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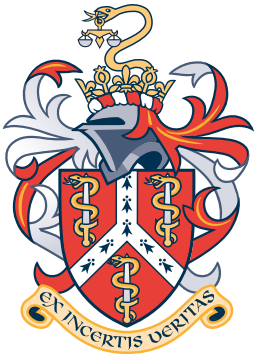

Faculty of Forensic & Legal Medicine

Guidance on paternity testing

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Introduction

There may be an issue regarding the paternity of a woman's pregnancy, where it may have arisen from an alleged rape or sexual assault, or be as a result of consensual intercourse, with the woman's regular partner. This guidance has been updated, as a result of new developments since it was first published in 2010.

Conception and pregnancy

The greatest likelihood of pregnancy is when unprotected sexual intercourse (UPSI) takes place at, or close to the time of ovulation. The luteal (post-ovulation) phase of the menstrual cycle is said to be relatively constant, at 14 days, thus it is possible to estimate when ovulation may occur in women with regular menstrual cycles. However, it is not a precise estimation and the issue of paternity may arise when an alleged rape occurs around the same time as consensual sexual activity.

Pregnancy risk is also related to the lack or incorrect use of contraception. It is impossible to give a reliable risk in any individual, as estimating where a woman may be in her cycle is difficult, as described above. Overall, there appears to be a low/negligible risk at day 1 or 2 of the cycle, (day 1 being the first day of the menstrual period), and the risk increases to its highest, (perhaps a 1:4 risk) at the time of ovulation, falling again as the cycle progresses. In any month, the overall chance of a fertile couple conceiving (fecundability) is said to be about 15%.

It is important that when UPSI has taken place a woman is offered and provided with the appropriate method(s) of emergency contraception, (EC), should she wish to use them, as well as advised that even when obtained immediately, they may fail.

In the UK, the age or duration of the pregnancy, (gestational age, GA) is calculated from the first day of the last menstrual period (LMP), but this may not be accurately recalled and, as noted above, the time from this to ovulation is variable and can be affected by a number of factors. Pregnancy usually lasts between 37 & 42 weeks, from the first day of the LMP.

In pregnancy, fertilisation usually occurs in the fallopian tube and implantation of the blastocyst occurs about 7 days later, which is about 3 weeks from the LMP. The subsequent time, up to 10 weeks (GA), is the embryonic phase and thereafter, the further development of the pregnancy is termed the fetal phase. A urinary pregnancy test, where beta human chorionic gonadotrophin (beta-hCG) is detected, is usually positive around the time of the first missed period.

Pregnancy in association with an alleged sexual assault or rape

It is said that the pregnancy rate from a single act of UPSI is of the order of 5% and the 'rape-related' pregnancy rate was said to be 5% based on research in the USA, published in 1996. Since then, EC has become more widely available, but there is no up-to-date information regarding the current 'rape-related' pregnancy rate, and indeed such data, if available, may not be accurate due to under-reporting of rape and sexual assault.

Establishing paternity

In cases where it is believed that a woman has become pregnant as a result of rape or sexual assault, paternity analysis for legal purposes can be carried out to help establish the identity of the father, or rule out a putative father.

After pregnancy

If the woman has already given birth to a baby, reference DNA samples, with the appropriate consent, should be submitted from:

- the child
- mother and
- the individual(s) believed to be the father

The preferred method used to collect the reference sample is via a buccal scrape; however, cord blood may be taken at the time of delivery, as long as doing so presents no risk to the new-born baby. A heel-prick blood sample may also be used for the reference sample for the baby.

It is essential that a multi-disciplinary discussion occurs between police, clinicians and forensic scientists or forensic service providers, (FSPs). Advice should be sought from the FSPs about what preservative should be used and into what type of container the blood should be drawn, along with the use of robust chain of custody (evidence) procedures.

During pregnancy

If the woman has recently discovered she is pregnant, there are several factors to be considered, whilst ensuring accurate information & support is given to the woman. She may need some time to assimilate the knowledge she is pregnant, and she should be counselled regarding how useful a dating scan may be in clarifying the gestation, which in turn may assist in establishing who the father may be. This will only be possible when there are significant differences in the times when intercourse took place

In the early stages of the pregnancy, determining paternity will also depend upon the decision made by the woman regarding her pregnancy. It must not be assumed that a woman who is, or may be pregnant as a result of an alleged rape, would necessarily opt to have the pregnancy terminated. She may choose to continue the pregnancy, in which case paternity testing could be done after delivery, as described above.

Termination of pregnancy (TOP)

In the UK, termination of pregnancy, (TOP) is governed by the Abortion Act (1967), as amended by the Human Fertilisation and Embryology Act (1990, 2008); this legislation applies in England, Wales and Scotland. In Northern Ireland, other legislation applies, including the Offences Against the Person Act (1861), and, as such, the criteria to obtain an abortion are more restricted and rely on a 'real & serious' risk to the mother's physical or mental health and that risk must be 'permanent or long term'. Recently, new guidance was issued to assist clinicians in Northern Ireland, whilst a review is undertaken, but the law remains unchanged.

In the UK, fetal viability is deemed to be attained at 24 weeks, thus a TOP may be carried out up to 24 completed weeks. More rarely, a TOP may be carried out beyond 24 weeks, for example, where the fetus has a serious abnormality or the pregnancy puts the mother's life at risk; in such situations, there is no legal time limit. The TOP can only be provided by and/or take place in an NHS hospital or specialist licenced clinic.

If the woman opts for a TOP, paternity analysis can be carried out on the products of conception, (POCs), or the fetus. The potential to obtain a suitable DNA profile depends upon the gestation and the method of termination. In order to advise the woman appropriately and ensure suitable arrangements are made, clinicians and the investigating officer need to establish:

- The gestation in weeks (based on ultrasound dating, rather than solely on the date of the first day of the LMP)
- The method of TOP to be used
- Whether the woman has given consent for police to collect the POCs and carry out DNA analysis
- Whether the police officer needs to provide a suitable container in which to retain the POCs; such a container should be opaque plastic (not glass which may break if frozen), contain no preservative, and, in particular, no formalin

Once obtained, the POCs should be placed in the appropriately labelled container and into a tamper-evident bag, then frozen. The POCs must remain frozen during storage &/or transport to the FSP.

In some cases involving vulnerable individuals, (e.g. a child or a woman who lacks capacity), the girl/woman may not be able or willing to support a police investigation. There may need to be a multi-disciplinary discussion regarding the best interests of the child/woman and the public interest in pursuing a criminal investigation. A court order may be required in order to seize POCs as evidence.

Methods of termination

In general terms, the methods may be described as medical and surgical:

- Medical methods rely on the use of drugs to stimulate the uterus to expel its contents.
- Surgical methods involve the contents of the uterus being removed by either vacuum aspiration or a dilatation and evacuation; surgical methods may mean the woman is offered an anaesthetic, either local or general.

The decision as to which method is appropriate depends on the gestation and the choice of the woman, as well as the advice of clinicians. The methods are not described in detail here, but links to such information are available below in the resources section

Early pregnancy

In early medical TOP, if the woman is at home when she passes the POCs, she can be asked to collect these and any sanitary protection she wears. It must be acknowledged that this may be exceptionally distressing for the woman, and so may not be possible. It may be necessary for her to use a number of containers and to label them sequentially. The containers will need to be collected from her and frozen as soon as possible to avoid degradation.

Whilst it may be possible to recover the POCs, e.g. from a sanitary towel, the embryo/greyish gestation sac may be too small to be seen amongst the blood clot & placental tissue. It may be unclear upon which sanitary towel the embryo/sac has been deposited or it may be lost into the toilet. If DNA analysis is attempted, the majority of the tissue will be maternal in origin, but it may be possible to obtain a fetal DNA profile, (see below).

Medical or surgical termination after 10 weeks is likely to yield sufficient tissue to enable DNA analysis and to obtain a fetal DNA profile.

Specialist consultations & advice

However, recent developments have shown that, at early gestations, possibly as early as 5-8 weeks, it may be possible to obtain a fetal DNA profile. This possibility has been described by FSPs, (but in relation to very few cases), who have advised that:

a) In consultation with a histopathologist, it may be possible for the POCs to be microscopically examined such that fetal tissue is separated and thus can be 'targeted' for DNA analysis. As a result, a DNA profile might be obtained earlier in the pregnancy than has previously been possible

b) Newer, more sensitive DNA analysis techniques, and in particular the use of Y-STR technology, (where the target is short-tandem repeats on the Y (male) chromosome) may enable analysis to take place at a slightly earlier gestation, as long as the fetus is male.

In such situations, there should be a multi-disciplinary discussion before the TOP begins, so that the woman and the staff involved are all aware what needs to be done, by whom and when. All POCs, however obtained, should be collected and submitted for analysis.

When a TOP occurs at a later gestation, then a portion of fetal tissue (e.g. a limb, muscle, blood from the heart), rather than the whole fetus, may be submitted, but it is advisable to confirm with the FSP exactly what they require. The disposal of any remaining fetal tissue should not take place until the FSP has confirmed that DNA analysis has been successful. DNA profiling should almost always be successful, unless the sample has deteriorated.

Samples to submit to the FSP laboratory for DNA analysis

- Buccal scrape from the mother
- Buccal scrape(s) from the putative father(s)
- POCs, as described above, stored in a sterile, opaque secure container, with no preservatives added (i.e. no formalin) and kept frozen.
- If no putative father is identified, or if the nominated suspects have been eliminated by DNA profiling, it is possible to carry out a speculative familial search of the UK National DNA DatabaseR.
- It is essential that appropriate chain of custody measures are in place, to ensure such evidence can be submitted in Court.

Ethical consideration / Human Tissues Act

It is important to acknowledge that discussions in such situations, as well as the practical aspects may be exceptionally distressing for the woman concerned, as well as her partner and family. It may also be distressing for the staff involved, therefore staff may request to be excused from involvement.

As noted, a fetal DNA profile is likely to be obtained from 10 weeks GA. However, if the incident is reported to police at an earlier GA, it is likely to be in the best interests of the woman who wants a TOP, to undergo the procedure at the earliest opportunity. The woman may also prefer to opt for an early medical TOP which is less likely to provide a fetal DNA profile; however, please see above regarding specialist consultations & advice.

Evidence seized by police for criminal investigation purposes is excluded from the Human Tissue Act 2004 regulations (see section 39). It is recommended that when analysis is complete, the remaining sample is returned to the clinic that carried out the termination, for the tissue to be disposed of following their procedures and in accordance with any wishes expressed by the woman. Please see the codes of practice on the Human Tissue Authority (HTA) website and guidance on disposal of fetal tissue following pregnancy loss or termination.

Other issues

1. **Miscarriage:** depending on the gestation and where it occurs, it may be possible to obtain POCs, with a view to obtaining a fetal DNA profile, based on the approach as outlined above, if the gestation is at least 9-10 weeks, (but see above, early pregnancy and specialist consultations and advice). It must be appreciated that miscarriage is unpredictable, so it may not be practical to secure POCs in these circumstances.
2. **Ectopic pregnancy:** this arises when the pregnancy develops outside the uterus, e.g. in the fallopian tube. The clinical presentation is usually around 6-8 weeks GA, and it can be a life-threatening emergency; therefore, it is unlikely to be feasible to obtain POCs for a fetal DNA profile.
3. **Twin/multiple pregnancy:** The fetuses may be identical or non-identical. Such circumstances will require a multi-disciplinary discussion, as it is possible, (at least in theory), for a woman to conceive where two or more ova are fertilised by different men.
4. **'Self' or non-police referrals:** It is the view of the FFLM and those consulted in the review of this document that when POCs are obtained from individuals who have not yet formally reported the allegation to the police, they should not be stored, but be sent for analysis. This is still feasible whilst protecting the identity of the complainant, if all samples are anonymised and only identified by a unique reference number. Clearly, this must be discussed with the relevant police force as early as possible, to ensure POCs are not taken as potential evidence if there is no prospect of them being submitted for testing.

Pre-natal diagnosis and establishing paternity

Sometimes, a woman discovers she is pregnant, following an alleged sexual assault, when it is not possible to distinguish by the GA, whether the pregnancy is that of her partner, or is as a result of the allegation. It may be possible for paternity to be established via other methods, which might assist the woman in making the decision whether to continue with the pregnancy or not, and perhaps assist the criminal justice process.

Established methods

These involve 'invasive techniques' by obtaining fetal cells from the placental bed (via chorionic villous sampling, CVS), or obtaining a sample of fluid from around the fetus which contains fetal cells, (amniocentesis). CVS is carried out at 11 -13 weeks GA, and is said to have a risk of miscarriage which is slightly higher than 1%. Amniocentesis is usually carried out from 15 weeks, and at this GA has a risk of miscarriage of 1%. It is possible to conduct 'early amniocentesis', before 15 weeks, but prior to 14 weeks, it has a higher risk of fetal loss (miscarriage) and other associated risks; thus it is not recommended.

Clearly, the use of either technique could lead to a miscarriage of a pregnancy which subsequently, when the DNA results are available, is shown to have been the wanted pregnancy of her partner. Therefore decisions regarding CVS and amniocentesis will require appropriate support, information and counselling to be provided to the woman by her clinicians. In reality, because of the risk of miscarriage, it is unlikely that there would be a significant requirement for such procedures. If the woman opts for such tests, and provides consent, there must be early discussion between clinicians, police and the FSP, and appropriate arrangements made for collection into an appropriate container, and transport, along with robust chain of evidence procedures.

However, if paternity is not an issue for the investigation, i.e. there is sufficient evidence already available to support a prosecution, then the police and FSPs would not be involved and any discussion around the use of such investigations is between the woman and the clinicians.

New methods

New methods of pre-natal diagnosis have been developed, whereby cell free fetal DNA, (cff DNA) can be separated from a blood sample obtained from the mother, usually after 9 weeks of pregnancy. The fragments of cff DNA enter the mother's blood circulation, via the placenta. This method is not associated with a risk of miscarriage, and may be adapted to these circumstances, if an elimination DNA sample can also be provided by the woman's partner.

The advice from FSPs is that this is not a technique which has been used or developed in this forensic medico-legal context. This situation is unlikely to change, as it would need appropriate validation before the results of such tests could be adduced in Court. Therefore it is seen as a clinical, rather than a medico-legal approach to this situation.

Should the use of such a technique assist a woman in decisions about her pregnancy, it will almost certainly involve a private provider and local discussions will have to take place regarding providers of and funding for such tests.

Useful references & resources

Conception & rape

Wilcox AJ, Dunson D, Day Baird D
The timing of the "fertile window" in the menstrual cycle: day specific estimates from a prospective study
BMJ. 2000; 321(7271): 1259–62

Stirnemann JJ, Samson A, Bernard J-P, Thalabard J-C.
Day-specific probabilities of conception in fertile cycles resulting in spontaneous pregnancies
Human Reproduction, 2013; Vol.28, No.4 pp. 1110–16

Colombo B, Masarotto G
Daily Fecundability: First Results from a New Data Base
on Behalf of the Menstrual Cycle Fecundability Study Group
Demographic Research, 2000; Volume 3, Article 5

Holmes MM, Resnick HS, Kilpatrick DG, Best CL
Rape-related pregnancy: estimates and descriptive characteristics from a national sample of women
Am J Obstet Gynecol. 1996;175(2):320-4

Embryology

The Universities of Fribourg, Lausanne and Bern
Human Embryology, Module 9 Fetal phase

The Universities of Fribourg, Lausanne and Bern
Timeline human development

Abortion legislation

Abortion Act 1967 c.87

Abortion law House of Commons Library
Abortion law

Department of Health, Social Services and Public Safety
Guidance for health and social care professionals on termination of pregnancy in Northern Ireland

Letter from the CMO in Northern Ireland regarding Guidance on Termination of Pregnancy in Northern Ireland

The Department of Health, (DOH)
The Sexual Health Policy Team, Public Health Directorate. Guidance in Relation to Requirements of the Abortion ACT 1967
10250. May 2014

BMA
Ethical guidance

Methods of termination of pregnancy

The Royal College of Obstetricians & Gynaecologists, (RCOG)
The Care of Women Requesting Induced Abortion Evidence-Based Clinical Guideline Number 7
November 2011

The National Health Service (NHS)
Abortion

CVS & amniocentesis

NHS
Chorionic villus sampling

NHS
Amniocentesis

Royal College of Obstreticians & Gynaecologists
Amniocentesis and Chorionic Villus Sampling

Human Tissue Authority

Codes of Practice

Codes of Practice 1 – Consent

Guidance on the disposal of pregnancy remains following pregnancy loss or termination

Cell free fetal DNA

Ryan A et al
Informatics-based, highly accurate, noninvasive prenatal paternity testing

NHS
The NHS RAPID project

Royal College of Obstreticians & Gynaecologists
Non-invasive Prenatal Testing for Chromosomal Abnormality using Maternal Plasma DNA

Produced by Dr Bernadette Butler
on behalf of the of the Faculty of Forensic & Legal Medicine

Send any feedback and comments to forensic.medicine@fflm.ac.uk