

Transvaginal Ultrasound-Guided Oocyte Retrieval ^[1]

By: Lane, Alison Keywords: [egg retrieval](#) ^[2] [assisted reproductive technology \(ART\)](#) ^[3] [ultrasound imaging](#) ^[4]

Transvaginal [ultrasound](#) ^[5]-guided [oocyte](#) ^[6] retrieval, also known as [egg](#) ^[7] retrieval, is a surgical technique used by medical professionals to extract mature eggs directly from the women's ovaries under the guidance of [ultrasound](#) ^[5] imaging. In 1982, physicians Suzan Lenz and Jørgen Lauritsen at the [University of Copenhagen](#) ^[8] in Copenhagen, Denmark, proposed the technology to improve the [egg](#) ^[7] collection aspect of [in vitro](#) ^[9] [fertilization](#) ^[10], or IVF. During IVF, a healthcare practitioner must remove mature eggs from a woman's ovaries to fertilize them with [sperm](#) ^[11] outside of the body. Transvaginal [ultrasound](#) ^[5]-guided [egg](#) ^[7] retrieval is a surgery that can be completed in a medical office setting in twenty minutes. Transvaginal [ultrasound](#) ^[5]-guided [egg](#) ^[7] retrieval increased mature [egg](#) ^[7] collection and rates of successful [fertilization](#) ^[10], becoming the new standard for [egg](#) ^[7] collection in IVF.

Prior to the late 1980s, laparoscopy was the standard surgical procedure used to collect eggs for IVF, requiring the patient to be fully unconscious in a hospital setting. IVF was first successfully used to accomplish human [pregnancy](#) ^[12] in 1978 by medical researchers [Robert Edwards](#) ^[13] and [Patrick Steptoe](#) ^[14]. Healthcare practitioners perform IVF on a woman in a series of steps. First, the patient's healthcare provider typically prescribes the woman some medications that increase the ovaries' [egg](#) ^[7] production. Then, fertility specialists retrieve the mature eggs via a procedure, which was laparoscopy before [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval, after which they fertilize the eggs with [sperm](#) ^[11] outside the woman's body. The fertility specialist then transfers the resulting embryos into the woman's [uterus](#) ^[16]. In order to retrieve the mature eggs for [fertilization](#) ^[10], Edwards and Steptoe used laparoscopy. For laparoscopic procedures, a surgeon inserts a thin tube with a camera attached to the end into the patient's abdomen via a surgical incision, in which they can use a variety of surgical instruments to extract the eggs. The technique comes with downsides, as the patient must be fully unconscious and there are many risks, including bleeding, infection, and abdominal pain.

As a result of the rising demand for IVF, researchers developed [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval in the late 1980s to resolve some of the technical limitations of laparoscopy. Physicians Lenz and Lauritsen, who worked together at the [University of Copenhagen](#) ^[8] in Copenhagen, Denmark, were some of the first researchers to investigate the use of [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval in 1982. From their preliminary research, Lenz and Lauritsen concluded that the new technique was safer and less expensive than laparoscopy. Then, in 1984, Pierre Dellenbach and his colleagues in Strasbourg, France, built upon Lenz and Lauritsen's research by successfully using [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval during five IVF procedures. After several other researchers began utilizing the technology throughout Europe, it became the standard of [egg](#) ^[7] retrieval for IVF towards the late 1980s. A 1987 article published in the *Toronto Star* details the first implementation of the novel technique at University Hospital in Ontario, Canada. University Hospital's [in vitro](#) ^[9] co-director, Stanley Brown, stated that unless their [ultrasound](#) ^[5] machinery broke down, there was a low chance that laparoscopy would be performed in the context of IVF at the hospital ever again.

As of 2020, [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval is still the standard practice for IVF [egg](#) ^[7] retrieval and is a relatively safe procedure that takes between twenty to thirty minutes. For patients undergoing IVF, [egg](#) ^[7] retrieval begins about thirty-five hours after being injected with a medication used to complete the ovarian stimulation process. To prepare for the procedure, the patient must stop eating or drinking after midnight the night before the procedure in order to avoid inhaling stomach contents during the procedure. On the day of the operation before the actual procedure begins, a healthcare professional administers pain-blocking medication directly into the patient's bloodstream to prevent any discomfort during the procedure. Unlike laparoscopy where the patient is fully unconscious under general anesthesia, the patient is conscious throughout an entire [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval procedure. Some physicians perceive that as advantageous because surgical procedures using general anesthesia are often associated with increased risks of side effects and increased costs. Some of those side effects include bleeding into the abdomen, injury to surrounding pelvic structures, and infection.

Healthcare professionals conduct [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval in a series of steps, beginning with the patient lying back on a table with both of their legs bent and supported by stirrups. First, the healthcare professional rinses the woman's [vagina](#) ^[17] with sterile water, and then inserts an [ultrasound](#) ^[5] probe into the [vagina](#) ^[17] to visualize the ovaries and fluid-filled [egg](#) ^[7] follicles. During a typical menstrual cycle, follicles within the ovaries house immature eggs while one will typically reach maturity each month. However, during IVF, patients take medications that enable many eggs to mature during one cycle rather than just one. Using the [ultrasound](#) ^[5] probe as guidance, the doctor inserts a thin needle into the patient's [vagina](#) ^[17], through the vaginal wall, and into the [ovary](#) ^[18] to access the mature eggs. Once inside the [ovary](#) ^[18], the needle, attached to a suction device, is guided by the doctor into follicles where it gently sucks up follicular fluid containing mature eggs. Physicians only collect mature eggs because immature eggs cannot be fertilized. The patient should feel minimal pain during the procedure,

and following the completion of the procedure, they must remain in the clinic for an hour to rest before heading home to fully recover.

Although many patients return to work the day after their procedure, they may experience some side effects. Because [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval is done under the guidance of [ultrasound](#) ^[5], severe complications are exceedingly rare, but mild side effects such as soreness, cramping, and bleeding are common. Those side effects can occur due to the manipulation of the ovaries and the small punctures used to extract the eggs from the ovaries. Because the ovaries can become enlarged from stimulation, the patient should avoid lifting heavy objects and high intensity exercise like running until the ovaries return to a normal size. According to Lucile Packard Children's Hospital at [Stanford University](#) ^[19] in Palo Alto, California, ovaries typically return to a normal size in about six to ten weeks, or until [menstruation](#) ^[20] occurs if the IVF [pregnancy](#) ^[12] is unsuccessful. Healthcare providers may also recommend that the patient avoid [sexual intercourse](#) ^[21] and hot tubs following the procedure to reduce the risk of infection. Despite those precautions and potential side effects, many physicians utilize [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval over any other methods of retrieval.

Aside from decreased operating room times and expenses, research suggests that [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval is more successful than laparoscopic [egg](#) ^[7] retrieval. Some of the measures of success include higher numbers of retrieved mature eggs and higher [fertilization](#) ^[10] rates, meaning physicians are able to transfer more [viable](#) ^[22] embryos. One study done in 1988 by David Seifer and colleagues at the Cleveland Clinic Foundation in Cleveland, Ohio, directly compared [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval to other methods of [egg](#) ^[7] retrieval like laparoscopy. They found that, in comparison to laparoscopic retrieval, [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval enabled physicians to acquire a higher number of mature eggs based on the visualization of the mature eggs within the ovaries. Laparoscopic methods of [egg](#) ^[7] retrieval have limited visibility, which may increase the likelihood of collecting immature eggs that cannot be used for IVF. Researchers hypothesize that laparoscopic methods of collection may have resulted in lower [fertilization](#) ^[10] rates than [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval. That is because physicians must pump carbon dioxide gas into a patient's abdomen during a laparoscopic procedure, which can potentially harm the eggs. The increased [fertilization](#) ^[10] rates of [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval procedures are not only beneficial to the success of IVF, but further support the technique's usage as IVF's standard method of [egg](#) ^[7] collection.

As of 2020, researchers are studying the effects of three-dimensional ultrasounds to make [transvaginal ultrasound](#) ^[15]-guided [oocyte](#) ^[6] retrieval more accurate and precise. Whereas the previous technology utilized two-dimensional [ultrasound](#) ^[5] waves, the use of three-dimensional [ultrasound](#) ^[5] waves has been shown to provide physicians with a more accurate assessment of the size of follicles. Physicians may also use the three-dimensional technology to enhance early screenings which may guide what medications the doctor may prescribe prior to [egg](#) ^[7] retrieval to make it more successful.

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Transvaginal ultrasound-guided oocyte retrieval, also known as egg retrieval, is a surgical technique used by medical professionals to extract mature eggs directly from the women's ovaries under the guidance of ultrasound imaging. In 1982, physicians Suzan Lenz and Jorgen Lauritsen at the University of Copenhagen in Copenhagen, Denmark, proposed the technology to improve the egg collection aspect of in vitro fertilization, or IVF. During IVF, a healthcare practitioner must remove mature eggs from a woman's ovaries to fertilize them with sperm outside of the body. Transvaginal ultrasound-guided egg retrieval is a surgery that can be completed in a medical office setting in twenty minutes. Transvaginal ultrasound-guided egg retrieval increased mature egg collection and rates of successful fertilization, becoming the new standard for egg collection in IVF.

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