THOUSAND WORDS ABOUT...

DOI: https://doi.org/10.20883/jms.2017.201

The effect of endometrioma on ovarian reserve

Małgorzata Szczepańska[1], Paweł P. Jagodziński[2], Ewa Wender-Ożegowska[1]

[1] Department of Obstetrics, Gynecology and Gynecological Oncology, Division of Reproduction, Poznan University of Medical Sciences, Poland
[2] Department of Biochemistry and Molecular Biology, Poznan University of Medical Sciences, Poland

ABSTRACT

An ovarian endometrioma is a very common form of endometriosis in women of reproductive age. This review presents the current state of research on ovarian reserve in women with ovarian endometriomas. Endometrioma can negatively affect ovarian markers: the anti-Müllerian hormone (AMH), antral follicle count (AFC) and *in vitro* fertilisation (IVF) results. Decisions on the surgical treatment of endometrial cysts should be carefully thought through, especially in women who have not given birth.

Keywords: endometriosis, AMH, ovarian reserve.

Most ovarian cysts which are recognized in women of reproductive age are related to ovulation and are resolved spontaneously. Ovarian endometrioma is the most common appearance of endometriosis and accounts for 17–44% of women with this enigmatic disorder [1, 2]. The natural course of an endometrioma is unknown, because of the lack of follow-up studies involving untreated women with endometrial cyst [3]. As with dermoid cysts and cystadenomas, endometriomas require surgical treatment. In contrast to other non-functional, benign ovarian tumors, endometrioma *per se* and cystectomy of endometriomas negatively affect ovarian reserve. This article will review the literature on the impact of endometriomas on ovarian reserve. The pathogenesis of infertility in women with endometriosis is not fully understood, except in the case of distorted pelvic anatomy. Among the reasons mentioned as the cause of the inability to become pregnant, impaired folliculogenesis, poor quality of oocytes and embryos and implantation defects are most common [4, 5]. The effect of endometriomas on fertility has not been fully established, although there is some evidence of abnormal physiological mechanisms of ovulation in ovaries with endometriomas, the exact causes are unknown. The inflammatory reaction––typically associated with the presence of endometriosis––may play a role [6]. Another possible mechanism could be mechanical damage to the ovarian tissue or disturbance of the vascularization of the organ by the presence of an expanding ovarian cyst [7].

Currently, there are insufficient data to clarify whether endometrioma- related damage to the ovarian reserve precedes or follows surgery.

An endometrioma is best defined as an ovarian pseudocyst developing from metaplasia of the coelomic epithelium [8] or originating from ectopic endometrial tissue, which constantly invaginates the ovarian cortex [9]. There are several prospective studies, which indicate that patients with endometriomas have reduced ovarian reserve [10, 11]. Ovarian reserve is defined as the functional potential of the ovary that reflects the number and quality of the remaining primordial follicles left in the ovary at any given time [12]. In clinical practice, it is possible to measure only the functional ovarian reserve (maturing, growing follicles), which represents a small percentage of the total ovarian reserve (including non-growing follicles). AFC is the number of small (2–10 mm in diameter) antral follicles. It can be decremented by transvaginal ultrasonography between days 2 and 4 of the menstrual cycle [13].

The most common laboratory tests which are used to measure ovarian reserve are the AMH and follicle stimulating hormone (FSH) tests. AMH belongs to the transforming growth factor-beta family, and is produced by the granulose cells of primary, pre-antral and small antral follicles. Serum AMH levels represent the most reliable marker of ovarian reserve, because they are menstrual cycle independent and are not subject to alteration under the influence of contraceptive pills or gonadotrophin releasing hormone agonists [14].

In a prospective cohort study by Hwu et al. (2011), the impact of unilateral and bilateral endometriomas on serum AMH levels was compared both before and after surgery. The mean baseline serum AMH level was significantly lower in patients with bilateral endometriomas (n = 32) compared to that of patients with unilateral endometriomas (n = 109) (1.56 ± 0.24 (SEM) vs. 2.45 ± 0.17 ng/ml, P < 0.05). The mean serum AMH level was significantly lower in patients treated with bilateral cystectomy than in patients treated with unilateral cystectomy (1.01 ± 0.11 vs. 1.48 ± 0.14 ng/ml, P < 0.05) [10].

In another prospective study, Goodman et al. (2016) evaluated patients with endometriomas (n = 58), pelvic endometriosis (n = 29) and volunteers with no endometriosis (n = 29) to assess AMH levels before and after surgery. This study also demonstrated that baseline AMH values were significantly lower (45%) in the endometrioma vs negative laparoscopy group (1.8 ng/mL [95% confidence interval, 1.2–2.4 ng/mL] vs. 3.2 ng/mL [95% confidence interval, 2.0–4.4 ng/mL]; *P* < 0.02). Only patients with endometriomas had a significant decline in ovarian reserve at 1 month after surgery (-48%; 95% confidence interval, -54 to -18%; *P* < 0.01; mean AMH baseline value, 1.77–1.12 ng/mL at 1 month after surgery). Six months after surgery, AMH values continued to be depressed from the baseline, but these were no longer significantly different [11]. The impact of endometriomas on ovulation and hyperstymulation have been intensively studied [7, 15–18].

In 2008 Horikawa et al. investigated the rate of ovulation in 28 infertile patients with unilateral endometriomas and found a 34% ovulation rate in affected gonads [15]. In a study published in 2009, Benaglia et al. examined ovulation rates in 70 women, based on the assumption that the expected ratio of ovulation in healthy and affected ovaries is about 1:1. Ovulation occurred in affected ovaries in only 22 cases (31%; 95% CI: 22–43%), this difference was statistically significant (*P* = 0.002) [7]. In a prospective study, Somigliana et al. (2006) evaluated responsiveness to ovarian hyperstymulation during IVF-ET cycles in 36 women with unilateral endometriomas who had not undergone previous ovarian surgery. In this study, the number of codominant follicles developing in affected gonads was reduced when compared with the contralateral intact ovaries of the same patients [16]. In a multicenter retrospective cohort study, Benaglia et al. (2013) explored ovarian responsiveness and oocyte quality in 39 unoperated women with bilateral endometriomas and 78 control women. The number of developing follicles and the number of oocytes retrieved was significantly lower in women with bilateral endometriomas. The total numbers of developing follicles in case and control subjects were 9.6 ± 3.3 and 14.1 ± 6.8, respectively. The numbers of oocytes retrieved were 7.1 ± 3.2 and 9.8 ± 5.5, respectively. However, this did not lead to significant differences in the quality of oocytes obtained or the chances of pregnancy [17]. Similar findings were demonstrated by Hamdan et al. (2015) in a meta–analysis, which included 33 studies. Compared with healthy women, women with endometriomas had a lower mean number of oocytes retrieved, required a higher FSH dosage for ovarian stimulation and had a lower AFC, suggesting that their ovarian reserve was diminished prior to IVF/ICSI [18].

Based on this literature review, it can concluded that the presence of endometriomas reduces ovarian reserve. Decisions on the surgical treatment of endometrial cysts should be carefully thought through, especially in women who have not given birth. According to Carvahlo et al., the assessment of AMH levels prior to surgery should be measured in order to discuss the risks and benefits of surgery with patients [19].

Acknowledgements

Conflict of interest statement
The authors declare no conflict of interest.

Funding sources
There are no sources of funding to declare.

References

1. Redwine DB. Ovarian endometriosis: a marker for more extensive pelvic and intestinal disease. Fertil Steril. 1999;72:310–315.
2. Jenkins S, Olive DL, Haney AF. Endometriosis: pathogenetic implications of the anatomic distribution. Obstet Gynecol. 1986;67:335–338.
3. Vercellini P, Frontino G, De Giorgi O, Aimi G, Zaina B, Crosignani PG. Comparison of a levonorgestrel-releasing intrauterine device versus expectant management after conservative surgery for symptomatic endometriosis: a pilot study. Fertil Steril. 2003;80:305–309.
4. Garcia-Velasco JA, Arici A. Is the endometrium or oocyte/embryo affected in endometriosis? Hum Reprod. 1999 Dec;14(Suppl. 2):77–89.

5. Garrido N, Navarro J, García-Velasco J, Remoh J, Pellice A, Simón C.The endometrium versus embryonic quality in endometriosis-related infertility. Hum Reprod Update. 2002;Jan-Feb;8(1):95–103.
6. Sanchez AM, Vigano P, Somigliana E, Panina-Bordignon P, Vercellini P, Candiani M. The distinguishing cellular and molecular features of the endometriotic ovarian cyst: from pathophysiology to the potential endometrioma-mediated damage to the ovary. Hum Reprod Update. 2013;20(2):217–230.
7. Benaglia L, Somigliana E, Vercellini P, Abbiati A, Ragni G, Fedele L. Endometriotic ovarian cysts negatively affect the rate of spontaneous ovulation. Hum Reprod. 2009 Sep;24(9):2183–6.
8. Hughesdon PE. The structure of endometrial cyst of the ovary. J Obstet Gynaecol Br Emp. 1957 Aug;64(4):481–7.
9. Hachisuga T, Kawarabayashi T. Histopathological analysis of laparoscopically treated ovarian endometriotic cysts with special reference to loss of follicles. Hum Reprod. 2002;17:432–435.
10. Hwu YM, Wu FS, Li SH, Sun FJ, Lin MH, Lee RK. The impact of endometrioma and laparoscopic cystectomy on serum anti-Müllerian hormone levels. Reprod Biol Endocrinol. 2011 Jun 9;9:80.
11. Goodman LR, Goldberg JM, Flyckt RL, Gupta M, Harwalker J, Falcone T. Effect of surgery on ovarian reserve in women with endometriomas, endometriosis and controls. Am J Obstet Gynecol. 2016 Nov;215(5):589.e1–589.e6.
12. Ding Y, Yuan Y, Ding J, Chen Y, Zhang X, Hua K. Comprehensive Assessment of the impact of laparoscopic ovarian cystectomy on ovarian reserve. J Minim Invasive Gynecol. 2015;22(7):1252–9.
13. La Marca A, Sunkara SK. Individualization of controlled ovarian stimulation in IVF using ovarian reserve markers: From theory to practice. Hum Reprod Update. 2013;20(1):124–40.
14. Iwase A, Hirokawa W, Goto M, Takikawa S, Nagatomo Y, Nakahara T, Manabe S, Kikkawa F.Serum anti-Müllerian hormone level is a useful marker for evaluating the impact of laparoscopic cystectomy on ovarian reserve. Fertil Steril. 2010Dec;94(7):2846–9.
15. Horikawa T, Nakagawa K, Ohgi S, Kojima R, Nakashima A, Ito M, Takahashi Y, Saito H. The frequency of ovulation from the affected ovary decreases following laparoscopic cystectomy in infertile women with unilateral endometrioma during a natural cycle. J Assist Reprod Genet. 2008;25:239–244.
16. Somigliana E, Infantino M, Benedetti F, Arnoldi M, Calanna G, Ragni G. The presence of ovarian endometriomas is associated with a reduced responsiveness to gonadotropins. Fertil Steril. 2006 Jul;86(1):192–6.
17. Benaglia L, Bermejo A, Somigliana E, Faulisi S, Ragni G, Fedele L, Garcia-Velasco JA. In vitro fertilization outcome in women with unoperated bilateral endometriomas. Fertil Steril. 2013 May;99(6):1714–9.
18. Hamdan M, Dunselman G, Li TC, Cheong Y. The impact of endometrioma on IVF/ICSI outcomes: a systematic review and meta-analysis. Hum Reprod Update. 2015 Nov-Dec;21(6):809–25.
19. Carvahlo L, nataraj N, Rao J, Khetarpal S, Abrao SM, Agarwal A. Seven ways to preserve female fertility in patients with endometriosis. Expert Rev Obstet Gynecol. 2012;7930:227–240.

Acceptance for editing: 2017-08-15
Acceptance for publication: 2017-09-30

Correspondence address:
Małgorzata Szczepańska
Department of Obstetrics,
Gynecology and Gynecological Oncology
Division of Reproduction
Poznan University of Medical Sciences
33 Polna Street, 60-535 Poznan, Poland
phone: +48618419302
fax: +48618419625
email: mal.gin@poczta.fm