Albert Altchek, "Uterus Transplantation," *The Mount Sinai Journal of Medicine* 70 (2003): 160.

<sup>18</sup> Marchione, "Uterus Transplant May Enable," 3.

<sup>19</sup> Brännström. Transplantation of the Uterus. 182.

<sup>20</sup> BBC, "Womb Transplant Breakthrough Hope," *BBC News Online: Health*, March 7, 2002, 2, <http://www.news.bbc.co.uk/2/low/health/1857426.stm>.

<sup>21</sup> Wheldon, "New York Doctor Given Go-Ahead," 5; Phil Mckenna, "Uterus Transplant Could Be Tomorrow," *New Scientist*, November 11, 2006, 1, <http://www.newscientist.com/article.ns?id=mg19225774.900>.

<sup>22</sup> Wheldon, "New York Doctor Given Go-Ahead," 5.

<sup>23</sup> Brännström, "Transplantation of the Uterus," 182.

<sup>24</sup> As Thomas H. Murray, director of the Hastings Center put it: "If they perfect this procedure [UT], trust me, somebody else will think it's a good idea [men bearing children].... If gay marriage gets some people upset, this is going to tip a lot of people over the edge." Stein, "First U.S. Uterus," 3.

<sup>25</sup> Peter J. Cullen, "Organ Donation: A Catholic Perspective," *Catholic Medical Quarterly* (November 1998: 4, [http://www.catholicdoctors.org.uk/CMQ/Nov\\_1998/organ\\_donation.htm](http://www.catholicdoctors.org.uk/CMQ/Nov_1998/organ_donation.htm).

<sup>26</sup> Ibid., quoting address of John Paul II to the First International Congress of the Society for Organ Sharing, June 20, 1991.

<sup>27</sup> In an editorial, Del Priore and co-author, Louis G. Keith, opine that, although uterine transplantation does not affect the life of the recipient, it certainly affects the “the ability of the recipient to reproduce. To some individuals, childbearing is the greatest event of a lifetime. To such persons, transplantation of organs of reproduction would not be considered frivolous or unnecessary, even though these organs do not sustain life.” *International Journal of Gynecology & Obstetrics* 76 (2002): 243–244.

<sup>28</sup> Pontifical Academy for Life, *Prospects for Xenotransplantation: Scientific and Ethical Considerations*, 10, [http://www.lifeissues.net/writers/doc/doc\\_20xenotransplant1.html](http://www.lifeissues.net/writers/doc/doc_20xenotransplant1.html).

<sup>29</sup> The reperfusion process, insuring that the recipient’s blood flows through the veins and arteries of the grafted uterus, provides a physiological confirmation of the fact that the grafted uterus becomes a part of the embodied person of the uterine recipient.

<sup>30</sup> Benedict Ashley, O.P., *Justice in the Church* (Washington, D.C.: The Catholic University of America Press, 1996), esp. ch. III, “Men and Hierarchy,” 67–130; and ch. IV, “Women and Worship,” 131–163.

<sup>31</sup> Benedict Ashley and Kevin D. O’Rourke, *Health Care Ethics: A Theological Analysis*, 4<sup>th</sup> ed. (Washington, D.C.: Georgetown University Press, 1996): 219–223.

<sup>32</sup> If surgery is used to remove or damage a part of the body when the continued functioning of that body part does not present a threat to the whole body, such surgery constitutes mutilation. Applied to the surgical removal of a uterus (hysterectomy): If the uterus is removed (even for the good goal of donating it to a woman without a womb) without the organ presenting any threat from to the woman’s bodily health or life, the hysterectomy is directly sterilizing or mutilation.

<sup>33</sup> Cadaveric donation of cornea, on the other hand, is morally acceptable and has proven to be a medical success. Cullen, “Organ Donation,” 3.

<sup>34</sup> Altchek, “Uterus Transplantation,” 160.

<sup>35</sup> George Agich underscores the point that, because human UT is investigative transplantation, it must be undertaken responsibly. Besides adequate preparatory research, the success of experimental transplantation largely depends on “the skill or experience—the ‘field strength’ of the team performing the procedure.” “Extension of Organ Transplantation: Some Ethical Considerations,” *The Mount Sinai Journal of Medicine*. 70 (2003): 146.

<sup>36</sup> Associated Press, “Hospital Plans to Offer,” 3.

<sup>37</sup> Bränström, “Transplantation of the Uterus,” 183.

<sup>38</sup> Altchek lists the following known risks involved with UT: those “associated with anesthesia, surgery, graft rejection and antirejection medication, susceptibility to infection, and increased long-term possibilities of diabetes, hypertension, and neoplasm, as well as risks of *in vitro* fertilization, should that be necessary.” “Uterus

Transplantation,” 157.

<sup>39</sup> Stein, “First U.S. Uterus,” 1.

<sup>40</sup> Ibid., 2. As of this writing, Del Priore’s lab told me that their published report of UT in a rhesus monkey is in its final edition and will be published soon.

<sup>41</sup> Consider Altchek’s description of the unique internal circulation system of the uterus and the challenge it presents for uterine reanastomosis: “while each kidney most often has a single, separate artery and vein, the uterus has a symmetrical circulation from a lateral uterine artery on each side, resulting from the embryonic fusion of the paired bilateral Müllerian duct to form a single uterus. In addition, the interior of the uterus has multiple anastomosing arcuate horizontal arteries connecting each uterine artery running in both anterior and posterior walls.... Furthermore, the arterioles of the uterus have extensive anastomoses with those of the adjacent vagina, which receives branches from the lateral hypogastric or uterine arteries. Thus nature has endowed the pear-sized uterus with an extraordinarily abundant arterial circulation which prepares the uterus for random placentation either in the anterior or posterior wall and permits nourishment to the fetus.”

And then there is the *really* difficult problem of a successful UT graft—reanastomosing the venous circulation of the uterus. “Veins run with arteries but are more numerous, and they are narrower, thin walled, and delicate. Anatomists have never paid much attention to them except to indicate an extensive, continuous, dense plexus of veins involving the uterus, parametrium, vagina, bladder, tubes and ovaries.” “Uterine Transplantation,” 158.

<sup>42</sup> Fageeh et al. advise future transplant teams attempting human UT to learn how to properly secure the grafted uterus in place to prevent the thrombosis that proved to be the nemesis of their first attempt: “Strong fixation of the transplanted uterus to the anterior abdominal wall and the sacral promontory is required, as the uterus lacks the support of the uterosacral ligaments and could develop slow progressive or acute prolapse with consecutive thrombosis, infarction, and loss of the uterus.” “Transplantation of the Human Uterus,” 251.

<sup>43</sup> Associated Press, “Hospital Plans to Offer,” 1; Marchione, “Uterus Transplants May Allow,” 1.

<sup>44</sup> Altchek, “Uterus Transplantation,” 157, 160; Brännstrom, “Transplantation of the Uterus,” 181, 182.

<sup>45</sup> R. Rachø El-Akouri, G. Kurlberg, and M. Brännstrom, “Successful Uterine Transplantation in the Mouse: Pregnancy and Postnatal Development of Offspring,” *Hum Reprod.* 18 (2003): 2018–2023.

<sup>46</sup> Ciaza Almén Wranning et al., “Auto-Transplantation of the Uterus in the Domestic Pig (*Sus scrofa*): Surgical Technique and Early Reperfusion Events,” *J. Obstet. Gynaecol. Res.* 32 (2006): 359; McKenna, “Uterus Transplant,” 1.

<sup>47</sup> A risk for uterine transplantation or any other medical procedure has two defining characteristics: the level of probability and the extent of damage. Further research with UT will help to identify known risks by means of a risk percentage or statistical frequency. And, of course, a very probable risk could be easily tolerated if it brought

only a small amount of damage. However, a risk that causes a high level of damage, even though highly improbable, brings more concern and requires more caution. Expanded research efforts in UT, especially in respect to risks to the woman receiving the graft and any baby conceived subsequently, would help to clarify the probability issue and, ultimately, whether the level of probability and the extent of damage are ethically acceptable. Pontifical Academy for Life, “Xenotransplantation,” 11.

<sup>48</sup> Brännström, “Transplantation of the Uterus,” 181.

<sup>49</sup> Marchione, “Uterus transplants,” 2.

<sup>50</sup> Ibid., 3.

<sup>51</sup> Brännström, “Transplantation of the Uterus,” 182; Stein, “First U.S. Uterus,” 1.

<sup>52</sup> Brännström, “Transplantation of the Uterus,” 182.

<sup>53</sup> Altchek, “Uterus Transplantation,” 157.

<sup>54</sup> Ibid., 161.

<sup>55</sup> Brännström, “Transplantation of the Uterus,” 182.