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Case report

Forensic DNA expertise of incest in early period of pregnancy

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ABSTRACT

Proving incest from tissue obtained by abortion early in pregnancy can be a challenge. Problems include the small quantity of embryonic tissue in the products of conception, and the mixing of DNA from mother and embryo. In many cases, this amorphous material cannot be grossly segregated into maternal and fetal components. Thus, morphological discrimination requires microscopy to select relevant tissue particles from which DNA can be typed. This combination of methods is reliable and efficient. In this article, we present two cases of incest discovered by examination of products of conception.

1. Introduction

Adolescence is a sensitive period of physical, sexual and psychosocial development. Each teenager becomes an individual with a unique personality.[1] Most commonly, incest is defined as mating between first-degree relatives, i.e., father–daughter, mother–son, or brother–sister, who have 30–50 percent of their genes in common. However, in some countries the definition may be widened to include half-sib and uncle–niece unions.[1–4] The dynamics of the brother–sister incest relationship have received far less attention than the father–daughter affair. Assumptions abound but, there has been a conspicuous lack of documentation despite estimates that incest between siblings may be five times more common than paternal incest. Sibling incest is more likely to occur if there is parental neglect or abandonment, as brothers and sisters turn to each other for comfort, nurturance and identity, or as a means of expressing rage and hurt. Also, this may appear through exposure to pornography or sexually explicit material, sex talked about openly in obscene words, and where parents make little effort to prevent children from seeing them engage in marital or extramarital activity in the home.[5] Legally, incest and sexual aggression toward minors are classified as a criminal behavior even if the perpetrators are minors themselves. Incest has psychological, social, medical, and legal ramifications.[6]

In some rape cases, sperm is not available from vaginal swabs and the only resulting genetic evidence can be products of conception. By determining parentage, it is possible to link the act to the perpetrator. In fact, genes from the suspect become part of the genetic makeup of the products of conception.[7] In the event of pregnancy after rape, paternity determination to identify the perpetrator can be performed prenatally by biopsy, by amniocentesis or by using abortion material as the source of DNA.[8] After termination of pregnancy, the abortion material consists of a mixture of fetal and maternal tissue and blood. Typing of short tandem repeat (STR) loci from fetal components has been very effective, but complications may arise if maternal tissue predominates, wherein the interpretation of the results may be more complicated. In many cases, this amorphous material cannot be segregated into maternal and fetal components upon gross dissection. Thus, morphologic discrimination frequently requires microscopy, and relevant tissue particles can be selected after histological examination. This combination of methods, not uncommon in clinical medicine, increases the reliability of the results.[9,10] In similar situations, biopsy of chorionic villi has been used as a tool for forensic paternity testing.[8,9,11]

We present two cases of incest that were investigated in the early period of pregnancy.

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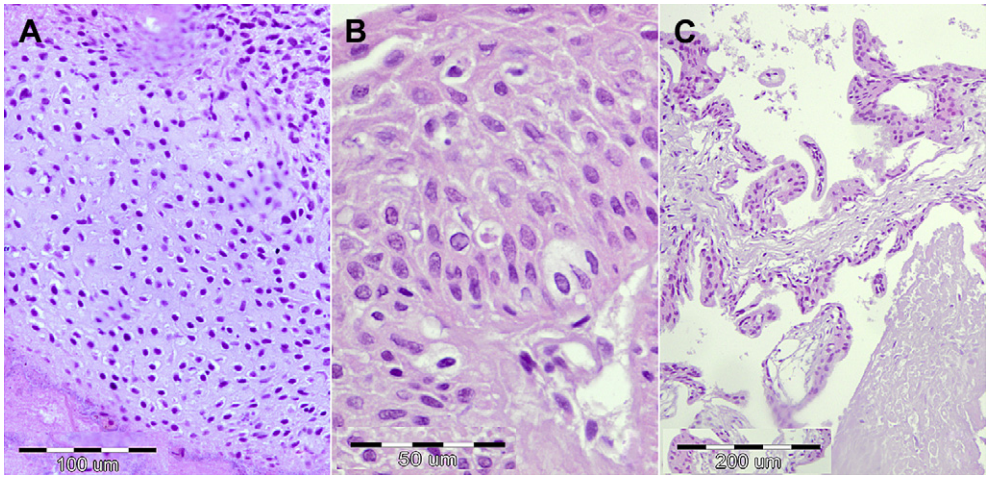

Fig. 1. Tissue analyzed from case 2. Histological appearance of cartilage (A), epidermis (B), and chorionic villus (C). Hematoxylin and eosin. Scale bar: 50 microns in A, 100 microns in B, 200 microns in C.

2. Case report

2.1. Case 1

In the first case, there was incest between brother and sister. Labour was induced with prostaglandin during the 15th week of pregnancy. The victim, a 14-year-old girl, stated before the investigative authorities that she had been raped by a 60-year-old man. Forensic DNA analysis of paternity included blood of the victim, blood taken from the heart of the fetus and blood of the suspect. Later in the forensic examination blood from her father and brother was analyzed.

The isolation of DNA from the blood of the victim, the fetus, the suspect, the father and the brother of the victim was performed with a Qiagen Mini kit.

2.2. Case 2

The second case was incest between uncle and niece. Vacuum abortion was performed in the seventh week of pregnancy. According to the information obtained from the investigating authorities, the 14-year-old victim had been raped by her uncle. For the purposes of forensic DNA analysis, we were provided with material from the performed abortion, blood of the victim and blood of the suspect.

Since it was impossible to identify which parts belong to the fetus in the amorphous mass obtained from the abortion by gross examination, the entire mass was fixed in 10% neutral formalin, and embedded in 14 paraffin blocks, in order to determine the presence of fetal tissue by histology. The blocks were cut into 5 micron-thick serial slices in order to be able to identify embryonic tissue deep within the blocks. The slices were stained with hematoxylin–eosin. Embryonic tissue was found in 3 paraffin blocks, and 1 contained chorionic villi (Fig. 1).

Deparaffination of the embedded tissue was performed using the Qiagen mini kit protocol for deparaffinization. DNA was extracted from the fetal tissue and placenta in the paraffin blocks, by the phenol–chloroform method.[12]

3. STR typing

Multiplex PCR amplification was performed using 1–3 ng of genomic DNA according to the manufacturer's protocols for the AmpFISTR Identifiler kit and AmpFISTR YFiler kit. Amplification was carried out in a 9600 Thermal Cycler (Applied Biosystems). For electrophoresis 1.5 μl of the PCR product was combined with 12 μl of formamide and 0.5 μl of GeneScan 500 LIZ size standard. The detection of PCR products and genotyping were carried out on an ABI PRISM 310 Genetic Analyser (Applied Biosystems) using the ABI PRISM collection software, ABI Prism 310 Data Collection software

Table 1
Profile analysis results for autosomal STR's – Case 1 (excluding loci underlined).

	Locus	Chromosomal location	Victim	Embryo	Suspect	Father	Brother
1	D8S1179	8	13/13	13/13	12/13	13	13
2	D21S11	21q11.2-q21	29/32.2	29/32.2	27/28	32.2/33.2	29/32.2
3	D7S820	7q11.21-22	10/11	10/11	8/11	11	10/11
4	CSF1PO	5q3.3-34	10/11	10/11	10/11	11	10/11
5	D3S1358	3p	15/18	15/16	15/16	16/18	15/16
6	TH01	11p15.5	7/9	9/9	9.3/9.3	7/9.3	7/9
7	D13S317	13q22-31	8/10	8/11	11/11	8/10	8/11
8	D16S539	16q24-qter	12/12	10/12	12/13	10/12	10/11
9	D2S1338	2q35-37.1	22/25	22/25	24/25	22/25	25
10	D19S433	19q12-13.1	13/13	13/15.2	14/14	13/15.2	13/15.2
11	vWA	12p12-pter	18/18	17/18	16/18	18	17/18
12	TPOX	2p23-pter	8/8	8/8	8/11	8/11	8
13	D18S51	18q21.3	15/21	14/21	14/18	14/21	14/15
14	D5S818	5q21-31	11/13	13/13	12/12	13/14	11/13
15	FGA	4q28	21/22	21/22	21/21	22/24	22
16	Amelogenin	X; p22.1-22.3 Y:p11.2	X/X	X/X	X/Y	X/Y	X/Y