For Debate

Should fertile people have access to in vitro fertilisation?

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The proposals for regulating the practice of in vitro fertilisation presented to the British parliament¹ and the current legislation in this subject in some states of Australia^{2,3} limit the use of in vitro fertilisation to infertile couples. Over the past decade, however, in vitro fertilisation has ceased to be only a means of bypassing infertility in women with blocked fallopian tubes and has become a technology with potential applications beyond alleviating infertility. Some of the procedures developed in conjunction with the treatment of infertility that have potential applications for fertile couples are the storage of embryos by freezing,⁴ the use of embryo biopsy to determine the genetic constitution of an embryo before its transfer to a woman,⁵ and the practice of surrogacy, which enables a woman to be the genetic mother of a child she does not carry.⁶ These procedures raise the question of whether it is reasonable for in vitro fertilisation to be limited to the treatment of infertility. We have examined some circumstances in which these procedures might be used and the problems to which they may give rise.

The suggestion that some fertile couples should have access to in vitro fertilisation will face familiar objections: some Roman Catholics will claim that in vitro fertilisation is not an acceptable means of becoming a parent because it separates the "unitive" and "procreative" aspects of the conjugal act⁷; some radical feminists will view reproductive technology as a male dominated subject in which women lose their autonomy and have their bodies used as "living laboratories" for experimental procedures⁸; and some politicians and health care providers will consider a "user pays" scheme more appropriate than the use of scarce public funds.⁹ Rather than go over this ground again, however, we shall consider only arguments that apply specifically to the use of in vitro fertilisation by fertile, rather than infertile, couples.

We have assumed that in vitro fertilisation and its related procedures represent a generally accepted treatment for infertility. Despite the objections just mentioned this assumption is justifiable with supporting evidence found in surveys of community attitudes to in vitro fertilisation¹⁰ and in the increasing numbers of infertile couples seeking the treatment.¹¹ At the same time we must be realistic about in vitro fertilisation. Although there is some indication that the use of new techniques may lead to an improvement in the success rate,^{12,13} the current live birth rate of 8.3% per treatment cycle started¹¹ and the side effects of some regimens of ovarian stimulation used to increase the number of ova collected for fertilisation¹⁴ show that it is no panacea.

The development of embryo freezing is a consequence of the use of superovulants, the hormones used in in vitro fertilisation to stimulate the development of

enough ova for a cycle of treatment. To minimise the chances of multiple births, which entail risks for both the woman and the babies,¹⁵ while maximising the possibility of a pregnancy usually only three embryos are transferred per cycle.¹¹ But sometimes more embryos than can be safely transferred in one treatment are obtained. The question of what will be done with them is a decision for the couple. There are four choices: the excess embryos can be frozen for use in a later attempt at in vitro fertilisation if the present treatment fails or to allow for family planning if the present transfer is successful; they can be discarded; they can be donated to another couple unable to achieve fertilisation; or they can be donated for research. All these possibilities raise ethical concerns. Such concerns could be reduced if ova rather than embryos could be successfully frozen. Frozen ova have been used to establish some pregnancies¹⁶; but recent research indicates that the procedure is unsafe because it increases the chance that any embryo resulting will be chromosomally abnormal.¹⁷ About 80% of embryos successfully survive the freeze-thaw process without apparent adverse effects.

Embryo freezing and fertility

Embryo freezing might benefit fertile as well as infertile couples. Two scenarios for its use by fertile couples are possible: in the first its use is based on medical grounds while in the second it is a matter of choice by the woman. Consider the first scenario. Suppose that a woman undergoes radiation treatment for cancer. Even if the treatment is successful in curing the cancer there is a serious risk that after the treatment her ova will carry genetic abnormalities induced by exposure to the radiation. Any future child that she may conceive will therefore be more likely to be genetically abnormal. Might not a woman in this situation be able to have ova collected, fertilised with her partner's sperm, and stored as frozen embryos before radiation treatment?

Most of the questions generated by this proposal are not unique. Concerns about the stability of the couple's relationship in withstanding the stress accompanying the woman's treatment and the possible fate of the embryos if the woman dies before they are transferred require consideration even in the present practice of in vitro fertilisation for infertility. The uncertainty that followed the "orphaning" of two embryos in Victoria after the death of their parents in an aeroplane crash¹⁸ and the more recent problems arising in the United States and in Victoria when couples divorce before the embryos have been used provide salutary warnings. Issues specific to this proposal arise if after the successful completion of radiation treatment the

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woman is unable to maintain a pregnancy. The apparent options are that the embryos are donated to another couple, donated for research, or allowed to succumb after removal from storage. A further possibility that may be applicable here and that will be discussed later is the use of surrogacy.

To understand why a fertile couple might choose embryo freezing for other than medical reasons requires some information about the causes of birth abnormalities and some appreciation of the pressures facing couples today. Currently, the major indication for prenatal diagnosis is advanced maternal age, generally interpreted as the woman being older than 37 at the expected date of delivery.¹⁹ With advanced maternal age there is an increased risk of a chromosomally abnormal ovum. Down syndrome, which is caused by trisomy of chromosome 21, clearly shows the increase of chromosomal abnormalities with increasing maternal age. A woman has a one in 2300 chance of producing a child affected by Down syndrome at age 20 but a one in 46 chance of doing so when she is 45.²⁰ Other chromosomal disorders also show a similar increase in prevalence with increasing maternal age, which is believed to arise from errors in chromosomal division during maturation of the ovum.²¹

Thus a woman is at least risk of producing chromosomally abnormal children when she is aged between 20 and 30, just as she may be beginning to establish her career. Should her chances of having a chromosomally normal child be jeopardised because she finds it important to continue to work through these years and so postpones childbearing until an age when the chances of chromosomal abnormalities occurring are increased? Should not some women in these circumstances have the option of deciding to have some ova collected during their optimal age for childbearing (perhaps by using the natural cycle), fertilised, and stored frozen as embryos for future transfer? A similar case of choosing to store frozen embryos might also occur when a woman undergoes sterilisation when reasonably young, believing that she has completed her family but wanting to have some insurance against the possibility of later changing her mind.

Problems about assessing the stability of a relationship and the disposal of the frozen embryos in the case of death of the parents or other unforeseen circumstances also arise here. The use of embryo freezing by a fertile woman wanting to pursue career opportunities or undergo sterilisation, however, seems more open to criticism than the use of the procedure on medical grounds. This may be because it is thought to be simply a matter of convenience; but the use of embryo freezing by women wishing to pursue a career could have long term benefits for the couple, their children, and for the society as a whole. There would be fewer children suffering from chromosomal abnormalities; the risk of an emotional burden for the couple producing such a child would be lessened; the need for institutions caring for affected children and adults could be reduced; and society would gain from the increased pool of talent that would be available because of women being able to establish themselves in their careers without fear of having an abnormal child as a result. The adoption of this suggestion, if combined with hormonal treatments that allow non-ovulating women to become pregnant,²² would allow women to become mothers after the menopause. Whether this is desirable and what stipulations should apply here need further serious consideration. If these issues can be resolved, however, it should be remembered that the cost of storage for the embryos over time is minimal when compared with the capital outlay on research and equipment, which has already occurred in establishing embryo freezing programmes for use in the context of infertility.¹⁸

Embryo biopsy and fertility

Just as the storage of frozen embryos for later use might reduce the incidence of birth abnormalities so might the use of embryo biopsy by fertile couples. Embryo biopsy is a new and partly untested procedure for detecting chromosomal and genetic abnormalities in the embryo. The procedure entails the removal of a cell from the embryo at the 4 or 8 cell stage before its transfer to a woman. The removal of the cell has no effect on viability or later development.⁵ If a chromosomal disorder is suspected in the embryo enough cells can be obtained for examination after five to six days' culture. It is technically possible to use only one cell for this assessment,²³ but this may not be reliable for detecting small chromosomal changes. Single gene abnormalities, such as Lesch-Nyhan syndrome, which is caused by an enzyme deficiency, may also be identified after embryo biopsy and assaying the activities of enzyme in the removed cell.²⁴ A more efficient approach for the detection of single gene abnormalities, however, is the recently developed technique of polymerase chain reaction. This allows specific pieces of DNA to be synthesised within a cell at a rate independent of the rate of cell division.²⁵ Enough DNA for analysis may be obtained after about two days, but the use of the technique is at present limited to those diseases for which the gene concerned has been characterised and for which a gene probe is available.

The recent application of embryo biopsy to sexing human embryos²² will benefit infertile couples known to be at risk of transmitting a sex linked disorder. Infertile couples undergoing in vitro fertilisation tend to be older than the average age of women having their first child and are thus at increased risk of producing a chromosomally abnormal embryo. The duration of infertility itself may affect the normality of any embryo formed.²⁶ If embryo biopsy is successful in clinical trials it will benefit infertile women of advanced maternal age and infertile couples at risk of producing offspring affected by a serious genetic disorder; but it could also benefit fertile couples in certain circumstances. An obvious case is when one or both partners are carriers of a genetic disease that could be transmitted to any offspring. For instance, a woman may carry the gene for Duchenne muscular dystrophy, a common sex linked disorder (prevalence 1/2500) that will affect half of the males conceived; both partners may be carriers of cystic fibrosis, a disorder estimated to be carried by about 4% of the population, which has a one in four chance of affecting offspring of either sex; or one partner may be a carrier of a rare dominant genetic disorder such as Huntington's chorea, which has a one in two chance of being passed on to any children.

For these couples the present available options are to forego having children, to use donated ova or sperm to conceive a child, to try to adopt a child, to use prenatal diagnosis followed by abortion if an abnormality is detected, or to disregard the prospect of producing an affected child. The first three of these are unsatisfactory if the couple wish to produce their own genetic child, and implementing the fourth option is accompanied by the possibility of entering a repeated cycle of prenatal diagnosis followed by therapeutic abortion at each attempt at pregnancy. The availability of embryo biopsy in these circumstances would reduce the chances of the couple entering this cycle and so reduce the number of therapeutic abortions after prenatal diagnosis. The psychological problems known to be associated with abortion, especially late abortions after amniocentesis,²⁷ would also be avoided.

In terms of cost most of the necessary research and development of embryo biopsy has already been completed or is under way. The future cost will be

small. The storage of frozen embryos would decrease the demand for embryo biopsy for advanced maternal age (the indication given for about 80% of prenatal diagnostic testing²⁸), and there is comparatively little demand for prenatal diagnostic testing from couples at risk of producing a child affected by a serious genetic disorder because of the rarity of inherited genetic disease. The use of embryo biopsy by infertile and fertile couples should increase the success of in vitro fertilisation by reducing the transfer of genetically abnormal embryos which fail to implant or result in later miscarriage. So it would seem entirely feasible for those fertile couples at risk to have access to in vitro fertilisation and embryo biopsy.

Surrogacy, in vitro fertilisation, and fertility

Surrogacy is usually an arrangement in which an infertile woman is able to become the adoptive but not genetic mother of a child conceived by another woman with the sperm of the infertile woman's partner. In vitro fertilisation, however, makes several variations possible. The combination of in vitro fertilisation and surrogacy most likely to be used is that in which a woman able to provide an ovum but not to maintain a pregnancy uses her partner's sperm to fertilise her own ovum and then transfers the resulting embryo to a woman who will return the child to the genetic parents after birth. The legality of such arrangements varies and often depends on whether an agent is involved.²⁹ In the United States at least there seems to be a demand for commercial surrogacy.³⁰ Several much publicised court cases have resulted from these arrangements, but when the overall numbers are considered there are surprisingly few court actions. Even if commercial surrogacy was to be generally prohibited most countries seem reluctant to make criminals of those who enter into altruistic surrogacy arrangements.

In what circumstances might surrogacy with in vitro fertilisation be appropriate for use by fertile couples? Again the grounds might be medical, such as if a fertile woman has heart disease, hypertension, or a kidney complaint which makes pregnancy inadvisable. Non-medical grounds are easy to envisage. For an athlete, a model, or a ballet dancer the physical changes brought about by pregnancy might mean the end of her career. For a business executive pregnancy may be a setback sufficient to put male colleagues several rungs ahead on the corporate ladder.

Some will no doubt find distasteful the idea that a woman should prefer to advance her career rather than undergo the experience of pregnancy and birth. Others will object to the fact that yet another intimate aspect of life has been drawn into the marketplace, thus creating two new classes of women: those who hire others to be pregnant and give birth for them and those who sell their bodies for these purposes. There are, however, many practices engaged in by consenting adults that may be distasteful to most of the community but are not prohibited. John Stuart Mill's famous principle, that the state should interfere with individual liberty only to prevent harm to others, has been invoked in defence of, for example, the rights of homosexuals to engage in anal intercourse. Can it also be used to defend the liberty of those wishing to buy or sell the services of surrogates? It is true that surrogacy arrangements concern a third party—the child—but it would be odd to say that the arrangements harm the child. Without the parents' freedom to make these arrangements the child would not have existed and being born as the result of a surrogacy arrangement is hardly likely to be such a blight on existence as to make it better never to have been born.

There is, of course, much more that could be said about surrogacy. Even if a strong enough case could be

made against allowing a free market in surrogacy some of the evils of a free market might be overcome by a system of carefully regulated commercial surrogacy. As argued elsewhere it would be more difficult to argue convincingly that altruistic surrogacy should be prohibited.³¹ Thus the possibility of surrogacy with in vitro fertilisation offers another set of circumstances in which it is arguable that in vitro fertilisation should not be restricted by law to infertile couples.

Conclusion

Legislation is often a crude instrument for regulating a developing technology. Considering the rapid development of in vitro fertilisation in recent years and the emphasis given to it as a treatment for infertility it is understandable, at least with hindsight, that already existing legislation failed to take into account its potential uses for fertile couples. Now that the potential application is readily apparent, however, legislators should give this issue much more careful consideration. There are several grounds, both medical and non-medical, on which fertile couples may seek access to in vitro fertilisation. We consider that some of these grounds are strong enough to place a heavy onus on those seeking to use legislation to prohibit such access. We are not aware of any arguments sufficiently weighty to discharge this onus.

If it is accepted that access to in vitro fertilisation treatment by the fertile should not be statutorily prohibited the question arises whether such treatment should be paid for from public medical funds to the limited extent that in vitro fertilisation treatment for infertile patients is paid for from these funds. That question, however, is beyond the scope of this paper.

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General practice computing in Scotland

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Abstract

Objective—To investigate a method of assessing the extent of routine patient data held on computer by Scottish general practitioners.

Design—An "electronic questionnaire" in the form of an interrogation questionnaire was used to extract a subset of data from practice computers running a standard software package (the general practice administrative system for Scotland, GPASS). The data were retained by each practice and also collected and analysed centrally to produce regional and national data.

Subjects—All 257 general practices in Scotland using GPASS software were sent the electronic questionnaire; data from 154 practices, including 759 general practitioners and covering 1010452 patients, were collected.

Results—Ninety three practices had all their patient records on computer; others had selectively entered data on, for example, only those patients receiving repeat prescriptions. The number of computerised patient records per practitioner ranged from 46 to 2373. Altogether 194261 patients had repeat prescribing data and 204005 morbidity or clinical data.

Conclusion—An electronic questionnaire is a simple and effective way of investigating the information held on practice computers, allowing analysis and feedback of information to practitioners. Development of this system will provide a cumulative information system for Scottish general practitioners.

Introduction

The importance of and preferences for information systems for general practitioners have been emphasised and described.^{1,2} Participation depends on the ease of data collection, and it has been estimated that twice as many United Kingdom general practitioners would participate in performance review activities if information were indirectly provided rather than provided by themselves.¹

An upsurge in the use of computers in general practice in Britain has occurred in recent years,^{3,4} and proposed changes in the organisation of the NHS are likely to accelerate this development.⁶ The most commonly computerised aspects of general practice are registration, repeat prescribing, simple patient recall, and practice audit.⁵ More than 15 types of computer software systems are estimated to be in use in general practice in the United Kingdom.¹

Scotland is fortunate in that it has both an NHS information technology policy and a standardised

general practice computer software system GPASS (general practice administrative system for Scotland).⁷ This is a set of software programs developed from pioneering work by Dr David Ferguson in the early 1980s on computerised repeat prescribing in Glasgow. Since 1984 the use of the software has been supported financially by the Scottish Home and Health Department and is available free to all general practitioners in Scotland who choose to buy compatible computer hardware. The programs currently support the core functions necessary for a surgery system, providing an age-sex register and facilities for repeat prescribing, morbidity recording, recall of patients, and audit.⁸ By the middle of 1988 there were over 250 registered users amounting to a quarter of all practices and over 32% of general practitioners in Scotland.⁸ It was estimated that over 1600000 patients (30% of the population of Scotland) were registered with practices using GPASS.

The number of registered users continues to grow steadily and now exceeds 350 practices. The use of common software means that data on patients are stored in a standardised and transferable way. This compatibility has exciting possibilities and led us to investigate the methods by which the data could be amalgamated and compared for the benefit of practices.

Methods

We sent an "electronic questionnaire" to all registered users of GPASS in Scotland during June 1988. The questionnaire was an interrogation program written by a member of the GPASS team and designed to identify how each practice was using the software. It was supplied on a floppy disk with instructions for use. When the program was run it produced an analysis of the data held on the system, both as a printed copy and electronically as a data file on the floppy disk. The material obtained reflected the overall clinical and administrative data on the practice computer rather than detailed information about individual patients. Confidentiality was assured by the omission of identifiers for patients in the returned data. Each practice retained a copy of the printed results. The floppy disk and one copy of the printed results were returned to the investigators for analysis.

Over 50 items of information were collected from each practice, including the number of doctors using the computer, the number of patients' records held, and the percentage of patients with a drug record, a clinical record, or other details such as blood pressure, cervical cytology results, and last consultation date. This information was amalgamated, analysed, and included in a report circulated to each practice two months later. The feedback was personalised for each

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