Research Article **ISSN 2639-944X**

Journal of Medical - Clinical Research & Reviews

The Impact of Enucleation of Unilateral Endometriomas on the Ovarian Reserve and Reproductive Function

Grigalashvili Nugesha*

Amtel Hospital, Tbilisi, Georgia.

***Correspondence:**
Nugesha Grigalashvili, 9, Tsinandali str., Postal code: 0144, Georgia, Tel: +995 599 239927.

Received: 08 May 2022; **Accepted:** 01 Jun 2022; **Published:** 06 Jun 2022

Citation: Grigalashvili N. The Impact of Enucleation of Unilateral Endometriomas on the Ovarian Reserve and Reproductive Function. J Med - Clin Res & Rev. 2022; 6(5): 1-5.

ABSTRACT

Background: *The data concerning the impact of endometrial cystectomy on the ovarian reserve is controversial. It is not clear how the cyst size and women age influence the outcome of surgical intervention in participants with ovarian endometrioma.*

Objectives: *The study was aimed to evaluate the impact of enucleation of unilateral endometriomas on the ovarian reserve and reproductive function with regard to cyst size and women age.*

Materials and Methods*: The study included 60 participants aged 19-40 years, with unilateral endometrioma and infertility, who underwent laparoscopy. Study participants were divided into 2 groups by the size of cyst: <3 and ≥ 3 cm. Each group was divided into subgroups by the age of participants: <35 and ≥ 35 years. The serum level of anti-mullerian hormone and antral follicle count were determined before, after 1 and 6 months of cystectomy. The rate of pregnancy was recorded during 1 year of post-surgery.*

Results*: The level of anti-mullerian hormone and antral follicle count were significantly low in participants aged ≥ 35. Ovarian reserve decreased in all participants after 1 month of surgery, restored after 6 months in younger women, but didn't reach the preoperative level. The pregnancy rate was low in participants aged ≥ 35 with cyst ≥ 3cm and no significant difference was found between smaller vs. larger cyst groups.*

Conclusion: *Endometrial cyst size does not affect the reproductive outcome in women after laparoscopic cystectomy; however, the age of participants and preoperative ovarian reserve are significant factors regarding reproductive function. Thus, preoperative ovarian reserve should be considered before surgery, especially in women aged ≥35 years.*

Keywords
Cystectomy, Ovary, Reserve, Reproduction.

Introduction
Laparoscopic enucleation of endometrial cysts is widely used in the treatment of infertility in participants with ovarian endometriosis [1-4]. There is no consensus between the research results, concerning the influence of endometrial cystectomy on the ovarian reserve. Some authors report on the advantage of laparoscopic enucleation as compared to other surgical interventions. Higher expectancy of first pregnancy, milder non-menstrual pain and milder dysmenorrhea are registered after laparoscopic enucleation as compared to the drainage and bipolar coagulation of internal lining and fenestration and coagulation of endometrial cyst [5-7]. Laparoscopic enucleation of endometrial cysts is related to the lower rates of recurrence [8,9].

The serum level of the anti-mullerian hormone (AMH) and antral follicle count (AFC) is an indicator of ovarian reserve. AMH is produced in the granulose tissue of the antral follicles and the damage to this tissue causes the decrease for AMH. Therefore, assessment of the serum level of AMH before and after cystectomy

provides information about the influence of surgical intervention on the ovarian reserve [10].

Some studies reported a decrease in the serum level of AMH after ovarian surgery as compared to the preoperative level [3,11]. After 3 months of follow-up, the level of AMH was found significantly decreased in participants, who underwent laparoscopic enucleation of the ovarian cyst [4,12-14]. However, some other studies report the recovery of AMH level after surgery at the 1 year of observation [2,15]. The research data concerning AFC before and after ovarian cystectomy are controversial as well. AFC was found to decrease after 3 and 6 months of surgery [5,16,17]. In contrary, other studies reported the increase of AFC after cystectomy, as compared to the preoperative AFC in the 6 and 12 months follow-up [18]. According to some authors, AFC does not change significantly after laparoscopic intervention [11,19,20]. Endometriotic cystectomies are reported to associate with a significant reduction in the AMH levels, but not in the AFC and AMH level is suggested to provide a more accurate assessment of the risk for iatrogenic depletion of the ovarian reserve in women with endometrioma [21].

According to the authors, endometriotic cystectomy does not affect ovarian tissue significantly when surgery is performed with accurate technique, but disease severity results in the loss of normal ovarian parenchyma [18,22]. Less is known about the role of age and cyst size in the outcome of surgical treatment of ovarian endometrioma with respect to the patient's fertility. It is not clear how the size of a cyst influences the outcome of the treatment for fertility and there is no consensus about age as a factor affecting the outcome of surgical intervention in participants with ovarian endometrioma [10,16]. Current study was aimed at further clarification of the impact of enucleation of unilateral endometriomas on the ovarian reserve and reproductive function. At the same time, we aimed to find if the age of study participants and the size of cyst has influence on the outcome of surgical treatment of ovarian endometrioma with respect to the patient's fertility.

Materials and Methods

The study was conducted in the Amtel hospital, Tbilisi, Georgia in the years of 2018-2020. Cohort study included 60 participants, aged 19-41, with unilateral ovarian endometrial cysts and infertility. Gynecologist put the diagnosis in the moment of the first visit of study participants to the hospital. Decision about surgical intervention was taken by treating gynecologist based on clinical examination. Participants underwent laparoscopic enucleation of ovarian endometrial cysts, without any hormonal treatment before and after surgery. Participants with anovulation, immunological, tubo-peritoneal and male factors of infertility were excluded from the study. Participants were divided into 2 groups by the size of a cyst: I gr - 31 participants with cyst size <3 cm and II gr - 29 patient with cyst size ≥ 3 cm. Each group was divided into subgroups by the participants' age: A - <35 years and B - ≥ 35 years (Table 1).

AFC and the level of the serum AMH were determined on the 2-3th day of the menstrual cycle before surgical intervention and after 1 and 6 months of cystectomy. The rate of pregnancy was recorded during 1 year of post-surgery follow-up.

Ethical consideration

Ethical Committee of the Amtel Hospital approved the methods used in the study. All participants signed a written consent concerning the use of their personal clinical data and publication of these data in the form of scientific article.

Statistical analysis

Paired Samples T-test and Pearson correlation test of the SPSS software version 23 was used for data statistical analyses.

Results

The preoperative serum level of AMH was statistically significantly higher in IA subgroup 3.14 ± 1.01ng/ml as compared to IB subgroups 1.60 ± 0.79 ng/ml as well as in IIA subgroup 3.20 ± 0.94 ng/ml as compared to IIB subgroup 1.12 ± 0.78 ng/ml (P=0.00). 1 month after the surgical intervention the level of AMH was significantly decreased in all subgroups (P=0.00). In IA subgroup, after 6 postoperative months, the AMH level was increased significantly from 1.71 ± 0.61 ng/ml to 2.26 ± 0.79 ng/ml (P=0,00), while in IB subgroup increase in the level of AMH from 0.86 ± 0.56 ng/ml to 0.98 ± 0.56 ng/ml was statistically insignificant (P=0.078).

In IIA subgroup, after 6 months of surgery, the mean level of AMH was found increased significantly from 1.94 ± 0.77ng/ml to 2.37 ± 0.82ng/ml (P=0.00). On contrary, in IIB subgroup after 6 months of cystectomy the level of AMH -0.42 ± 0.38 ng/ml was unchanged from the previous figure – 0.43 ± 0.50 ng/ml (P=0.859).

In all subgroups, the levels of AMH after 1 and 6 months of surgery were significantly low as compared to the preoperative levels (P=0.00) (Table 2).

In the IA subgroup, the preoperative level of AFC – 10.37 ± 1.82 was significantly higher as compared to the IB subgroup 6.73 ± 2.31 (P=0,00). In the IIA subgroup, preoperative AFC – 10.28 ± 2.49 was significantly higher as compared to IIB subgroup 5.46 ± 2.26 (P=0.00), as well.

In 1 month after surgery AFC was significantly decreased in IA and IB subgroups till 4.81 ± 1.27 and 3.13 ± 1.18 respectively (P=0.00), but a significant increase was registered in 6 months after surgical intervention up to 7.87 ± 1.96 (P=0.00) and 4.06 ± 2.31 (P=0.00) respectively.

In participants of IIA and IIB subgroups, the AFC was found significantly decreased after 1 month of surgery till 5.28 ± 1.72 and 2.40 ± 1.45 respectively (P=0.00). In 6 months, the AFC was increased significantly in IIA subgroup-7.07 ± 2.67 (P=0.001), however, remained unchanged in IIB subgroup -2. 73 ± 1 (P=0.136). AFC remained significantly decreased after 1 and 6 months of surgery as compared to the preoperative level in all groups (P=0.00) (Table 3).

Table 1: Distribution of participants with respect to the age and the size of cyst.

Number of participants in groups	Number of participants in subgroups	Mean age	The mean diameter of endometrial cyst
I group 31 participants	IA 16 participants	27.69 ± 4.78 (21-34 years)	2.42 ± 0.28 cm
	IB 15 participants	37,47 ± 2,13 (35-41 years)	2,46 ± 0,30 cm
II group 29 participants	IIA 14 participants	26,00 ± 5,39 (19-34 years)	4,35 ± 0,77 cm
	IIB 15 participants	38,07 ± 2,21 (35-41 years)	3, 99 ± 0,62 cm

Table 2: The serum anti-müllerian hormone (ng/ml) and antral follicle count before and after the laparoscopic ovarian cystectomy (statistically significant difference between: *preoperative and 1 month postoperative periods, £1 and 6 month postoperative periods, ¥preoperative and 6 month postoperative periods).

Subgroups of participants	AMH					
	before laparoscopy (ng/ml)	1 month after laparoscopy (ng/ml)	6 months after laparoscopy (ng/ml)	*P* value (Before laparoscopy and after 1 month)	*P* value (Before laparoscopy and after 6 month)	*P* value (After 1 and 6 months)
IA	3,14 ± 1,01	1,71 ± 0,61*	2,26 ± 0,79£,¥	<0.001	<0.001	<0.001
IB	1,60 ± 0,79	0,86 ± 0,56*	0,98 ± 0,56¥	<0.001	<0.001	>0.05
IIA	3,20 ± 0,94	1,94 ± 0,77*	2,37 ± 0,82£,¥	<0.001	<0.001	<0.05
IIB	1,12 ± 0,78	0,43 ± 0,50*	0,42 ± 0,38¥	<0.001	<0.05	>0.05

Table 3: Antral follicle count before and after the laparoscopic ovarian cystectomy (statistically significant difference between: *preoperative and 1-month postoperative periods, £1 and 6 month postoperative periods, ¥preoperative and 6 month postoperative periods).

Subgroups of participants	AFC					
	Before laparoscopy	1 Month after laparoscopy	6 Months after laparoscopy	*P* value (Before laparoscopy and after 1 month)	*P* value (Before laparoscopy and after 6 month)	*P* value (After 1 and 6 months)
IA	10,37 ± 1,82	4,81 ± 1,27*	7,87 ± 1,96£,¥	<0.001	<0.001	<0.001
IB	6,73 ± 2,31	3,13 ± 1,18*	4,06 ± 2,31£,¥	<0.001	<0.001	<0.05
IIA	10,28 ± 2,49	5,28 ± 1,72*	7,071 ± 2,67£,¥	<0.001	<0.05	<0.05
IIB	5,46 ± 2,26	2,40 ± 1,45*	2,73 ± 1,94¥	<0.001	<0.001	>0.05

The rate of pregnancy during 1 postoperative year follow-up was such as following: IA subgroup -68. 8%, IB subgroup – 46. 7%, IIA subgroup -64. 3%, IIB subgroup -20%. The pregnancy rate was higher in IA subgroup, though the difference was not statistically significant between IA and IB subgroups (P=0.284). In subgroups IIA the rate of pregnancy was found significantly higher as compared to the IIB subgroup (P=0.014). Thus, no significant difference was found in the rate of pregnancy between the participants aged <35 with smaller vs larger cyst size (P=0.284). The difference in the rate of pregnancy was found statistically insignificant with the respect to cyst size in women aged ≥ 35 as well (P=0.186).

The age of women was found to negatively correlate with the level of AMH and AFC before laparoscopic enucleation of unilateral ovarian endometriomas (r = -0. 88; r = -0. 83), as well as after 1 month (r = -0. 85; r = -0. 78) and 6 months (r = -0.90; r = -0.79), (P=0.00) of surgery.

The rate of pregnancy was found to positively correlate with the parameters of serum AMH level and AFC in preoperative period (r = 0,33; r = 0,40) and with AFC after 6 postoperative months (r = 0.35) (P=0.005). A relatively weak correlation was registered between the rate of pregnancy and AMH level after 6 months of surgery (r =30), (P=0.016). No correlation between the cyst size and any other variables was revealed.

Discussion

According to the data obtained, the subgroups of participants aged ≥35 were distinguished by the lowest preoperative level of AMH and AFC. There was no difference in preoperative levels of AMH and AFC between the subgroups with endometrial cyst size <3 cm and ≥ 3 cm. These findings indicate that size of the cyst does not affect the ovarian reserve, while the age of women is crucial regarding that. The lower preoperative level of AMH and AFC in these participants should be ascribed to the natural decline of ovarian reserve in relatively aged women as compared to younger individuals [17].

Findings concerning the significant decrease in AMH and AFC in 1 postoperative month, are in accordance with the results of other studies [1-3,7,23]. In contrary to the reports on the decrease in the AFC after ovarian cystectomy [8,15], and similar to some other studies [11,12,17,19], our findings confirm the increase in AFC after ovarian cystectomy after 6 post surgery months not only in younger participants, but also in older women with cyst size <3 cm, though the level of AFC did not reach the preoperative level.

Decrease of AMH and AFC after 6 postoperative months, in participants aged ≥ 35 with cyst size ≥ 3 cm, can be ascribed to the damage of ovarian tissue due to enucleation of large endometriomas. The rate of pregnancy after cystectomy is reported to vary from 30% to 60% during the 12 months of observation [16]. The age of participants was heterogeneous and the authors did not discuss the role of age in preserving the ovarian reserve. According to our findings, laparoscopic enucleation of the ovarian endometriomas promotes pregnancy in the first year after surgical intervention. Relatively higher rate of pregnancy after surgery in women aged <35 in our study indicates the better preservation of ovarian reserve in participants, who undergo cystectomy at the younger age. According to our results, the rate of pregnancy positively correlates with AMH and AFC in the preoperative period and the age of women negatively correlates with these parameters. The cyst size was not found to positively correlate to any other variables.

No significant difference in the rate of pregnancy between two the age subgroups with small cyst size was revealed. However, in case of large endometriomas, the pregnancy rate was significantly low in older women. No difference in the rate of pregnancy between the same age subgroups with smaller and large cysts was revealed. These findings suggest that cyst size does not affect reproductive function. The data coincide with the report on no statistically significant correlation between preoperative cyst diameter and ovarian parenchyma removed [22]. Our findings provide argument for existing recommendation concerning consideration of the preoperative ovarian reserve status prior to ovarian cystectomy [24].

Conclusion

Endometrial cyst size does not affect the reproductive outcome in women after laparoscopic cystectomy; the age of participants and preoperative ovarian reserve are significant factors regarding reproductive function; Preoperative ovarian reserve should be considered before surgery, especially in women aged ≥ 35 years.

Acknowledgements

The author is thankful to the "Amtel Hospital" for providing access to the archival recordings.

References

1. Fritzer N, Hudelist G. Love is a pain? Quality of sex life after surgical resection of endometriosis a review. Eur J Obstet Gynecol Reprod Biol. 2017; 209: 72-76.
2. Iwase A, Nakamura T, Kato N, et al. Anti-Müllerian hormone levels after laparoscopic cystectomy for endometriomas as a possible predictor for pregnancy in infertility treatments. Gynecol Endocrinol. 2016; 32: 293-297.
3. Lee N, Min S, Won S. The recurrence rate of ovarian endometrioma in women aged 40–49 years and impact of hormonal treatment after conservative surgery. Sci Rep. 2020; 10: 16461.
4. Owczarek D, Malinowski A, Wilczyński M. Ovarian reserve evaluation after laparoscopic cyst enucleation, depending on applied haemostasis technique and with particular consideration of endometrial cysts. Prz Menopauzalny. 2018; 17: 22-27.
5. Dan H, Limin F. Laparoscopic ovarian cystectomy versus fenestration/coagulation or laser vaporization for the treatment of endometriomas: a meta-analysis of randomized controlled trials. Gynecol Obstet Invest. 2013; 76: 75-82.
6. Karadağ C, Demircan S, Turgut A, et al. Effects of laparoscopic cystectomy on ovarian reserve in patients with endometrioma and dermoid cyst. Turk J Obstet Gynecol. 2020; 17: 15-20.
7. Saridogan, E, Becker CM, Feki A, et al. Recommendations for the Surgical Treatment of Endometriosis. Part 1 Ovarian Endometrioma. Human reproduction open. 2017; 2017: hox016.
8. Lee N, Min S, Won S, et al. The recurrence rate of ovarian endometrioma in women aged 40-49 years and impact of hormonal treatment after conservative surgery. Sci Rep. 2020; 10: 16461.
9. Yadav A, Patel S. A review article on ovarian cystectomy in endometriomas by laparoscopy. Int J Reprod Contraception Obstet Gynecol. 2017; 6.
10. Carnahan M, Fedor J, Agarwal A, et al. Ovarian endometrioma: Guidelines for selection of cases for surgical treatment or expectant management. Expert Review of Obstetrics and Gynecology. 2013; 8.
11. Raffi F, Metwally M, Amer S. The impact of excision of ovarian endometrioma on ovarian reserve: A systematic review and meta-analysis. J Clin Endocrinol Metab. 2012; 97: 3146-3154.
12. Chun S, Cho HJ, Ji Y Il. Comparison of early postoperative decline of serum antiMüllerian hormone levels after unilateral laparoscopic ovarian cystectomy between participants categorized according to histologic diagnosis. Taiwan J Obstet Gynecol. 2016; 55: 641-645.
13. Jang WK, Lim SY, Park JC, et al. Surgical impact on serum anti-Müllerian hormone in women with benign ovarian cyst: A prospective study. Obstet Gynecol Sci. 2014; 57: 121-127.
14. Mostaejeran F, Hamoush Z, Rouholamin S. Evaluation of antimullerian hormone levels before and after laparoscopic management of endometriosis. Adv Biomed Res. 2015; 4: 182.
15. Sugita A, Iwase A, Goto M, et al. One-year follow-up of serum antimüllerian hormone levels in participants with cystectomy: Are different sequential changes due to different mechanisms causing damage to the ovarian reserve. Fertil Steril. 2013; 100: 516-522.
16. Celik HG, Dogan E, Okyay E, et al. Effect of laparoscopic excision of endometriomas on ovarian reserve: Serial changes in the serum antimüllerian hormone levels. Fertil Steril. 2012; 97.

17. Melado L, Vitorino R, Coughlan C, et al. Ethnic and Sociocultural Differences in Ovarian Reserve Age-Specific Anti-Müllerian Hormone Values and Antral Follicle Count for Women of the Arabian Peninsula. Frontiers in Endocrinology. 2021; 12: 735116.

18. Bhat RG, Dhulked S, Ramachandran A, et al. Laparoscopic cystectomy of endometrioma: Good surgical technique does not adversely affect ovarian reserve. J Hum Reprod Sci. 2014; 7: 125-129.

19. Muzii L, Galati G, Di Tucci C, et al. Medical treatment of ovarian endometriomas: a prospective evaluation of the effect of dienogest on ovarian reserve, cyst diameter, and associated pain. Gynecol Endocrinol. 2020; 36: 81-83.

20. Owczarek, D, Malinowski A, Wilczyński M. Ovarian reserve evaluation after laparoscopic cyst enucleation, depending on applied haemostasis technique and with particular consideration of endometrial cysts. Przeglad menopauzalny Menopause review. 2018; 17: 22-27.

21. Younis JS, Shapso N, Ben-Sira Y, et al. Endometrioma surgery a systematic review and meta-analysis of the effect on antral follicle count and anti-Müllerian hormone. American Journal of Obstetrics and Gynecology. 2022; 226: 33-51.

22. Ramachandran A, Dhulkhed S, Bhakta R, et al. Influence of endomeriotic cyst diameter and the severity of endometriosis on the ovarian parenchyma excised during laparoscopic cystectomy. J Clin Diagnostic Res. 2013; 7: 2241-2243.

23. AlKudmani B, Gat I, Buell D, et al. In Vitro Fertilization Success Rates after Surgically Treated Endometriosis and Effect of Time Interval between Surgery and In Vitro Fertilization. J Minim Invasive Gynecol. 2018; 25: 99-104.

24. Cranney R, Condous G, Reid S. An update on the diagnosis, surgical management, and fertility outcomes for women with endometrioma. Acta Obstetricia et Gynecologica Scandinavica. 2017; 96: 633-643.