

Ectogenesis

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Abstract

The World Health Organization defines infertility as the inability to become pregnant despite regular sexual intercourse, more than a year without using any contraceptive methods. This issue affects a growing number of couples, which is why the WHO recognized infertility as a social disease. This problem affects an increasing number of couples and therefore the WHO considered infertility as a social disease. One of the reasons of infertility are irregularities in the woman's uterus, which completely prevent women from self-birth of children. The alternative for women with infertility problems may be in addition to the surrogacy, ectogenesis. Ectogenesis is the process of development of the human fetus outside the woman's body, from conception to birth. The term was introduced into scientific discourse by British biologist and geneticist J.B.S. Haldane (1892-1964). In Poland surrogacy according to the law is prohibited and uterine transplant is a pioneering method, not performed by doctors in our country. The only successful uterine transplant was carried out in Sweden in 2014. As a result, came into the world a healthy baby who was born at 31 weeks gestation. European countries where surrogacy is legally include Ukraine, Georgia and Greece. Research on artificial womb conducted since the 80s of the twentieth century, mainly by US researchers. They were detained for reasons of bioethics, because the embryos survived in it only 6 weeks. The discovery of the possibility of development of the fetus outside the womb is an important

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discovery at the level of biomedical technology. This method of helping women with an abnormal uterus has many supporters, but also critics, therefore, still needs a lot of time to conduct studies that document the effectiveness of ectogenesis.

Introduction

The World Health Organization defines infertility as the inability to become pregnant despite regular sexual intercourse, more than a year without using any contraceptive methods. Infertility marriage becomes a huge issue twenty-first century, represents a major challenge for reproductive medicine. WHO recognized infertility as a social disease. Important in the etiology of female reproductive disorders is a women's infertility factor.

The causes of uterine dysfunction is very much [1]. Endometrial cancer is the most common gynecological cancer in western European countries. An effective method of treatment in this case may be brachytherapy [2]. Unfortunately, despite the fact that this method allows to eradicate cancer, causes many side effects. These include irreversible distortion of the uterus and causing the obstruction of the cervix of the uterus. The intrauterine adhesions (IUA) are fibrous tissue connections occurring in the uterus and connecting opposite or adjacent areas. Commonly occur as a result of various types of injuries acting on the endometrium and myometrium, eg. after infectious or mechanical agents. IUA are the most common complication of medical procedures performed in the womb. Very severe form of IUA is Asherman's Syndrome, characterized by the presence of adhesions with the greatest intensity, corresponding to cases of total obstruction of the uterine cavity and the total absence of menstrual periods. IUA to a different extent prevent embryo implantation in the uterus and proper whistle blowing pregnancy. Severe inflammation of the endometrium that cause irreversible damage also make impossible to get pregnant. Other diseases of the uterus that can cause female infertility include: uterine leiomyomas, birth defects, agenesis of the uterus and the surgical removal of the organ, eg. as a result of atony postpartum.

Despite a significant advancement in the development of medical technologies, often we are not able to overcome some of the difficulties associated with reproduction. An obstacle factors are: technologies, ethic and legal [3]. To controversial ideas we include surrogacy or construction of artificial womb.

Ectogenesis is a technology concept for development of human embryos outside the woman's body from conception to birth. This notion was created by geneticist J.B.S. Haldane in 1923. [4] The vision of the scientist did not live up yet fully implemented. The solution of this problem expect women whose uterus is not able to report pregnancy, do not have this organ and those who become pregnant is contraindicated for medical reasons. In the light of current Polish law, the only alternative for women with an abnormal uterus is adoption. In other European countries, for example Georgia, Ukraine and Greece are also legal surrogacy. Scientists at the world only a few times managed to transplant a human uterus, this method is not widespread. The artificial uterus is the organ, which so has not been created and now is in the area of clinical trials.

The aim of the study was to present the possibility of obtaining offspring for women who can not have children because of the abnormal uterus and familiarization with the methods of ectogenesis which are in clinical trials and may be used for several years in medicine.

The legal aspects of subrogation

Every scientist and a future parents trying for a child must act in accordance with the law. Unfortunately, into Polish law there is no clear information about subrogation, and especially opportunities extracorporeal child's growth. Family and Guardianship Code

was introduced by law in 1964, at a time when in Poland nobody had thought about subrogation and uterus transplant. According to Family and Guardianship Code the child's mother is the woman who gave birth to them [5]. The woman who didn't give birth to a child may request the denial of motherhood without any consequences, even if she is a biological mother. There is also unknown how would be treated a doctor's taking care of couples seeking to have a baby in such an unconventional way. Any lawsuits could be based on the Civil Code, which cancel the legal action against the rules of social coexistence [6]. This legal actions could be considered a contract between parents/mother and a woman who gave birth to a child. Another obstacle for surrogacy contained in the Polish law could also be Article 189 of the Criminal Code. §1 of this article describes human trafficking, but without more details [7]. Without a doubt is the fact remains that the surrogate would like to receive a financial benefit from the biological parents for allowing the child's development in her body. It is all unknown because in our country so far no one has met with such a problem. It is also unclear what thinks the society about subrogation, artificial womb or uterus transplant, because knowledge of these subjects is really low. An uterine transplant seems to be the easiest to be accepted by society and the law as the method which is the least controversial and already in the phase of the study. The objection in society might raise funding for this treatment from the National Health Fund. There are few first World countries where the issue of subrogation is unregulated. In most countries of the European Union subrogation is prohibited, while in some european countries like Georgia, Ukraine, Russia, Greece, the Czech Republic and the United Kingdom is a permitted method. The United Kingdom is also an example of a country which is allowed altruistic subrogation, which is free, and after the birth the biological mother has to formally adopt the baby. Very interesting subrogation accept France, where this method is formally prohibited, but children having French parents born this way outside of France obtain French nationality and a birth certificate[8]. The truth is that Poland has to wait for details of the legislation on surrogacy. No such legislation creates a lot of problems couples

who have trouble in getting pregnant. There are already signs of couples who go to another country, for example The Czech Republic or Ukraine, to use the services of clinics doing subrogation. We should keep in mind that not everyone is ready to opt for adoption, and it is hard to think about it those who have not experienced a problem with get pregnant with his own child.

The alternatives for women with an abnormal uterus

Women with AEFI (absolute uterine factor infertility) account for about 4% of patients with infertility [1]. The alternative for them is in view of Polish law adoption. However, for many it is not satisfaction of the need entrenched desire to have their own offspring. These capabilities give them the transplant the uterus.

Techniques for uterus transplantation (UTX) have been developed in rodent / domestic animals towards future clinical introduction of UTX to treat uterine factor infertility [9]. The history of human uterus transplants dating back to 2000, when for the first time scientists and doctors in Saudi Arabia are able to perform UTX with success [1]. The patient was a 26 year old woman after peripartum hysterectomy. The donor was not related with organ recipient, 46 year old woman. The transplantation was accepted, but after 3 months of treatment there was a complication. The transplanted uterus was removed because of thrombosis and necrosis of blood vessels. The authors as the cause of this failure give prolapse of the uterus[1].

Another transplant described in the medical literature UTX was performed by doctors in Turkey. The patient was a 21 year-old Turkish woman with Müllerian agenesis, born without a uterus. The donor was a woman with a double womb, the same age as recipient. The patient got menstruation 20 days after transplantation. It failed to fertilize 18 months after transplantation, but she miscarried twice.

At the turn of 2012 and 2013, Professor Brännström from Sweden formed a research team that conducts research on uterine transplants [10]. The

team amassed 10 women who wanted to undergo transplantation. One of them for medical reasons could not undergo surgery of uterus transplantation. All patients were born without the organ or must be removed due to cervical cancer. Organs they have received from close relatives – eg. the mothers who did not want to have to enlarge the family. In two cases, the uterus has been removed due to bilateral uterine artery thrombotic occlusions and persistent intra-uterine infection [1]. One of the greatest achievements in the uterus transplant took place in 2015. In February 2015 in hospital in Gothenburg was born a child thanks to a transplanted uterus. The boy was born prematurely, at 32 weeks pregnant. The mother was 36 years.

Uterine transplants are very controversial, mainly for ethical reasons, as well as legal. Polish law only regulates transplant of organs of life-saving so the UTx would require new regulations. This raises the question whether transplantation of the uterus is as necessary as the other organs transplantation- kidney, lung, bone marrow, organs needed for life. In the view of Polish law uterus transplant is a treatment that aims to improve the quality of life for a woman to bear a child. Ethical problem can be a donor organ. It may be deceased or living, related to the recipient or not.

The creation of an artificial uterus is still unmatched dream of scientists from around the world. It combines the different field of medicine - gynecology, embryology, neonatology. For legal and bioethical work on embryos they are very difficult. One of them is the fact that most countries allows the study of embryos up to 14 days of pregnancy [11]. Artificial uterus by scientists would meet two important functions. First, it would act as an artificial organ, which could advance embryos from fertilization to birth [1]. The invention also would perform the function of an incubator for premature newborns, so that would increase the survival of premature babies born before 24 weeks of gestation [10].

Work on the creation of an artificial womb ongoing since the 80s of the last century. The first attempts at implantation of embryos outside the human body was carried out in 1982 in Bologna, Italy. Finally, the study has been suspended for reasons of bioethics and the opposition then government [10].

Liu scientist from New York, conducted research on artificial breeding of the mucous membranes of the uterus. Eventually successfully he managed to combine epithelial cells from the stromal cells of the uterus. For legal reasons the United States, cell culture obtained by Liu had to be ended after 6 days. Addressing the subject of an artificial womb can not forget about the problem of the bearing. It has been shown that the human placenta can continue to supply nutrients and to receive waste material when connected to the artificial womb [10]. There were also attempts to transplant bearings, but they ended in failure. There are studies that prove that it is possible to "connect" bearing the mother's bloodstream [1].

Conclusion

Problem of ectogenesis is now being only an idea that would solve the problem of reproduction of women without uterus and with defects of this organ.

Growing from year to year, the problem of infertility will intensify the need for research on the possibilities of becoming pregnant women with an abnormal uterus. Moreover, it is difficult to predict whether the public will accept new methods of getting pregnant, for reasons of illustrative and bioethics. Currently in Poland, the only alternative for women who can not have the child because of the abnormal or lack of uterus is adoption.

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