Mummy was a fetus: motherhood and fetal ovarian transplantation

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Abstract

Infertility affects 15 per cent of the world's couples. Research at Edinburgh University has been directed at transplanting fetal ovarian tissue into infertile women, thus enabling them to bear children. Fetal ovary transplantation (FOT) has generated substantial controversy; in fact, one ethicist deemed the procedure 'so grotesque as to be unbelievable' (1).

Some have suggested that fetal eggs may harbour unknown chromosomal abnormalities: however, there is no evidence that these eggs possess a higher incidence of genetic anomaly than ova found in a healthy adult female. There is also concern that fetal egg children will be psychologically harmed by the knowledge of their special conceptual status. It will be demonstrated that special conceptual status in and of itself does not determine developmental success. Rather, psychological well-being is dependent upon how the family and child cope with the unique challenges inherent in FOT. Lastly, though considering FOT a legitimate method of family building, given the global population crisis the wisdom of procreational rights will be challenged. Inherent to this challenge is a re-evaluation of the treatment of infertility as a significant disease necessitating remedy.

'Who ran to help me when I fell,
And would some pretty story tell,
Or kiss the place to make it well?
My mother'

Ann Taylor, 'My Mother' (2)

Introduction

For most of us the word 'mother' is special. She is the person who gave birth to you, raised you, fed you, loved you, fought with you, and in the final analysis, did her best to be a good mother. For millions of years children, regardless of who raised

them, could be certain they had a mother who was once a living person. However, the concept of motherhood has been challenged by research from Edinburgh University aimed at transplanting the ovaries of an aborted fetus into an infertile woman. Fetal ovary transplantation (FOT) will produce for the first time, a child who will inherit the genes of a woman who herself never lived. For many these circumstances are most unsettling (3); a person whose genetic mother was never born contradicts the way people have been born for millions of years.

Three important issues are raised by the advent of FOT. First, there is concern that by using fetal eggs which have not been subject to environmental pressure we may be introducing additional genetic anomalies into the population. It will be maintained in this paper that fetal eggs are not inferior and do not have a higher incidence of chromosomal abnormality than eggs found in a healthy adult female. Furthermore, it will be asserted that it may be preferable to harvest fetal eggs as they have had less exposure to environmental toxins, which are known to cause chromosomal aberrations.

Second, there are concerns about how a child might react to the knowledge that his mother was an aborted fetus. To this objection it will be demonstrated that anxiety over potential emotional damage is unwarranted in light of the significant analogous history of children adopted in infancy and children produced via medically assisted conception (MAI). And lastly, it will be maintained that while FOT is a legitimate method of family building, the development of procedures to introduce additional children into an already over-populated world may not be in society's best interest.

Genetic objections

Concern exists over using fetal eggs which 'have not been subjected to the pressures which govern survival and normal development to adulthood' (4); in that it is possible fetal eggs may harbour genetic anomalies not eliminated through natural selection. However, both our current knowledge of oogenesis (5), and studies on human and non-human subjects

Key words

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contradict much of this concern. In fact, this lack of environmental exposure may be preferable, given the established association between advanced maternal age and increased risk of congenital malformation (6).

By the fifth month of gestation the average female fetus will have approximately 7,000,000 eggs, 400,000 of which will remain at puberty with less than 500 of these being ovulated (7). Some may argue that we should avoid using fetal eggs since we are selecting eggs which have not been 'subject to pressures' which allow specific eggs to survive to ovulation. The actual mechanisms behind why some eggs survive to menarche are not known (8); however, there is no evidence to suggest that a particular egg survives because it is superior to other eggs. This also applies to ovulation where up to 15 follicles (9) mature simultaneously yet only one will ultimately ovulate (10). This process is controlled by subtle temporal hormonal interactions and once again there is no evidence to suggest that the eggs are subject to selective pressure (11).

Experiments

Besides the lack of evidence that fetal eggs are genetically inferior, the contention that fetal eggs are not subject to environmental pressure is not entirely true. For fetal eggs to mature they must be stimulated by the recipient's maternal hormones. What distinguishes fetal eggs is the temporality of exposure. Fetal tissue grafted into a post-pubescent woman has minimal exposure to a pre-pubescent hormonal environment and significantly less exposure to the post-pubescent hormonal environment. There is no evidence that genetic defect results from a temporal reduction of maternal hormonal exposure. In fact, experiments on both human and non-human subjects indicate ovarian tissue transfer is both a viable and safe procedure. In 1945 embryonic mouse ovarian tissue was grafted into mature mice which successfully produced young (12). Human births have already been reported using immature eggs harvested from one patient and fertilized via *in vitro* fertilization (IVF) in another patient who 'delivered healthy triplet girls' (13). Four additional children have been born using this procedure and to this date, they are all 'very healthy' with 'no linked genetic anomaly' (14).

Contrary to concerns over the lack of environmental pressure on transplanted fetal eggs, it may be preferable that fetal eggs have minimal environmental exposure. It is postulated that the association between advanced maternal age and an increased incidence of birth defects (15) is that; in addition to 'genetic factors' (16), the eggs, having existed longer, suffer more environmental insults (17). While only 10 per cent of congenital defects can be directly attributed to 'environmental factors', the aetiology of approximately 65 per cent of all

congenital defects is not clear and may represent a combination of both genetic and environmental insults (18). Though teratogenesis concerns post-conceptive insults, it is conceivable that environment similarly affects the unfertilized, pre-conceptive egg (19). In fact, there are a number of congenital defects, including Down's Syndrome (20), which result from pre-conceptive non-disjunction (21). What role environment plays in these pre-conceptive anomalies remains to be determined; however, 'it has been known for a long time that the likelihood of non-disjunction occurring increases with advancing maternal age' (22). Given this association between advanced maternal age and non-disjunction, one can argue that fetal eggs may harbour fewer genetic anomalies, because they have had less potentially damaging environmental exposure.

Another argument advanced against FOT is that we are skipping a generation of evolution and thus 'breaking a natural law of biology' (4). This is a weak argument as it fails to take into consideration the molecular basis of evolution. Evolution occurs when re-combined or mutated genetic material is passed from one generation to the next at conception (24). The genetic material in a fetal egg has already undergone re-combination and is arrested in an early stage of cell division till ovulation (24). At ovulation, which for some eggs may not occur for forty years, the ovum completes nuclear division and it is not till conception that a unique genome (25) is created. It is important to remember that evolution can only occur if genetic material is passed on to progeny. If a fetus is aborted, it can never contribute to our evolutionary heritage as its unique genes are lost forever unless, of course, fetal ova are harvested and grafted into a live reproducing woman. Therefore, concerns about 'skipping a generation' are totally unfounded as abortion (ie, the death of the organism prior to procreation), represents an evolutionary dead end.

Chromosomal defects

Another objection to the use of FOT is that spontaneously aborted fetuses have a high incidence of chromosomal defect. This is a valid concern because miscarriage is frequently secondary to genetic anomaly (26). However, one could meet this objection, at least in part, by pointing out that it is possible to examine chromosomes for both gross and subtle genetic defects, thus enabling physicians to screen potential donor eggs for chromosomal defect(s).

If our ability to detect genetic abnormalities in spontaneously aborted fetal tissue is not satisfactory, we can limit the harvesting of ovarian tissue to elective abortions where there is a lower risk of chromosomal abnormality. Nevertheless, no matter how conception is achieved, be it 'natural' or medically assisted, there will always be a risk of unknowingly

passing on a genetic defect. It may be asking too much of medicine to detect every chromosomal abnormality; however, present and future genetic analytic techniques should enable physicians significantly to reduce the incidence of birth defects.

Lastly, some fear that increased demand for fetal tissue secondary to infertility treatment will 'encourage abortion' (4). It is, however, questionable how many women would undergo this invasive (27) and psychologically complicated (28) procedure purely for the benefit of another woman. In fact, it has been argued that abortion for the purpose of harvesting fetal tissue is morally reprehensible as it shows a gross disregard for life. While there is extensive debate over whether or not a fetus represents 'human' life, there is little doubt a fetus represents a form of life which has the potential to become human. To prevent such abuse, legislation could be enacted prohibiting reimbursement for donated fetal tissue. There were approximately 58,000 abortions performed in the United States during 1988 (29). Millions of eggs could be obtained even if consent for fetal tissue donation were granted in only a small percentage of abortions.

Emotional repercussions for fetal mothers

For most individuals, the woman who raised them is the same person who sweated in labour to give birth to them. That a child can be conceived from the egg of a female who never lived outside her own mother's womb is an idea so alien to ancient traditions that it demands scrutiny – an idea one Boston University ethicist claimed to be 'so grotesque as to be unbelievable' (1). While the moral outrage of some is expected, given the uniqueness of FOT, history offers ample precedent for similar genealogical circumstances.

Children raised by adults other than their 'biological' parents have undoubtedly existed during most if not all of human history. Take, for instance, the familiar scenario of a child adopted in infancy who has no personal memory of her biological parents and, as has been standard practice in the past (30), will know little if anything about them. An objection raised against FOT is the potential reaction of progeny to the news that their genetic mother was an aborted fetus. This argument is flawed as it assumes children carry the cultural and intellectual baggage of adults. We are at intellectual and emotional ease with the ideas and technology to which we are born. Tension is created by the introduction of new ideas and technology which upset established norms (31). For example, that this paper was written on a lap-top computer is mind-boggling to my mother while for my son who has been raised computer-savvy, this fact hardly deserves notice. Most will agree that children are not born with preconceived notions of morality; rather, a child's moral character results from

interactions with significant others (32). Therefore, for the fetal egg child (FEC) to accept his special circumstances with minimal emotional trauma two conditions should be met. First, the FEC must be accepted by her family and significant others. Second, the facts behind the child's non-traditional conceptual status should be disclosed in a 'well-timed and developmentally appropriate' (33) manner. With these conditions met, the child's chances of accepting his special circumstances without significant difficulty are enhanced. This is not to imply there will be no negative reaction once a child learns of her special conceptual status. Certainly there may be many emotions associated with the knowledge of being conceived outside sexual intercourse (34). Studies of children produced through MAC have demonstrated both positive and negative associations. An Australian group reported no 'increase in psychosocial problems above that which might be expected in the population at large' in a series of IVF children between the ages of one and three (35). Another study concluded that 'the majority [of children produced via IVF] were performing above the norm for their chronological age but were subject to 'a significantly higher incidence of ... behavioral and emotional problems' (36). Compare this to the testimonial offered by Lillian Atallah, a 'test tube baby', when she said: 'Knowing about my AID (Artificial Insemination by Donor) origin did nothing to alter my feelings for my family. Instead, I felt grateful for the trouble they had taken to give me life' (37).

In addition to studies on children produced through MAC, there is a substantial history of adopted (or orphaned) children who, like a potential FEC, never knew or have no memory of their genetic mother. Controversy exists, however, concerning the incidence of psychiatric disturbance within adoptive families (38). There is an extensive literature supporting the contention that adopted children display no significant psychological harm as a result of being adopted (39). A study published by the Child Welfare League of America in 1970 concluded that adopted children exhibit 'no evidence of more pathology than the control children ... living with their natural parents (40). In fact Marvin Eisenstadt has even suggested there exists an occasional positive correlation between being orphaned and achievement (41). Being myself adopted, I can say with confidence that the knowledge that those who raised me were not my biological parents was inconsequential. My *real* parents are the mother and father who raised me, not my biological parents. Nevertheless, I agree with Miriam Reitz when she wrote 'adoption is a second-best plan' when compared to children being raised by their natural parents (42). Marriage and child-rearing can be difficult and it is not inconceivable that adoption complicates these experiences. Countering literature which may minimize the problems inherent in adoption is ample evidence suggesting that adoption can be difficult both for the

adoptive and the adoptive parents (43). Among the important issues adoptive parents must face are infertility (44) and the lack of biological connection to their child (45). Adopted children are similarly challenged, having to confront issues of abandonment (46), separation, and feelings of being different (47).

Given the inherent complexity of interpersonal adoptive/MAC relationships, we may expect continued controversy. What we can learn from the many conflicting studies is that adoption/MAC success is dependent on how parents and children adapt to their particular circumstances. Adoptive/MAC parents, though faced with special challenges, are inherently no better or worse than biological parents. Adoption and MAC have certainly not been dismal failures. With respect to adoption, the persistence of this ancient practice is a testimony to its utility. Besides placing children in what are ideally nurturing homes, adoption and MAC offer infertile couples the opportunity to experience all the good (48) we associate with parenthood. It is for these vital human reasons that adoption and MAC, despite potential pitfalls, have remained, and will remain, viable and positive alternatives for family building.

While adoption and MAC-created families may have an increased risk of dysfunction, their potential shortcomings certainly do not warrant avoiding the joy of parenthood. Fetal egg children will be similar in many ways to children who are adopted or created through MAC. While adoption and MAC are not without hazard, what seems clear is that these alternatives to family building are, in and of themselves, not detrimental to the child or the family. Rather, it is the family's 'ability to deal with the special challenges inherent in adoptive [or MAC] relationships' which ultimately determines outcome (49). Successful child development is dependent more upon the quality of parenting than the genealogical ties a child has with her parents (50). Given these considerations, concerns over the possible psychological ramifications of being a FEC are perhaps exaggerated.

Lastly, some have suggested that we can avoid all potential harm by keeping the child ignorant of its conceptual history (51). Though a discussion concerning 'right to know' theories is beyond the scope of this paper, given how bad human beings are at keeping secrets, honesty is indeed the best policy (52). Better this child know his special circumstances at an early age 'so the knowledge can be absorbed over a period of time as the child grows' (53). 'Children and adults are less upset by what are presumed to be unpalatable facts than by the deception that is designed to protect them from the facts' (54).

Issues of population control

'and God said unto them, Be fruitful, and multiply, and replenish the earth.'

Genesis 1:28 (55)

Procreation is so basic to the human condition and satisfies so many personal and cultural needs that it occupies a unique position in both our legal and psychic heritage. However, considering the global population crisis (56), one may ask why we continue to devise new ways of combating infertility and thus, produce more children. Is it in society's best interest to afford each individual a right to procreate?

Most cultures have recognized a right, if not an obligation (57) to procreate. For instance, according to the Code of Jewish Law 'it is the duty of every man to take a wife to himself, in order to fulfil the precept of propagation' (58). In addition to religious dictates, the American judiciary has clearly recognized a right to procreate (59). Given the primacy of procreation, it is not surprising that infertility is considered a 'disease' necessitating treatment (60). *Webster's Third New International Dictionary* defines disease as, 'an impairment of the normal state of the living animal ... or any of its components that interrupts or modifies the performance of the vital functions' (61).

As most couples are fertile (62), infertility may be viewed as an *impairment of the normal state*. Additionally, propagation can be considered a *vital function* as it preserves the species and satisfies many cultural and personal needs. Though admittedly a disease, does infertility endanger the life of the individual? Certainly no one has ever died from this malady and though not life-threatening, infertility is not without negative psychological consequences (63). Infertility does adversely affect an individual's quality of life and it is for this reason we treat infertility as a medical disease.

While it may benefit infertile couples to become parents, it is not in society's best interest that all couples have children. Does the reduction of psychological distress warrant the introduction of additional children into an already over-populated world? This question is related to the larger issue of applying medical technology to human disability. Few would argue against using medicine to combat, if not eradicate, cancer. More controversial is the use of human growth hormone to enhance a normal child's height. Infertility falls between these two extremes: it is not a life-threatening illness yet nor is it frivolous.

Treating infertility represents a balance between the needs of the individual versus those of society. As long as we assume there is a right to procreate we must grant each infertile couple the opportunity to have children. However, if we agree there is a population crisis then assuming that each individual has a right to procreate is certainly not going to be in the best interest of society.

Conclusions

Our present knowledge of reproduction dispels much of the concern over introducing unforeseen

chromosomal defects through FOT. There is no medical evidence which suggests that fetal ovaries or eggs are inferior to the eggs present in a healthy adult female. With the exception of heritable disease, it is irrelevant who the genetic or biological mother of a child is. In the case of adopted children, who are analogous to potential FEC, there is ample evidence in the literature that adoption in and of itself is not detrimental. Rather, the dysfunction observed in some families results from the dynamics of the family situation, not the adoption. Furthermore, given the success of adoption and the similarities of adopted children to FEC, one can reasonably conclude that concerns of psychological harm resulting from a child knowing his genetic mother was an aborted fetus are overestimated. Adopted children, like potential FEC, rarely know anything about their genetic parents and are raised by individuals who are genetically unrelated. While adoption may not be the ideal, it is reiterated that the persistence of this ancient practice illustrates its utility.

Much of the resistance to FOT stems from the procedure's novelty. Throughout the twentieth century many of our ideas as to what is possible and hence normal have been shattered. Think of the computer user, fifteen years ago; his 64 KB monster sitting mightily on the desk, confronted by the 33 MHz, 200 MB lap-top. Remember the uproar (64) in 1978 with the birth of Louise Brown, the world's first 'test tube baby'. It is not hard to envision that once established, FOT and FEC will be one of many variations of MAC and will gain a well deserved 'measure of respectability' (65).

It is important to challenge the assumption of a right to procreate. We should be asking why, in a world which is increasingly populated, we continue to devise new means of introducing children. Should we use science to resolve all of nature's imperfections? Is infertility an 'imperfection' needing remedy? Is a fetus an ethically and legally legitimate source for eggs, ovaries, and other tissues? If we accept the premise that there exists a fundamental right to procreate, then the ovaries of aborted fetuses procured by the most rigorous medical, ethical, and legal standards are a viable and morally justifiable source of potential personhood.

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Correction

In the paper, "Mummy was a fetus: motherhood and fetal ovarian transplantation", 1995; 21: 298-304, the number of abortions in the United States for 1988 was

given as 58,192. The correct number of abortions in the United States for that year is 1.59 million.