Scoping out follicles: simultaneous laparoscopic ovarian cystectomy and oocyte retrieval for fertility preservation

Fertility-sparing surgery in the setting of a large ovarian mass poses a specific set of challenges to the reproductive surgeon. Several factors need to be taken into consideration in the decision-making process such as the patient's age, their ovarian reserve, and future reproductive goals. Yet, the question often boils down to the following: should we proceed with surgery or ovarian stimulation first? This dilemma should be approached on a case-by-case basis, with careful consideration of the advantages and disadvantages of each choice. Proceeding with surgery first may risk collateral damage to the ovarian cortex resulting in a decrease in the patient's ovarian reserve and, consequently, a lower response to future ovarian stimulation. In contrast, ovarian stimulation in the presence of a large ovarian mass can be complicated by poor visualization or access to stimulated follicles or the inadvertent puncture of the ovarian mass, which could lead to bleeding, infection, or seeding if there is a suspicion of malignancy. Yet, we almost never offer—or even consider—the option of doing both simultaneously.

In this issue of *Fertility and Sterility*, Alviggi et al. (1) highlight their experience of performing simultaneous laparoscopic ovarian cystectomy and oocyte retrieval for fertility preservation. The patient was a 31-year-old nulliparous woman with a history of right salpingo-oophorectomy who presented with a 10-cm teratoma in the left ovary. Her serum antimüllerian hormone level was 1.08 ng/mL; however, the investigators were unable to visualize normal ovarian parenchyma or antral follicles via transvaginal or transabdominal ultrasonography (US) and, therefore, decided to proceed with a trial of ovarian stimulation to ascertain follicular development, if any. The patient's ovarian stimulation protocol consisted of 250 IU of recombinant follicle-stimulating hormone and gonadotropin-releasing hormone antagonist (0.25 mg) beginning on cycle days 2 and 5, respectively. Because malignancy could not be ruled out, oral letrozole (5-mg dose daily) was coadministered during ovarian stimulation to reduce serum estradiol levels. Despite no discernible follicular visualization ultrasonographically, increasing estradiol levels were noted, and therefore, ovarian stimulation was continued; the patient eventually received a gonadotropin-releasing hormone agonist trigger on cycle day 13. Laparoscopy was performed under spinal anesthesia on cycle day 15. Abdominal entry was achieved with the Hasson technique. The follicles were aspirated using a 17-gauge aspiration needle with a pressure of 124 mm Hg. The ovarian cyst was then enucleated entirely from the ovarian parenchyma using blunt dissection. Once the cyst was removed, additional follicles were found and aspirated in a similar fashion. A total of 7 oocytes were retrieved, of which 6 mature oocytes were cryopreserved. The entire laparoscopic procedure was performed at an intraperitoneal pressure not exceeding 10 mm Hg. Histologic examination of the ovarian cyst confirmed a mature ovarian teratoma.

Laparoscopic oocyte retrieval (LOR) during the natural menstrual cycle was originally described in 1968 by Steptoe (2). What is more, Louise Brown, the first in vitro fertilization infant, was born to Lesley Brown who underwent LOR (3). This technique is rarely considered nowadays given the feasibility and safety of transvaginal and/or transabdominal approaches; however, its utility remains unquestionable in certain scenarios, such as those described in this video article (1). The investigators should be commended for accomplishing ovarian stimulation in the absence of US monitoring and for excising a large ovarian mass of uncertain malignant potential completely intact during LOR. Many reproductive specialists would have given up on this patient after failing to see any follicular growth, concerned about their ability to safely aspirate any follicles via a transvaginal or transabdominal approach, perhaps describing the patient as a "poor candidate" for fertility preservation. In this context, the video article highlights important technical aspects about performing simultaneous LOR and ovarian cystectomy. For example, a follicle can be distinguished from a cyst by its soft consistency and gray-blue appearance on the ovarian surface. Once the follicle is identified and punctured, abrupt lateral movements should be avoided to reduce the risk of bleeding after aspiration. When performing the cystectomy, an ovarian stripping technique with atraumatic instruments is used, including the use of hydrodissection, which mitigates the risk of damage to the ovarian cortex and follicles. Surgical technique should focus on excising an intact cyst, thereby avoiding peritonitis or malignant dissemination because of intra-abdominal exposure of the cyst contents. The entire procedure can be performed under regional anesthesia, primarily because of its advantages over general anesthesia, namely, increased safety, shorter procedural time, early ambulation, faster resumption of bowel function, and better control of postoperative pain.

Although the clinical management adopted by Alviggi et al. (1) appears unique, some readers may question the investigators' approach. First, there is uncertainty about any attempts at performing transvaginal or transabdominal US with external abdominal pressure to visualize ovarian follicles in the operating room (OR) before laparoscopy. The video clearly demonstrates at least 3 to 4 follicles on the surface of the ovary at the time of laparoscopy, which begets the question of whether these follicles could have been visualized and retrieved transabdominally. The role of pelvic washings or frozen section before or during LOR remained unaddressed. Second, the use of regional anesthesia, specifically spinal anesthesia, has been suggested as an alternative to general anesthesia for laparoscopy; however, the concerns of hypotension after spinal anesthesia, higher sensory level during laparoscopy, particularly shoulder discomfort due to diaphragmatic irritation, and respiratory suppression due to pneumoperitoneum limit its generalizability in routine clinical practice (4). There are additional logistic challenges such as availability of an OR 34 to 36 hours after trigger

and access to an experienced anesthesiologist who is comfortable administering spinal anesthesia for laparoscopy. The latter is critical in cases where unanticipated bleeding or ventilation issues may necessitate prompt conversion to general anesthesia.

To summarize, simultaneous LOR and ovarian cystectomy can be considered an effective strategy in patients with ovarian masses that obscure US visualization of stimulated follicles. Because of the rarity of these procedures, there are minimal data to determine the benefits of coadministration of aromatase inhibitors during ovarian stimulation, the optimal time to schedule LOR after trigger, or the utility of intraoperative US to visualize follicles. Although these procedures can be performed under regional anesthesia, they require systems-based support, including timely access to an OR and experienced anesthesiologists. Although the ultimate question of proceeding with surgery or oocyte stimulation first in patients with ovarian masses remains unanswered, observational data from women with endometriosis suggest that ovarian response and live birth rates are higher in young women ($\leq$35 years) when ovarian stimulation is performed before surgery (5).

CRediT Authorship Contribution Statement

Miguel Russo: Conceptualization, Project administration, Supervision, Writing – original draft, Writing – review & editing. **Steven R. Lindheim:** Conceptualization, Formal analysis, Validation, Visualization, Writing – original draft, Writing – review & editing. **Nigel Pereira:** Conceptualization, Investigation, Methodology, Supervision, Visualization, Writing – original draft, Writing – review & editing.

Declaration of Interests

M.R. has nothing to disclose. S.R.L. has nothing to disclose. N.P. reports consulting fees and honoraria from BioSyent Pharma, Inc., outside the submitted work.

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