Pregnancy: Women Who have OI

A woman with osteogenesis imperfecta (OI) who becomes pregnant may experience an uneventful pregnancy, or one with difficulties. Similarly, a baby with OI may be born with very few complications, or with numerous fractures and other problems.

There are few data about the likelihood of women with OI developing complications during pregnancy. The wide variation in OI symptoms, coupled with the wide variation in pregnancy complications in all women, make it difficult to predict how pregnancy will affect a woman with OI.

Given that OI is a rare disorder, it may be difficult to find a doctor with experience treating women with OI, or managing pregnancies in which the fetus has OI. In general, it is recommended that women with OI who are pregnant or considering becoming pregnant consult a competent obstetrician/gynecologist. A specialist in high-risk pregnancies may be helpful for women who anticipate pregnancy complications, either due to severe OI-related problems, or other problems, such as a history of preterm labor, multiple miscarriages, or other significant health concerns**.** Planning to deliver at a hospital with special services for high-risk mothers and babies is another consideration.

Gynecologic Concerns of Women with OI
Girls with OI Type I and Type IV can expect to begin menstruating at the same age as, or just slightly later than, girls who do not have OI. However, girls with OI Type III may experience a delay of several years before beginning to menstruate (Reed). This type of delay has been associated with an increased risk for osteoporosis in the general population. Once menstruation starts in girls with OI, their cycles are generally regular although heavy bleeding may occur in girls and women who have a history of easy bruising or bleeding tendencies. There is no evidence to suggest that fertility is influenced by OI. However, miscarriage rates may be higher among women who have OI.

Obstetric Concerns of Women with OI
There are a number of areas of concern when women with OI become pregnant. These include the following:

- Although many women with mild OI experience few adverse effects from pregnancy, they may have loose joints, reduced mobility, increased bone pain, and dental problems during pregnancy.
- All pregnant women experience changes in their bone density during pregnancy, but there is concern that women with OI do not regain the lost bone density after pregnancy, or do not regain it as quickly as other women**.**
- Short stature, spinal curvature, and rib cage deformities can lead to complications when already crowded internal organs must accommodate a growing fetus. Complications can range from breathlessness and discomfort to more serious problems that necessitate early hospitalization or premature delivery. Monitoring of respiratory function may be indicated.
- Pregnancy is not clearly associated with increased maternal fracture risk. However, carrying a child to term can place additional stress on weakened bones and loose joints. A woman might be more likely to fall when her growing abdomen disrupts her balance. Obstetrical manipulation during delivery may result in fractures.
- Women with OI have reported several other pregnancy complications. It is not known whether they occur more frequently or severely in women with OI than in other women. These complications include pre-eclampsia (characterized by high blood pressure, protein in the urine, and body swelling); premature delivery; placenta previa (when the placenta covers the cervical opening); premature rupture of membranes; recurrent urinary tract infections; anemia (low red blood cell count); and calcium deficiency.
- A history of pelvic fractures and/or pelvic deformities may necessitate cesarean delivery.
- Women with a history of easy bruising, recurrent nosebleeds or bleeding tendencies following previous surgeries may be more susceptible to excessive bleeding after delivery. Blood coagulation and platelet tests may be prescribed prior to the delivery date as a precautionary measure.

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- Potential anesthesia concerns for women with OI include hyperthermia (raised body temperature), or an inability to receive epidural anesthesia due to spinal curvature or compression.
- A recent Scottish study of back pain in pregnant women who have OI suggests that vertebral crush fractures are common and that caesarian section does not prevent this problem. (McAllion) • After the baby is born, the mother with OI may also experience increased bone pain, susceptibility to fracture, or other connective tissue problems.

Talking to Your Doctor

It is recommended that women with OI work with their physicians, before becoming pregnant if possible, to assess their personal health and OI-related issues that may cause pregnancy complications. Short stature; a history of pelvic or spine fracture; and a history of respiratory compromise are important areas for discussion. Though pregnancy is not entirely predictable for any woman, health problems present before pregnancy (whether or not they are related to OI) may be made worse by the stresses that pregnancy places on a woman's body.

A woman with OI should also talk to her physician about appropriate diet and exercise before, during and after pregnancy to ensure optimum health for both herself and her baby. A baby's need for calcium during pregnancy and breastfeeding may deplete the mother's bone density if she does not get adequate calcium through her diet and, if prescribed by her doctor, prenatal supplements. Because "mega dosing" on calcium can lead to other problems, such as kidney stones, it is important to consult with a physician about appropriate intake of calcium and other nutrients. At this time, there are no treatments, or dietary supplements that can prevent the child from having OI or that will make the type of OI milder.

Genetic Counseling and Prenatal Diagnosis

A person with OI has a 50 percent chance of passing on the disorder to each child. The child will have the same OI-causing mutation as the parent, although the child's symptoms may be milder or more severe than the parent's symptoms. It is possible that the child of a person with OI will have a spontaneous genetic mutation resulting in a different type of OI, but the chances of this happening are no greater for a parent with OI than they are for the general population**.** Some individuals with very mild OI have been known to have a child with more severe symptoms. In these cases, it is believed that the parent is a mildly affected mosaic for OI. Mosaicism means that the individual carries a mutation for OI in only some of his or her cells. This can cause very mild symptoms of OI or none at all in the carrier. Excluding OI, the risk of other congenital disorders in pregnancies in which one parent has OI is the same as that of the general population.

It is recommended that couples at risk of having a child with OI seek genetic counseling before conception, or as early in the pregnancy as possible. A genetic counselor can provide information on OI genetics and prenatal diagnosis. Collagen testing of the parent with OI can be a useful tool to diagnose the child. Because collagen testing takes months to be completed, it should be initiated before conception if the person with OI has not been previously biopsied. A geneticist can also provide information about preimplantation genetic testing.

Preimplantation genetic testing or preimplantation genetic diagnosis is a new procedure that has recently become available. It involves in vitro fertilization plus the added step of "embryo analysis." After a couple has gone through the initial stages for in vitro fertilization and embryos have been formed, a single cell is removed from the dividing cells at the 8-cell stage and is tested for a single genetic condition, in this case OI. If the embryo does not show any signs of OI, it is then implanted in the mother to continue normal development. At this time there is no known adverse effect on the fetus to having one cell removed at this stage. To be a candidate for this procedure, the parent's exact genetic mutation must be identified, usually through a collagen biopsy or DNA analysis, and a mutation-specific test developed. This procedure cannot remove the OI gene (or the gene for any other condition), but only embryos without the mutation are implanted**.**

Undergoing prenatal diagnosis does not obligate parents to elect pregnancy termination, and the information may be useful in managing pregnancy and delivery. According to a recent study (Cubert), prenatal diagnosis did not influence mode of delivery in most instances.

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Prenatal Diagnosis

There are three techniques for prenatal diagnosis of OI in a fetus. None of these techniques can detect OI in 100 percent of the cases in which it occurs. Individualized assessment by a genetic counselor and/or geneticist is necessary to determine which techniques are most useful for a particular pregnancy.

Ultrasound can be used to examine the fetus' skeleton for bowing, fractures, shortening, or other bone abnormalities consistent with OI. Ultrasound is generally most helpful for prenatal diagnosis of the more severe forms of OI. The fetal skeleton shows signs of OI as early as 16 weeks in OI Type II and 18 weeks in OI Type III. Fetuses with mild OI seldom show evidence of fractures or deformity before birth. Ultrasound is a noninvasive, low-risk procedure. There are different levels of ultrasound, some of which are more useful than others in detecting OI.

Chorionic villus sampling (CVS) and **amniocentesis** analyze cells obtained from the fetus for collagen defects and/or a genetic mutation that causes OI. CVS looks at placental cells, while amniocentesis examines fetal cells (amniocytes) shed into the amniotic fluid. Both of these procedures carry a risk of miscarriage (about 1 in 200 for amniocentesis, and about 1 percent for CVS). These prenatal tests are useful if the parent who has OI already has the results of his or her own collagen or DNA tests. For more information about these prenatal diagnostic procedures, consult a genetic counselor, and see the OI Foundation fact sheet titled OI Issues: Genetics.

Delivery Options

In general, decisions about the best mode of delivery (vaginal vs. cesarean) should be made on an individual basis. There are no definitive research data showing that cesarean delivery is safer than vaginal delivery in women with OI who have normal pelvic dimensions and no other significant complications. A recent study (Cubert) found evidence that cesarean delivery did not decrease fracture rates at birth in infants with non-lethal forms of OI nor did it prolong survival for those with more severe forms. Some physicians believe it is appropriate, when planning a mode of delivery, to assess the degree of mineralization of the baby's skull. Theoretically, there is an increased risk of central nervous system injury with vaginal delivery when the baby's skull is poorly mineralized. Most cesarean deliveries in a recent study were done for the usual obstetric indications. (Cubert).

Some physicians might consider a planned cesarean section if a woman has a history of pelvic fractures or contracted pelvis, if the woman has a severe form of OI, or if other significant complications are present. Some of the complications that have been reported during delivery include a birth canal that is too small to permit birth, uterine rupture, and hemorrhage. Women at greatest risk for bleeding are those with a history of recurrent nosebleeds, easy bruising, or excessive bleeding following previous surgical procedures. Though uterine rupture has been reported to occur (Carlson), it does not appear to be a frequent complication.

Because some people with OI may be at increased risk for hyperthermia (an increase in body temperature in response to anesthesia), some physicians might consider spinal or epidural anesthesia to be the safest approach. However, these anesthesia procedures, which involve injection of medication near the spine, may be difficult in some women with spinal curvature, deformity or compression fractures.

Planning for the delivery should also include conferring with the hospital's neonatologist, chief obstetrical nurse and nursery staff. Medical personnel who have experience with premature infants often have the skills necessary to handle a tiny, fragile baby who has OI. Parents may also want to make arrangements, prior to the due date, to have cord blood saved for DNA analysis. It can be helpful for families at risk for OI Type I or Type IV to have the question of OI inheritance answered as soon as possible.

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