

PREIMPLANTATION DIAGNOSIS FOR ECTODERMAL DYSPLASIA SYNDROMES

“Thinking outside the box” and “pushing the envelope” are catchy phrases used to describe innovations in thought or technology that encourage progress and change the way things are done. Sometimes the innovations are sudden and dramatic. Other times the innovations are small steps that lead to innovative applications of ideas or technologies that are not new to the world, but only to groups of people who become aware of them as time passes. A series of such small steps has overtaken the various ectodermal dysplasia support groups and their memberships.

What I’m talking about are advances in genetic technology that have led to molecular diagnosis of several of the ectodermal dysplasia (ED) syndromes and advances in reproductive technology; together, these mean that the diagnosis can be made very early in life. The genetic technologies have been developing slowly over the past two decades and have been used in various settings to diagnose many genetic disorders first in adults, then in children and unborn children, and now even in fertilized human eggs. As the age of diagnosis has been pushed earlier and earlier in life, questions have arisen about the propriety of early diagnosis and the issue has become as much a topic of religious debate as scientific capabilities.

The purpose of this article is not to describe the technologies in great detail, but to focus attention on prenatal diagnosis of the ED syndromes. First, one has to realize that over the past decade and a half, molecular diagnosis for several EDs has become a reality; that is, the gene mutations responsible for the syndromes have been identified. Molecular testing is available for hypohidrotic ectodermal dysplasia (HED), Clouston syndrome, Hay-Wells syndrome, the EEC syndrome, and more complex syndromes like Ellis-van Creveld syndrome. This is wonderful news for the membership of the support groups since diagnosis based only on physical features is often imprecise or impossible.

Second, one has to know that prenatal diagnosis has gone from simple observation (ultrasonography) and fetal skin biopsy, to molecular studies on the membranes or fluid that surrounds the fetus and on cells removed from the fertilized egg before it is attached to the mother’s womb (preimplantation diagnosis). It is this early prenatal diagnosis, before implantation, that has fueled some of the recent debate, rooted as it is in very personal ideas about the morality of sex selection of babies, termination of affected fetuses, the relative value and costs of testing, and the impact of raising affected children or being affected. Third, preimplantation diagnosis is theoretically available for any of the ED syndromes for which the basic gene mutation is known.

What is preimplantation diagnosis? Basically, preimplantation diagnosis refers to studying a fertilized egg after it has been fertilized in a laboratory and has started to divide, when there are as few as four cells present by removing one of the cells for study while the remaining cells are untouched. If the cell being studied has the gene mutation responsible for the syndrome in question, the remaining cells will also carry the same mutation. If not, the mutation is not present in the remaining cells. Either way, a decision can be made about placing the cells in the womb and allowing them to continue development. While placing the cells in the womb and stimulating implantation is not always successful, the techniques to do so have been used for years to help couples who have trouble conceiving without such intervention. The rate of “success” in achieving a pregnancy after a test-tube (IVF) conception is often around 20-25% per cycle but varies between centres and also depends on the reason for the infertility (if that is why IVF is being used).

How does preimplantation diagnosis differ from other diagnostic studies? Aside from the associated costs and risks, the difference between preimplantation diagnosis and other methods of diagnosis is simply one of timing; that is, when in the life cycle the cells are collected for testing. The molecular tests are essentially identical.

Diagnostic tests in adults and children are not especially controversial. Many prenatal diagnostic tests, however, raise ethical questions related to interfering with biological processes, reproductive choice, sex selection, onset of life, and abortion. Proponents of prenatal testing during mid-pregnancy cite many advantages for early diagnosis, chief among

them are preparation of the family and health care providers for the birth of an affected child or peace of mind if the unborn child is not affected. Opponents counter that access to abortion outweighs the potential good. Proponents of preimplantation diagnosis say that the tests are done before pregnancy begins, ameliorating the question of abortion. Opponents counter that life begins with conception (fertilization) and whether the event is in the womb (fallopian tube) or in a test tube is unrelated to the moral question. Others debate the sociological impact of sex selection, supposing that only male fetuses would be impacted by early diagnosis in the case of X-linked disorders such as X-linked HED (sometimes also known as Christ-Seimens-Tourraine syndrome).

The support groups themselves cannot take a stance on the issue; that is, it would be difficult for support groups to condone or condemn any prenatal testing, preimplantation diagnosis included, because families differ so much in their feelings on these topics. The mission of the support groups is to educate individuals, families, health care providers, and the general public about ED syndromes; encourage research; and facilitate appropriate care for affected individuals. Choices about reproduction, the timing of clinical or molecular testing, treatment, and participation in research are very personal, sometimes complex issues. If anyone is concerned about the morality of the issue, it might be helpful for them to seek pastoral counselling or to raise this in genetic counselling.

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