Long-term health outcomes of surgical menopause
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The onset of natural menopause is defined as a 12-month span with no menstrual period. In the U.S., the average age for natural menopause is 51. Estrogen levels change in the 2 years prior to menopause and continue to drop 2 years after menopause.

Surgical menopause and its effects
Menopause can occur because of surgical procedures that cause a sudden decrease in hormone levels, rather than the gradual decrease from natural menopause.

- Bilateral salpingo-oophorectomy removes the fallopian tubes and the ovaries but retains the uterus. Women will experience menopause after this surgery because of a sudden decrease in hormone levels.
  - Salpingectomy is removal of only the fallopian tubes while leaving the ovaries. Salpingectomy does not result in surgical menopause because the ovaries are able to maintain hormone levels.

- Hysterectomy removes the uterus and cervix but leaves the ovaries intact. Although women do not have menstrual periods after hysterectomy, they usually have higher hormone levels than menopausal women. After hysterectomy, women typically experience menopause 1-2 years earlier than if they had not had a hysterectomy.
  - A subtotal hysterectomy removes the uterus but leaves the cervix. Women are candidates for this procedure if there is no reason to have the cervix removed. Women who have had abnormal Pap smears or cervical cancer are not appropriate candidates for this procedure.

Risk-reducing salpingo-oophorectomy (RRSO) reduces breast and ovarian cancer risks in BRCA mutation carriers:

- RRSO significantly decreases the risk of ovarian, fallopian tube, and peritoneal cancer. It also significantly decrease risk of breast cancer (up to 75%).
• NCCN guidelines provide recommendations for the age at which RRSO provides the most benefits in terms of cancer reduction, depending on whether a woman has a BRCA1 or BRCA2 mutation.

• Generally, in the U.S., half of women with BRCA mutations have RRSO. While some tend to wait until they are 45 years or older to avoid side effects, in doing so they may not receive the maximum risk reduction benefit of RRSO.

Other consequences of early menopause

Early menopause as a result of RRSO is a known risk factor for other diseases. These are unrelated to the decreased cancer risk that occurs following RRSO in high-risk women.

Women who experience early menopause are known to have an increased risk of heart disease as estrogen is thought protect heart function by suppressing LDL levels. No studies have been conducted on heart health in women with BRCA mutations who have had RRSO.

Early menopause also increases risk of osteoporosis. Estrogen helps to keep bones strong; when estrogen declines at menopause, bone density rapidly decreases. Taking exogenous (outside the body) estrogen (estrone, estradiol, or estriol) does not protect against decreased bone density. Research has shown that RRSO before the age of 50 leads to a higher risk for osteopenia—a precursor to osteoporosis. Between 30-72% of women (without hereditary cancer syndromes) who experience surgical menopause develop osteopenia.

Early menopause also increases risk of impaired cognition. There is strong biologic evidence shows that estrogen supports cognitive function, yet no studies have been done on post-RRSO cognition.

Unfortunately, for women who undergo RRSO, it is difficult to be certain about risk of other health-related outcomes due to lack of long-term outcome data. However, studies are underway on try to address this important issue.