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Results from transabdominal ultrasonic guided aspiration of follicles in non-accessible ovaries

Abstract

Aim of study: To report transabdominal ultrasonic guided oocyte retrieval being a feasible, effective, and safe method for collection of oocytes from transvaginally inaccessible ovaries

Methods: We performed a retrospective cohort study of patients aged 18–45 years in IVF/ICSI treatment during the years 2000 to 2021. Records from cycles where transabdominal collection was carried out were included using a registration number for transabdominal collection and the following data were extracted for evaluation: number of oocytes collected, after human choriogonadotropin (hCG) (as a marker of pregnancy), number of transferred embryos, age, BMI, cycle number, and complications including bleeding and infection.

The indications for transabdominal oocyte retrieval were difficulties in visualizing ovaries transvaginal either due fibroids or obesity which in both cases might displace an ovary from the female pelvis. We found a significant higher BMI and cycle number and found reduced number of oocytes collected and embryos transferred amongst patients having oocytes collected transabdominally and a higher cycle number. We observed no bleeding or infections in any of the groups.

Conclusion: Trans abdominal oocyte retrieval is a feasible, effective, and safe method of oocyte retrieval for the purpose of fertility preservation or in patients with inaccessible ovaries via the transvaginal route undergoing IVF.

Keywords: IVF, oocyte collection, transabdominal aspiration, transvaginal aspiration, safety

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Abbreviations: IVF, In Vitro fertilitzation; ICSI, intra cytoplasmic sperm injection; hCG, human choirongonadotropin; BMI, body mass index

Introduction

Ultrasonic-guided aspiration has since the 1980's been the preferred procedure for oocyte collection in assisted fertilization. The method replaced laparoscopy when it became known as a fast, atraumatic, outpatient procedure. The first ultrasonic-guided oocyte collection in the world was performed in Copenhagen in 1980.[1]

It was soon followed up by larger series performed partly in general anesthesia and partly in local anesthesia.[2] These aspirations were done through the abdominal skin as vaginal probes were non-existent. Other groups took up the method and published their results on abdominal puncture.[3–6] This new technique was extensively evaluated using different aspiration systems such as controlled vacuum contra aspiration by a syringe to collect a maximum of oocytes;[7] attention was especially directed towards possible complications.

An overview of these studies is given in the thesis by Suzan Lenz.[8] Oocytes were collected by both laparoscopy and ultrasonic guidance. The recovery rate of oocytes per aspirated follicle varied from 51% to 75% and in the beginning, the recovery rate for the oocytes aspirated via ultrasonic-guided aspiration was lower than that seen by laparoscopy by the same groups and using the same aspiration system.

The right diameter of the needle is crucial for vacuum aspiration, as a small diameter will result in high suction pressure potentially smashing oocytes, and a large diameter will create a low pressure which will result in fewer oocytes harvested. The technique involved a full urinary bladder to show the follicles, and the bladder had to be traversed by the needle during the procedure. This would cause hematuria in the first or few following urinary voidings in up to 20% of the patients. This was the only complication reported by the Copenhagen group at the Copenhagen University Hospital during the 4-5 years the method was used as the first choice. Feichtinger & Kemeter[4] reported cystitis, puncture of bowel and iliac vein. These complications are obviously due to lack of training as the bowel is easily identified by ultrasound; the iliac vein is behind the ovary from the abdominal direction and the needle should not traverse the ovary and go behind reaching the vessels.

With the introduction of vaginally ultrasonic guided collection[9–13] iliac vein puncture became a real problem and was seen in 1-8% in the initial reports. Also, infections began to appear in cultures and in the woman's pelvis. Vaginal bleeding became a new complication, and it has ever since been a problem in IVF treatments and is especially related to the use of thicker needles. Vaginal ultrasonic aspiration became the most preferred method because it is possible for most gynecologists to learn even with little experience in ultrasound.

The ovary is in some cases not visualized or accessible from the vaginal route and most clinics will have to abandon oocytes from such an ovary. In this clinic we have chosen to aspirate transabdominally as our gynecologists are familiar with the old method. The big advantage in these cases is that a full urinary bladder is unnecessary; the ovary is not in the female pelvis in these situations, it is close to the abdominal wall and the urinary bladder is not punctured. Thus, no complications or rare minor complications could be anticipated.

In this study, we want to report the results from transabdominal, ultrasonic-guided collection of oocytes for artificial insemination in cases where the ovary in question was inaccessible by the vaginal route.

Material and methods

Patient cohort

We performed a retrospective cohort study at the Copenhagen Fertility Center in Denmark of patients undergoing oocyte collection from 2000 until 2020. Women admitted to IVF/ICSI, were eligible for inclusion if they had one or more mature follicles for oocyte retrieval after hCG injection 34-36 hours before the timed oocyte pick-up. Different stimulation protocols were used depending on the clinical evaluation of each patient. All women were less than 45 years of age due to Danish legislation.

Oocyte retrieval procedure

No sedatives or intravenous administration of drugs were given during the procedure in the last 3 years of the study. Previously mild intravenous sedation and pain relief were administered, but with the introduction of fine needles of 20 gauge, this was found to be unnecessary. The patient was kept under observation for 30 minutes after oocyte collection.

The vagina was cleaned with isotonic saline. The vaginal probe was cleaned and covered by a sterile transducer cover and a sterile needle guide was mounted. The transducer was introduced to the vagina. Each ovary was inspected separately. If accessible, a single lumen needle was inserted through the needle guide canal to the vaginal vault and identified on the ultrasound screen. Citanest® in a total volume of up to two ml was applied to the vaginal wall and to the ovarian capsule. An empty 20 ml syringe was then mounted on the needle and each follicle was punctured and aspirated by hand. Syringes were changed repeatedly and collected follicular fluids were immediately handed to the technician for inspection under a microscope to inspection for oocytes.

The procedure was repeated on the contralateral ovary. If one or both ovaries were inaccessible from the vaginal route the transabdominal procedure was chosen.

The transducer was prepared as described above and the abdominal skin was sterilized with 70% alcohol, which was also used as transmission media between the skin and the transducer. Follicles were localized and the needle was introduced through the guide. Local anesthesia was applied to the skin and the needle was inserted through the skin and the abdominal wall to the ovary. Follicles were aspirated by a syringe. It was never necessary to traverse the urinary bladder.

Cases with endometriosis were given Zinacef intravenously after the procedure.

Ultrasound equipment

A Brüel and Kjær Flex Focus 500 ultrasound machine and a dynamic vaginal probe (7,5MHz) was used.

Needles

Needles changed during the period. Only single lumen needles were used connected to 20ml syringes and hand-controlled vacuum. Needles with an outer diameter from 1.4mm (17-gauge) to 0.9mm (20-gauge) were used and the development went towards thinner needles as bleeding and pain were minimized with thinner needles. Today, all collections are performed with 20-gauge single lumen needles. All needles were an average of 33cm in length.

Outcome measures

The following data were extracted from the records: type of aspiration (transabdominal or vaginal), number of oocytes collected, hCG (as a marker of pregnancy), number of transferred embryos, age and BMI of the woman, cycle number, registered pain, infection, and bleeding.

Statistical method

Statistical software GraphPad Prism 9 (GraphPad Software San Diego, CA; USA) was used to perform the statistical analysis. The level of statistical significance was set at P-value<0.05. Data were assumed to follow a gaussian distribution. Students T-tests were performed between the two groups for the following parameters: number of oocytes collected, hCG (as a marker of pregnancy), number of transferred embryos, age, BMI, cycle number.

Results

17208 oocyte pickups were performed, of these were 149 perfomed transabdominally and 17059 transvaginally. In total 7447 patients were included in the study.

None of the groups had registered infections or bleedings.

We found significant differences in BMI, cycle number, number of oocytes collected, and number of embryos transferred between the two groups, however no differences in pregnancy rate or age were found (Table 1) and (Figure 1).

The number of oocytes picked up and embryos transferred were significantly lower in the transabdominal group compared to the transvaginal group (Figure 1b,1c), and transabdominal oocyte collections took place significantly further into the process than the transvaginal oocyte collections with the average cycle number being 3.5 and 2.9, respectively (Figure 1d). Patients who underwent transabdominal aspiration had a significantly higher BMI compared to the transvaginal group (Figure 1e). No significant difference in pregnancy rate was found between the two groups. For further details, see Table 1.

Table 1 Transabdominal and transvaginal treatment groups stratified by baseline characteristics and fertility treatment outcomes

	Transabdominal (n=149)	**Transvaginal (n=17.059)**	**p-value**
Age	38.1	37.8	0.3
BMI	27	23.9	<0.0001
Number of cycles	3.5	2.9	0.003
Number of oocytes picked up	3.9	5.9	<0.0001
Number of transferred embryos	1.5	1.7	0.005
hCG (pregnancy rate)	0.1745 (17.5%)	0.2344 (23.4%)	0.103

Notes: BMI; HCG. Significant values (p<0.05) are written in bold.

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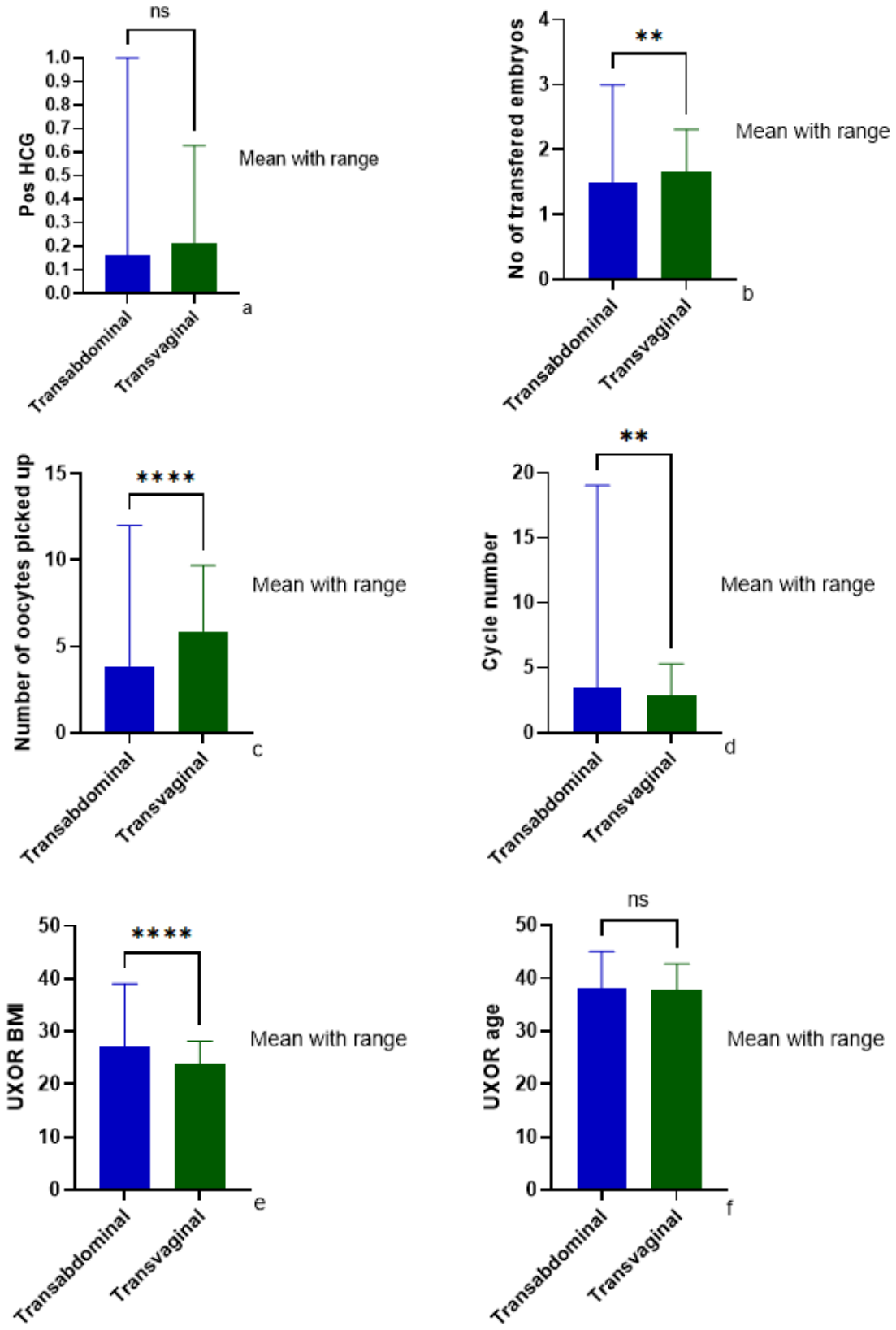

Figure 1 Results of student t-tests performed between transabdominal and transvaginal groups for the indicated parameters. (ns=non significant, **= p<0.005, ***= p<0.0001).

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Discussion

Our results show that transabdominal oocyte collections are not associated with an increased risk of infections or bleeding. They also suggest that trans abdominal oocyte collections are mainly performed in the presence of complicating factor involved. This is based on the fact that these patients have had significantly more previous treatments than patients who underwent vaginal oocyte collection. Being overweight is generally accepted as a predisposing factor for both reduced fertility and reduced success of fertility treatments.[14] This combined with the beforementioned indication of abdominal oocyte collections being performed on more complicated cases could explain the significant fewer oocytes collected and embryos transferred in this group. However, despite the lower number of embryos transferred, there is no difference in the number of positive hCG tests between the two groups.

Most clinics will cancel the cycle in which oocytes cannot be collected via the transvaginal method, but our results clearly show that patients who undergo transabdominal oocyte collections can expect equal chances of pregnancy pr. cycle as patients who have oocytes collected transvaginally. However, should embryo freezing be desired, the patients should expect fewer eligible embryos.

Reducing needle thickness always results in less pain, bleeding, and infection risk, and our results demonstrate that a single lumen 20G needle can be used for trans abdominal oocyte collection making the oocyte retrieval feasible without sedation. There is a limit to the smallest size of a puncture needle to be used for transabdominal and transvaginal puncture as a certain stiffness is needed for the procedure to manipulate the needle in the right position and not to harm the cumulus oocyte complex, but we have previously shown that 20G needles can be used safely and efficiently also vaginally.[15]

Conclusion

We conclude that ovaries that are inaccessible transvaginally should not cause cancellation of treatment if the expertise is present in the clinic to perform transabdominal oocytes collections, as these patients can expect equal results to patients having oocytes collected transvaginally.

Furthermore, we conclude that transabdominal oocyte collection does not carry an increased risk of infections, and if performed with a thin needle the pain is minimal and the procedure can be performed without sedation and only local anaesthesia.

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Author contribution statement

Oocyte aspirations were performed by S. Lenz, G.J. Almind, and S. Lindenberg. Data collection and statistics were performed by G.J. Almind, S. Lindenberg and F. Lindenberg. All authors contributed to writing the manuscripts.

Ethics statements

Studies involving animal subjects: Generated Statement: No animal studies are presented in this manuscript.

Studies involving human subjects: Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Inclusion of identifiable human data

Generated Statement: No potentially identifiable human images or data are presented in this study.

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Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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