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女性生育力保护数字化医疗服务专家共识 (2026 版)

中华医学会儿科学分会

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【摘要】 女性生育力保护是关乎人口长期均衡发展的核心民生议题, 生育力损害已成为影响女性生殖健康与人口发展质量的突出公共卫生问题。传统生育力保护服务存在全流程覆盖不足、个体化指导欠缺、多学科协作不畅等局限, 有待进一步改进, 以满足女性全生命周期生殖健康需求。立足《“健康中国 2030”规划纲要》“发展互联网健康服务”的战略导向, 数字化医疗为破解上述难题提供创新路径。本共识经中华医学会儿科学分会专家循证研讨, 系统性地阐述了数字化女性生育力保护的临床实施路径和全程化管理体系。本共识旨在通过系统化的数字化医疗服务路径, 提升女性生育力保护服务的可及性、精准性与安全性, 为临床实践提供全面、可行的指导依据, 助力女性生殖健康与人口可持续发展。

【关键词】 女性生育力保护; 数字化医疗服务; 临床应用; 专家共识

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Expert consensus on digital healthcare services for female fertility protection (2026)

Society of Family Planning, the Chinese Medical Association

Corresponding authors: Liu Xinyan, Department of Obstetrics and Gynecology, Peking Union Medical College Hospital, Chinese Academy of Medical Sciences, Beijing 100032, China, Email: liuxymeng@163.com; Che Yan, Shanghai Institute for Biomedical and Pharmaceutical Technologies, Institute for Public Health and Policy Research; NHC Key Lab of Reproduction Regulation, Shanghai 200237, China, Email: yan.che@sibpt.cn

【Abstract】 Female fertility protection is a core livelihood issue integral to the long-term balanced development of the population. Impaired fertility has become a prominent public health problem affecting women's reproductive health and the quality of demographic development. Traditional fertility protection

services face several limitations, such as inadequate whole-process coverage, lack of personalized guidance, and inefficient multidisciplinary collaboration, making it difficult to meet women's reproductive health needs throughout their lifespan. Guided by the strategic direction of "developing internet-based health services" outlined in the "Healthy China 2030", digital healthcare offers an innovative approach to addressing these challenges. Based on evidence review and expert deliberations by the Society of Family Planning, the Chinese Medical Association, this consensus systematically elaborates the clinical implementation pathways and whole-process management framework for digital female fertility protection. The consensus aims to enhance the accessibility, precision, and safety of female fertility protection services through systematic digital solutions, providing comprehensive and practical guidance for clinical practice, thereby contributing to women's reproductive health and sustainable population development.

【 Key words 】 Female fertility protection; Digital healthcare services; Clinical application; Expert consensus

Fund program: Beijing Post-Abortion Care Program for Protecting Women's Fertility (FW-QYQT2025051201117)

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临床研究

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囊胚形态学评级与胚胎培养液游离 DNA 浓度之间的相关性研究

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【摘要】 目的 分析囊胚形态学评级与培养液中游离 DNA (cell-free DNA, cfDNA) 浓度之间的关联, 以描述囊胚培养液中 cfDNA 的释放特征。方法 本横断面研究共纳入 2020 年 5 月至 2023 年 9 月在北京大学第三医院妇产科生殖医学中心进行单胚胎培养且单囊胚冻存的不孕症患者夫妇的 485 枚囊胚。收集自受精后第 4

天 (day 4, D4) 起至囊胚冻存前的所有培养液, 采用定量聚合酶链反应检测胚胎培养液中的 *duf1220* 基因, 以间接定量反映培养液中 cfDNA 的含量。采用多因素线性回归分析囊胚发育天数 (D5、D6、D7) 以及不同囊胚形态学评级 [包括内细胞团 (inner cell mass, ICM) 评级、滋养层细胞 (trophectoderm, TE) 评级和囊胚扩张程度] 对胚胎培养液中 *duf1220* 基因浓度的影响。结果 ① 485 枚囊胚培养液 *duf1220* 基因浓度为 0.49 (0.13, 1.07) ng/μL。囊胚发育天数分析显示, D5、D6、D7 组 *duf1220* 基因浓度分别为 0.15 (0.06, 0.57) ng/μL、0.68 (0.35, 1.42) ng/μL 和 3.12 (0.88, 5.73) ng/μL, 组间差异具有统计学意义 ($P<0.001$)。②形态学分析显示, ICM 评级为 A、B、C 级的囊胚 *duf1220* 基因浓度分别为 0.14 (0.06, 0.54) ng/μL、0.52 (0.15, 1.11) ng/μL 和 0.54 (0.16, 1.80) ng/μL, 组间差异具有统计学意义 ($P<0.001$); 而 TE 评级和囊胚扩张程度各组间 *duf1220* 基因浓度差异均无统计学意义 (均 $P>0.05$)。③多因素线性回归分析显示, 校正后 D6、D7 囊胚 *duf1220* 基因浓度仍显著高于 D5 ($P=0.008$, $P=0.002$), 但 ICM 评级的影响在校正后不再具有统计学意义。④分层分析表明, 在 D5 胚胎中 ($n=200$), 不同 ICM 评级间 *duf1220* 基因浓度差异有统计学意义 ($P=0.006$), 而 D6 胚胎 ($n=279$) 各形态学指标间差异均无统计学意义 (均 $P>0.05$)。结论 囊胚培养液中 cfDNA 浓度与胚胎培养天数显著相关, D6/D7 形成的囊胚其培养液中 cfDNA 浓度明显升高。ICM 评级与培养液 cfDNA 浓度的相关性在 D5 囊胚中较为显著, 提示不同发育阶段的胚胎可能具有不同的 DNA 释放特征。

【关键词】 胚胎发育; 凋亡; 胚胎形态学; 胚胎游离 DNA; 培养液

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Study on the correlation between blastocyst morphological grading and free DNA concentration in culture medium

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【Abstract】 **Objective** To evaluate the correlation between blastocyst morphology grading and the concentration of cell-free DNA (cfDNA) in the culture medium, and to explore the release characteristics of cfDNA in blastocyst culture medium. **Methods** A total of 485 blastocysts that underwent single embryo culture and single blastocyst cryopreservation at the Reproductive Medicine Center of the Department of Obstetrics and Gynecology, Peking University Third Hospital from May 2020 to September 2023 were included in this cross-sectional study. Culture medium was collected from day 4 (D4) until before blastocyst cryopreservation. The *duf1220* gene in the embryo culture medium was detected

by quantitative polymerase chain reaction to indirectly quantify the cfDNA content. Multivariate linear regression analysis was used to examine the effects of blastocyst development days (D5, D6, D7) and different blastocyst morphological grades [including inner cell mass (ICM) grade, trophoctoderm (TE) grade and blastocyst expansion degree] on the concentration of *duf1220* gene in the embryo culture medium. **Results** 1) The concentration of *duf1220* gene in the culture medium of 485 blastocysts was 0.49 (0.13, 1.07) ng/ μ L. The analysis of blastocyst formation days showed that the concentrations of *duf1220* gene in the D5, D6, and D7 groups were 0.15 (0.06, 0.57) ng/ μ L, 0.68 (0.35, 1.42) ng/ μ L, and 3.12 (0.88, 5.73) ng/ μ L, respectively, with a significant difference among the three groups ($P<0.001$). 2) Morphological analysis revealed that the concentrations of *duf1220* gene in blastocysts with ICM grades A, B, and C were 0.14 (0.06, 0.54) ng/ μ L, 0.52 (0.15, 1.11) ng/ μ L, and 0.54 (0.16, 1.80) ng/ μ L, respectively, with a significant difference among the three groups ($P<0.001$); however, there were no significant differences in the TE grades and expansion degrees (all $P>0.05$). 3) Multivariate linear regression analysis showed that after adjustment, the *duf1220* gene concentration in D6 and D7 blastocysts as still significantly higher than that in D5 ($P=0.008$, $P=0.002$), but the effect of ICM grade was no longer significant. 4) Stratified analysis indicated that in D5 embryos ($n=200$), the concentrations of *duf1220* gene differed significantly among different ICM grades ($P=0.006$), while in D6 embryos ($n=279$), there were no significant differences among the various morphological indicators (all $P>0.05$). **Conclusion** The concentration of cfDNA in blastocyst culture medium is significantly correlated with the number of culture days. The concentration of cfDNA in the culture medium of blastocysts formed on D6/D7 is significantly higher. The correlation between ICM grade and cfDNA concentration is more significant in D5 blastocysts, suggesting that embryos at different developmental stages may have different DNA release characteristics.

【Key words】 Embryonic development; Apoptosis; Embryonic morphology; Embryonic free DNA; Culture medium

Fund program: National Key R&D Program of China (2023YFC2705604); General Program of National Natural Science Foundation of China (82371706); National Clinical Key Specialty Construction Program (2023)

·临床报道·

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不同体外授精方式对低获卵数患者妊娠结局的影响

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【摘要】 目的 比较低获卵数患者接受不同体外授精方式治疗后的助孕结局。**方法** 通过回顾性队列研究, 选取 2018 年 1 月 1 日至 2021 年 12 月 31 日于北京大学第三医院妇产科生殖医学中心首次接受辅助生殖技术治疗的低获卵数患者, 根据其授精方式进行分组, 纳入卵胞质内单精子注射 (intracytoplasmic sperm injection, ICSI) 组 212 例, 常规体外受精 (*in vitro* fertilization, IVF) 组 1 785 例, 采用 1:1 倾向性评分对两组患者的基本资料和胚胎移植数进行匹配, 匹配到 ICSI 组和常规 IVF 组患者各 206 例。比较不同授精方式对低获卵数患者助孕结局的影响。**结果** 匹配后两组除不孕年限、精子浓度、刺激方案、可移植胚胎形成率外, 其他一般资料、卵巢刺激方案及胚胎实验室参数差异基本均衡 (均 $P>0.05$)。匹配后 ICSI 组的每枚获卵的受精率 [52.87% (469/887)] 低于常规 IVF 组 [65.20% (517/793)], 差异具有统计学意义 ($P<0.001$); 而两组间每枚授精卵子的受精率、人绒毛膜促性腺激素阳性率、临床妊娠率、着床率、流产率、活产率、妊娠期糖尿病发病率、妊娠期高血压疾病发病率、早产率和累积活产率的差异均无统计学意义 (均 $P>0.05$)。控制混杂因素后, 女方年龄和基础卵泡刺激素水平是累积活产的独立影响因素 ($aOR=0.893$, 95% CI : 0.841~0.947, $P<0.001$; $aOR=0.892$, 95% CI : 0.816~0.976, $P=0.012$)。分层分析的结果显示, 在年龄 ≥ 35 岁患者中, ICSI 组累积活产率 [9.00% (9/100)] 显著低于常规 IVF 组 [22.81% (26/114)], 差异有统计学意义 ($aOR=0.318$, 95% CI : 0.124~0.813, $P=0.017$); 在获卵数为 6 枚的患者中, ICSI 组累积活产率 [25.93% (14/54)] 显著低于常规 IVF 组 [45.45% (20/44)], 差异有统计学意义 ($aOR=0.188$, 95% CI : 0.059~0.603, $P=0.006$)。ICSI 组的低出生体质量率 [34.21% (13/38)] 显著高于常规 IVF 组 [15.56% (7/45)], 差异具有统计学意义 ($P=0.048$), 单胎和双胎分娩后两组低出生体质量风险差异均无统计学意义 ($aOR=0.828$, 95% CI : 0.083~5.481, $P=0.844$; $aOR=0.035$, 95% CI : 0.001~1.153, $P=0.060$)。**结论** 低获卵数女性采用 ICSI 不能改善辅助生殖助孕结局, 尤其是年龄 ≥ 35 岁人群建议优先考虑常规 IVF。

【关键词】 体外受精; 精子注射, 细胞质内; 低获卵数; 累积活产率
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Impact of different *in vitro* fertilization methods on pregnancy outcomes in patients with low oocyte yield

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【Abstract】 Objective To compare the assisted reproductive treatment outcomes of patients with low oocyte yield following different *in vitro* fertilization (IVF) methods. **Methods** In this retrospective cohort study, we enrolled patients with low oocyte yield who underwent their first IVF cycle at the Reproductive Medical Center, Department of Obstetrics and Gynecology, Peking University Third

Hospital between January 1, 2018, and December 31, 2021. Participants were divided into two groups based on the different fertilization methods: the intracytoplasmic sperm injection (ICSI) group ($n=212$) and the conventional IVF (cIVF) group ($n=1\,785$). Propensity score matching (1 : 1) was applied to balance baseline characteristics and the number of embryos transferred, resulting in 206 matched patients in each group. The difference in the assisted reproductive treatment outcomes was compared between the two fertilization methods. **Results** After matching, the duration of infertility, sperm density, ovarian stimulation protocol, transferable embryo rate between the two groups were statistically significant, while other baseline characteristics, ovarian stimulation protocols, and embryological parameters were well-balanced between the two groups (all $P>0.05$). The fertilization rate per oocyte retrieved was significantly lower in the ICSI group [52.87% (469/887)] than in the cIVF group [65.20% (517/793), $P<0.001$]. However, no significant differences were observed between the two groups in fertilization rate per inseminated oocyte, positive human chorionic gonadotropin rate, clinical pregnancy rate, implantation rate, miscarriage rate, live birth rate, incidence of gestational diabetes mellitus, incidence of hypertensive disorders of pregnancy, preterm birth rate, or cumulative live birth rate (all $P>0.05$). After adjusting for confounders, female age and baseline follicle-stimulating hormone level were identified as independent factors affecting cumulative live birth (aOR=0.893, 95% CI: 0.841–0.947, $P<0.001$; aOR=0.892, 95% CI: 0.816–0.976, $P=0.012$). In stratified analyses, among patients aged ≥ 35 years, the cumulative live birth rate was significantly lower in the ICSI group [9.00% (9/100)] than in the cIVF group [22.81% (26/114), aOR=0.318, 95% CI: 0.124–0.813, $P=0.017$]. Similarly, among those with 6 oocytes retrieved, the cumulative live birth rate was significantly lower in the ICSI group [25.93% (14/54)] than in the cIVF group [45.45% (20/44), aOR= 0.188, 95% CI: 0.059–0.603, $P=0.006$]. The rate of low birth weight was significantly higher in the ICSI group [34.21% (13/38)] than in the cIVF group [15.56% (7/45), $P=0.048$]. No statistically significant differences were observed in the risk of low birth weight between the two groups after singleton or twin delivery (aOR=0.828, 95% CI: 0.083–5.481, $P=0.844$; aOR=0.035, 95% CI: 0.001–1.153, $P=0.060$). **Conclusion** In patients with low oocyte yield, ICSI does not improve assisted reproductive outcomes compared with cIVF. cIVF should be prioritized, especially in women aged ≥ 35 years.

【Key words】 Fertilization *in vitro*; Sperm injection, intracytoplasmic; Low oocyte yield; Cumulative live birth rate

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·现场调查·

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乳腺癌患者生育力保存决策冲突现状及影响因素研究

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【摘要】 目的 探讨乳腺癌患者在生育力保存决策过程中存在的冲突和影响因素, 为制订决策支持计划提供依据。方法 本研究采用横断面研究, 通过便利抽样法选取郑州大学第三附属医院乳腺甲状腺外科 2024 年 9 月至 2025 年 6 月 303 例乳腺癌患者, 采用决策准备量表、决策冲突量表及广泛性焦虑障碍量表进行调查。相关性分析采用 Pearson 相关, 影响因素分析采用多元线性回归。结果 有 63.4% (192/303) 的乳腺癌患者生育力保存决策准备不充分; 94.7% (287/303) 的乳腺癌患者存在决策冲突 (得分 >37.5 分); 多元线性回归模型表明, 焦虑对冲突具有显著的正向影响 ($\beta=0.21, P<0.001$); 准备度对冲突具有显著的负向影响 ($\beta=-0.16, P=0.011$); 年龄对决策冲突的独立影响主要表现为: 31~40 岁患者的冲突水平显著高于 40 岁以上患者 ($\beta=0.26, P=0.002$); 受教育水平上, 与大专及本科以上相比, 小学及以下 ($\beta=0.21, P=0.010$)、初中学历 ($\beta=0.27, P=0.002$) 患者的决策冲突水平显著更高。结论 大多数乳腺癌患者生育力保存决策时准备不足, 存在较大的决策冲突, 并且焦虑度、决策准备度受到年龄、子女数、文化程度等影响。

【关键词】 乳腺癌; 生育力保存; 决策冲突; 决策准备; 影响因素

Research on the status and influencing factors of decision conflict regarding fertility preservation in breast cancer patients

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【Abstract】 **Objective** To understand the conflicts and influencing factors encountered by breast cancer patients during the decision-making process regarding fertility preservation, in order to provide a basis for developing a decision support plan. **Methods** This study employed a convenience sampling method to select 303 breast cancer patients from the Breast and Thyroid Surgery

Department of the Third Affiliated Hospital of Zhengzhou University between September 2024 and June, 2025. The participants were surveyed using the Decision Preparation Scale, Decision Conflict Scale, and Generalized Anxiety Disorder Scale. Correlation analysis was performed using Pearson correlation, while the analysis of influencing factors employed multiple linear regression.

Results About 63.4% (192/303) of breast cancer patients were inadequately prepared for their fertility preservation decisions, while 94.7% (287/303) exhibited decision conflict (score>37.5). Multivariate linear regression models indicated that anxiety had a significant positive impact on conflict ($\beta=0.21$, $P<0.001$), while readiness exhibited a significant negative effect ($\beta=-0.16$, $P=0.011$). Age's independent influence on decision-making conflict was primarily manifested as follows: patients aged 31–40 years showed significantly higher conflict levels compared with those over 40 years ($\beta=0.26$, $P=0.002$). Regarding education levels, patients with primary school education or below ($\beta=0.21$, $P=0.010$) and junior high school education ($\beta=0.27$, $P=0.002$) exhibited significantly higher decision-making conflict levels compared with those with college or higher education qualifications.

Conclusion Most breast cancer patients are insufficiently prepared when making fertility preservation decisions, have significant decision-making conflicts, and their anxiety levels and decision readiness are influenced by factors such as age, the number of children, and educational attainment.

【Key words】 Breast neoplasms; Fertility preservation; Decision conflict; Decision preparation; Influencing factors

现场调查

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2019—2024 年厦门市行人工流产的女性特征 分析及其变化趋势

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【摘要】 目的 探讨厦门市人工流产女性特征并分析其流行病学变化趋势, 为降低人工流产提供依据。方法 采取以医院为单位的描述性研究, 对厦门大学附属妇女儿童医院优生优育科 2019 年 1 月至 2024 年 12 月施行人工流产手术的育龄

女性资料进行回顾性分析。结果 共纳入人工流产女性 26 127 例，年龄为 (31.20±5.94) 岁，其中 13~24 岁者占 15.4% (4 015/26 127)，已婚占 77.1% (20 153/26 127)，已育占 74.0% (19 339/26 127)。初次妊娠流产者占 17.0% (4 445/26 127)，流产 2 次者占 30.4% (7 932/26 127)，流产 3 次及以上者占 24.8% (6 482/26 127，最多 13 次)，有剖宫产史者占 22.2% (5 810/26 127)。2019—2024 年人工流产手术总量呈下降趋势，女性年龄、生育 2 孩及以上者比例、重复人工流产中高龄 (≥35 岁) 人群比例、已婚者所占比例上升 (均 $P<0.001$)。2019—2024 年，人工流产后选择长效可逆避孕方法 (long-acting reversible contraceptive, LARC) 女性占比基本稳定在 30%~40%，主要集中于 25~34 岁人群，行 LARC 女性中人工流产次数≥3 者占比 37.1% (3 554/9 571)。结论 女性人工流产总数明显下降，但已婚、已育、重复流产中高龄女性所占比例持续增加，人工流产次数越多，流产后选用 LARC 者比例越高。

【关键词】 流产，人工； 产后避孕； 长效可逆避孕措施

Characteristics and trends of women undergoing induced abortion in Xiamen from 2019 to 2024

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【Abstract】 Objective To explore the characteristics of women in Xiamen undergoing induced abortion, and to analyze the epidemiological trends, providing a basis for reducing induced abortions. **Methods** A hospital-based descriptive study was conducted to retrospectively analyze the data of reproductive-aged women who underwent induced abortions in the Aristogenesis Department of Women and Children's Hospital of Xiamen University from January 2019 to December 2024. **Results** A total of 26 127 women undergoing induced abortion were enrolled. The average age of women undergoing induced abortion was (31.20±5.94) years. Among them, 15.4% (4 015/26 127) were aged 13–24 years, 77.1% (20 153/26 127) were married, 74.0% (19 339/26 127) had given birth before, 17.0% (4 445/26 127) were having an abortion for the first time, 30.4% (7 932/26 127) had had an abortion for twice, and 24.8% (6 482/26 127) had three or more abortions (with a maximum of 13 times), and 22.2% (5 810/26 127) had a history of cesarean section. The total number of induced abortion surgeries from 2019 to 2024 showed a downward trend. The age of the patients, the proportion of those who had given birth to two or more children, the proportion of advanced-age (≥35 years) patients with recurrent abortion, and the proportion of married individuals increased ($P<0.001$). From 2019 to 2024, the proportion of women opting for long-acting contraceptive methods (LARC) after abortion remained stable at 30%–40%, predominantly among those aged 25–34 years. Among women who chose LARC after abortion, those with ≥3 induced abortions accounted for 37.1% (3 554/9 571). **Conclusion** The total number of induced abortions among women has shown a significant decline, but the proportion of married and

multiparous women, as well as advanced-age women with recurrent abortions, continues to rise. Among those who opt for LARC post-abortion, the percentage increases with the number of abortions.

【Key words】 Abortion, induced; Postpartum contraception; Long-acting reversible contraceptive methods

·个案报道·

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卵巢扭转复位术后成功取卵并冻胚移植妊娠:1例报道与文献复习

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【摘要】 卵巢扭转是妇科常见的急腹症, 同时也是辅助生殖技术中严重的并发症。本文报道 1 例接受辅助生殖治疗的患者, 在取卵前发生单侧卵巢扭转, 经过保守治疗后继续取卵并成功妊娠。扭转侧和非扭转侧卵巢的卵母细胞均行体外受精助孕后比较实验室结局的差异。对比观察取卵后两侧的卵子及胚胎发育情况后, 扭转侧卵子后续胚胎发育关键指标上表现显著滞后。这一现象提示, 扭转侧卵巢缺血-缺氧损伤可能对卵母细胞质量及早期胚胎发育潜能产生了持续性负面影响, 通过延长扭转侧囊胚培养至第 6 天, 可避免过早丢弃发育迟缓但具潜能的胚胎。优先移植正常侧囊胚, 可取得临床妊娠。

【关键词】 卵巢扭转; 生殖技术, 辅助; 妊娠结局

Successful oocyte retrieval after ovarian torsion reduction and pregnancy after cryopreserved embryo transfer: a case report and literature review

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【Abstract】 Ovarian torsion is a common acute abdomen in gynecology and also a serious complication in assisted reproductive technology. This article reports

the case of a patient who received assisted reproductive treatment and developed unilateral ovarian torsion before oocyte retrieval. After conservative treatment, the patient continued with oocyte retrieval and achieved pregnancy. The laboratory outcomes were compared after *in vitro* fertilization treatment for the twisted and non-twisted ovaries. After comparing the oocytes and embryo development on both sides oocyte retrieval, there was a significant delay in the key indicators of subsequent embryo development on the twisted side. This phenomenon suggests that ischemia-hypoxia injury to the twisted ovary may have a lasting negative impact on oocyte quality and the developmental potential of early embryos. By extending the culture of the blastocyst derived from the torsioned ovary to day 6, it is possible to avoid prematurely discarding delayed but potentially promising embryos. Transplanting the normal side's blastocyst preferentially can lead to clinical pregnancy.

【Key words】 Ovarian torsion; Reproductive techniques, assisted; Pregnancy outcome

个案报道

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低促性腺激素性性腺功能减退患者 IVF-ET 助孕成功报道并文献复习

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【摘要】 本文报道 1 例 35 岁因“原发闭经 18 年, 婚后未避孕未孕 3.5 年”就诊, 并通过体外受精-胚胎移植成功妊娠患者的诊疗经过。患者诊断为低促性腺激素性性腺功能减退症, 同时存在狼疮抗凝物 (lupus anticoagulant, LA) 阳性及亚临床甲状腺功能减退症。第一周期采用单纯外源性卵泡刺激素方案, 因未补充黄体生成素活性制剂导致空卵泡综合征未获卵。第二周期调整方案并联合多种促性腺激素, 成功获卵并培养成 1 枚优质囊胚; 冻融胚胎移植周期中, 基于 LA 阳性给予低分子肝素干预, 最终获得临床妊娠。本案例提示对于低促性腺激素性性腺功能减退患者, 早期补充黄体生成素活性制剂的个体化促排卵方案是改善助孕结局的关键, 合并免疫因素 (如 LA 阳性) 者, 在移植周期进行针对性干预可以提高妊娠成功率。

【关键词】 受精, 体外; 胚胎移植; 低促性腺激素性性腺功能减退症; 狼疮抗凝物; 卵巢疾病

A case report of successful pregnancy with *in vitro* fertilization and embryo transfer in a patient with hypogonadotropic hypogonadism and literature review

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【 Abstract 】 This article reports the case of a 35-year-old patient who presented with "primary amenorrhea for 18 years and infertility for 3.5 years after marriage", and successfully achieved pregnancy through *in vitro* fertilization and embryo transfer. The patient was diagnosed with hypogonadotropic hypogonadism, accompanied by positive lupus anticoagulant (LA) and subclinical hypothyroidism. In the first cycle, stimulation was performed using exogenous follicle-stimulating hormone only, and no oocytes were retrieved due to empty follicle syndrome, caused by lack of luteinizing hormone (LH) activity supplementation. In the second cycle, the protocol was adjusted using a combination of gonadotropins, resulting in successful oocyte retrieval and the development of one high-quality blastocyst. During the frozen-thawed embryo transfer cycle, low-molecular-weight heparin was administered due to positive LA, and clinical pregnancy was finally achieved. These findings suggest that an individualized ovulation induction protocol with early LH activity supplementation is the key to improve assisted reproductive outcomes in patients with hypogonadotropic hypogonadism, and targeted intervention during the transfer cycle for those with concomitant immune factors (such as positive LA) may enhance pregnancy success rates.

【 Key words 】 Fertilization *in vitro*; Embryo transfer; Hypogonadotropic hypogonadism; Lupus anticoagulant; Ovarian diseases

·生殖管理·

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中国人类辅助生殖技术服务核心质量控制与评估指标体系的构建

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任炳楠与林悦欣对本文有同等贡献

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【摘要】 目的 研究构建我国人类辅助生殖技术服务核心质量控制与评估指标体系。方法 通过文献分析和理论研究构建服务核心质量控制与评估指标体系,运用德尔菲法开展 3 轮专家咨询。结果 第一轮、第二轮及第三轮专家咨询的函询问卷有效回收率分别为 100.00% (25/25)、92.00% (23/25)、100.00% (25/25),专家权威系数依次为 0.94、0.94、0.95。经过三轮专家咨询后,纳入指标重要性评分平均数均 ≥ 4.36 ,变异系数均 ≤ 0.17 ,各指标重要程度较高,专家分歧较小,协调性趋于一致。最终形成包含参考指标(女方年龄、抗米勒管激素值)、服务效果指标(卵泡质内单精子注射周期第二次减数分裂中期卵率、正常受精率、冻胚复苏存活率、种植率、临床妊娠率、活胎分娩率、累积活产率)和服务安全性指标(中重度卵巢过度刺激综合征率、多胎妊娠率、平均移植胚胎数、出生缺陷率)3个维度13个指标的人类辅助生殖技术服务核心质量控制与评估指标体系。结论 本研究纳入的指标覆盖辅助生殖技术临床和实验室的主要技术环节,可有效反映技术服务的效果和安全性。创新性引入参数指标,有利于构建标准化人群。

【关键词】 生殖技术; 辅助; 质量控制; 德尔菲法; 指标体系

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Construction of the core quality control and evaluation indicator system for human assisted reproductive technology services in China

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【 Abstract 】 Objective To study the development of a core quality control and evaluation indicator system for human assisted reproductive technology services in China. **Methods** Construct a service core quality control and evaluation indicator system through literature analysis and theoretical research, and conduct three rounds of expert consultations using the Delphi method. **Results** The effective recovery rates of the inquiry questionnaires for the first, second and third rounds of expert consultation were 100.00% (25/25), 92.00% (23/25) and 100.00% (25/25), respectively, and the expert authority coefficients were 0.94, 0.94 and 0.95, respectively. After three rounds of expert consultations, the average scores of the importance of the included indicators were all ≥ 4.36 , and the coefficients of variation were all ≤ 0.17 . The importance of each indicator was relatively high, the differences among experts were small, and the coordination tended to be consistent. Ultimately, a core quality control and evaluation indicator system for human assisted reproductive technology services was formed, which includes 3 dimensions and 13 indicators: reference indicators(female age and anti-Müllerian hormone levels),service effect indicators

(rate of metaphase II oocyte in intracytoplasmic sperm injection cycles,normal fertilization rate,survival rate of frozen embryo recovery,implantation rate,clinical pregnancy rate,live birth rate and cumulative live birth rate) and service safety indicators (rate of moderate to severe ovarian hyperstimulation syndrome,multiple pregnancy rate,average number of embryos transferred and birth defect rate).

Conclusion The indicators included in this study cover the main technical links of clinical and laboratory assisted reproductive technology, and can effectively reflect the effect and safety of technical services. The innovative introduction of parameter indicators is conducive to building a standardized population.

【Key words】 Reproductive techniques, assisted; Quality control; Delphi method; Indicator system

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综述

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肠道微生态在辅助生殖技术中的研究现状与展望: 关联、机制与干预

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【摘要】 肠道菌群作为人体复杂的微生态系统, 其稳态与女性生殖健康密切相关, “肠-生殖轴”概念的提出揭示了其潜在的调控作用。现有研究表明, 肠道微生态失调不仅与多种妇产科疾病相关, 还可能影响不孕人群辅助生殖技术 (assisted reproductive technology, ART) 的临床结局。本综述聚焦肠道微生物群及其代谢物与体外受精、卵胞质内单精子注射及冻融胚胎移植等关键 ART 环节的关联性证据, 评价益生菌等肠道微生态制剂改善治疗结局的临床进展, 并探讨肠道微生态影响 ART 助孕结局的潜在机制, 旨在梳理该领域研究现状, 并展望基于肠道微生态调控改善生殖结局的临床应用潜力与未来研究方向。

【关键词】 肠道微生态; 不孕症; 生殖技术, 辅助; 体外受精; 胚胎移植; 反复种植失败

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Gut microbiota in assisted reproductive technology: current research advances, mechanistic insights, and therapeutic interventions

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【Abstract】 As a complex microecosystem in humans, the gut microbiota maintains intimate connections with female reproductive health. The proposed concept of the "gut-reproductive axis" underscores its potential regulatory role. Current evidence indicates that gut dysbiosis is not only associated with various gynecological and obstetric disorders but also may impact clinical outcomes of assisted reproductive technology (ART). This review synthesizes evidence linking gut microbiota and derived metabolites to key ART procedures--including *in vitro* fertilization, intracytoplasmic sperm injection, and frozen-thawed embryo transfer--evaluates clinical advances in microbial interventions (e.g., probiotics) for improving treatment outcomes, and elucidates the underlying mechanisms through which gut microbiota influence ART success. We aim to consolidate the current research landscape and discuss the clinical translational potential of microbiota-targeted strategies for optimizing reproductive outcomes, while highlighting future research directions.

【Key words】 Gut microbiota; Infertility; Reproductive techniques, assisted; Fertilization *in vitro*; Embryo transfer; Recurrent implantation failure

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心理压力与女性生殖道微生物组的交互作用对生殖结局的影响

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【摘要】 近年来, 心理压力对生殖的影响越来越受到重视。众多研究表明, 心理压力能够导致患者生殖功能下降, 而生殖功能的异常又会进一步加重患者的心

理问题；与此同时，微生物，尤其是生殖道微生物对生殖的影响也逐渐被揭示，益生菌丰度的下降与致病菌丰度的上升都会对生殖功能产生负面影响。随着研究的逐渐深入，心理与微生物间的关联逐渐浮出水面，这提示生殖、心理与微生物三者间可能存在复杂的相互作用关系。本文将综合现有研究梳理三者间的关联，并探讨其中机制，以期通过调节心理状态与微生物菌群改善生殖健康提供理论依据与干预方向。

【关键词】 心理压力； 生殖道微生物组； 生殖结局； 菌群调控； 心理干预

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Interaction between psychological stress and the female genital microbiome and its impact on reproductive outcomes

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【 Abstract 】 In recent years, the impact of psychological stress on reproduction has received increasing attention. Numerous studies have shown that psychological stress can lead to a decline in patients' fertility, and abnormal fertility can further exacerbate their psychological problems. Meanwhile, the influence of microorganisms, especially the genital microbiome, on reproduction has gradually been revealed. A decrease in probiotic abundance and an increase in pathogenic bacteria abundance both exert negative effects on fertility. With the deepening of research, the association between psychology and the microbiome has gradually emerged, suggesting a complex interactive relationship among reproduction, psychology and the microbiome. This paper synthesizes existing studies to sort out the correlations among reproduction, psychology and the microbiome and explores the underlying mechanisms, aiming to provide a theoretical basis and intervention directions for improving reproductive health by regulating psychological states and microbial flora.

【 Key words 】 Psychological stress; Genital microbiome; Reproductive outcomes; Microbiota regulation; Psychological intervention

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多囊卵巢综合征与代谢综合征相关性的研究进展

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【摘要】 多囊卵巢综合征 (polycystic ovary syndrome, PCOS) 是育龄期女性最常见的生殖内分泌及代谢紊乱性疾病, 其患者中代谢综合征 (metabolic syndrome, MetS) 发病率显著增高。这两者在遗传易感性、表观遗传修饰上表现出明显的关联性, 在以胰岛素抵抗为核心的病理生理机制上存在交叉, 在肥胖、血脂异常、代谢相关脂肪性肝病等临床表型方面高度重叠。本文从 PCOS 的诊断标准与表型异质性、PCOS 与 MetS 的相关性依据、针对 PCOS-MetS 的临床管理以及未来研究展望四个方面对 PCOS-MetS 概念的提出及其临床管理模式进行综述。

【关键词】 多囊卵巢综合征; 代谢综合征; 胰岛素抵抗; 临床管理

Research progress in the association between polycystic ovary syndrome and metabolic syndrome

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【 Abstract 】 Polycystic ovary syndrome (PCOS) is the most common reproductive endocrine and metabolic disorder in women of reproductive age. Studies have shown that the prevalence of metabolic syndrome (MetS) is significantly increased among women with PCOS. The two conditions exhibit significant associations in genetic susceptibility and epigenetic modifications, share overlapping pathophysiological mechanisms centered on insulin resistance, and show high overlap in clinical phenotypes such as obesity, dyslipidemia, and metabolic dysfunction-associated steatotic liver disease. This review addresses the concept of PCOS-MetS and its associated clinical management paradigms, structured around four key areas: PCOS diagnostic criteria and phenotypic heterogeneity, the evidence base for the PCOS-MetS correlation, clinical

management of PCOS-MetS, and future research directions. It systematically examines the evolution of PCOS diagnostic criteria and their limitations regarding phenotypic heterogeneity.

【Key words】 Polycystic ovary syndrome; Metabolic syndrome; Insulin resistance; Clinical management

综述

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从遗传关联到临床实践: 子宫内膜异位症共病管理证据

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【摘要】 子宫内膜异位症是一种雌激素依赖的慢性炎症性疾病, 影响约 10% 的育龄女性。其病因复杂, 起病隐匿, 且常导致诊断延迟。近年来, 全基因组关联研究为该病的发生发展提供了新思路。本文整合遗传相关性分析和孟德尔随机化等方法, 归纳了子宫内膜异位症与相关疾病的遗传关联, 并结合临床流行病学证据梳理其共病特点。现有研究提示, 子宫内膜异位症不仅与生殖性状 (如初潮年龄)、生殖系统疾病 (子宫肌瘤、卵巢癌等) 有关, 还可能伴随疼痛 (偏头痛、盆腔痛等)、神经精神疾病 (抑郁症等) 及自身免疫性疾病。部分孟德尔随机化研究提示, 子宫内膜异位症与其他疾病间可能存在因果关系。从机制上看, 共享基因多富集于激素、炎症和免疫相关通路, 这些通路可能在多种疾病中发挥作用。总体而言, 从遗传学角度分析子宫内膜异位症及其共病关系, 有助于加深对其发病机制的理解, 并为早期诊断及分层管理提供参考。

【关键词】 子宫内膜异位症; 共病管理; 全基因组关联研究; 孟德尔随机化; 遗传相关性; 免疫性疾病

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From genetic association to clinical practice: evidence for endometriosis comorbidity management

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【Abstract】 Endometriosis is an estrogen-dependent, chronic inflammatory disease that affects approximately 10% women of childbearing age. Its etiology is complex, the onset is insidious, and it often leads to delayed diagnosis. In recent years, genome-wide association studies have provided new ideas for the occurrence and development of this disease. This paper summarizes the genetic association between endometriosis and related diseases by integrating genetic correlation analysis and Mendelian randomization, and sorts out its comorbidity characteristics based on clinical epidemiological evidence. Existing studies suggest that endometriosis is not only related to reproductive traits (such as age of menarche) and reproductive system diseases (uterine fibroids, ovarian cancer, etc.), but may also be accompanied by pain (migraine, pelvic pain, etc.), neuropsychiatric disorders (depression, etc.) and autoimmune diseases. Some Mendelian randomization studies suggest a possible causal relationship between endometriosis and other diseases. Mechanistically, shared genes are mostly enriched in hormone, inflammatory, and immune-related pathways, which may play a role in a variety of diseases. Overall, analyzing endometriosis and its comorbidities from a genetic perspective can help deepen the understanding of its pathogenesis and provide a reference for early diagnosis and stratified management.

【Key words】 Endometriosis; Comorbidity management; Genome-wide association study; Mendelian randomization; Genetic correlation; Immunological diseases

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线粒体功能异常在子宫内膜相关不孕中的机制与靶向干预: 从基础到临床转化

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【摘要】 子宫内膜作为胚胎着床与妊娠维持的关键组织，其结构完整性与功能稳态直接决定生育结局。导致不孕症的子宫内膜因素包含宫腔粘连、子宫内膜炎、子宫腺肌病等，目前针对这些疾病的临床治疗手段有限。近年来，线粒体功能异常在不孕症中的作用逐渐受到关注，作为细胞能量代谢的核心，其结构与功能的稳定直接影响内膜细胞的增殖、分化及内分泌功能。本文系统综述了线粒体在子宫内膜生理功能中的作用、线粒体功能异常与子宫内膜相关不孕的病理关联，探讨了线粒体移植、抗氧化治疗及中药活性成分调控等新兴治疗策略的研究进展，并分析了其具体机制解析不充分及临床转化面临的挑战，明确当前研究空白，为线粒体靶向治疗的优化升级及临床转化提供新思路。

【关键词】 不孕症； 氧化应激； 线粒体动力学； 子宫内膜容受性； 线粒体损伤； 线粒体移植

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Mitochondrial dysfunction in endometrium-related infertility: mechanisms and bench-to-bedside translation

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【Abstract】 As a critical tissue for embryo implantation and pregnancy maintenance, the structural integrity and functional homeostasis of the endometrium directly determine reproductive outcomes. Endometrial factors that can lead to infertility include intrauterine adhesion, endometritis, adenomyosis and other conditions, for which current clinical therapeutic options are limited. In recent years, the role of mitochondrial dysfunction in infertility has garnered increasing attention. As the core of cellular energy metabolism, the stability of mitochondrial structure and function directly affects the proliferation, differentiation, and endocrine function of endometrial cells. This review systematically summarizes the role of mitochondria in the physiological functions of the endometrium, the pathological association between mitochondrial dysfunction and endometrium-related infertility, and explores the research progress of emerging therapeutic strategies such as mitochondrial transplantation, antioxidant therapy, and regulation by active components of Traditional Chinese Medicine. Additionally, it analyzes the insufficient understanding of specific mechanisms and the challenges in clinical translation, clarifies research gaps, and provides new insights for the optimization, upgrading, and clinical translation of mitochondria-targeted therapies.

【Key words】 Infertility; Oxidative stress; Mitochondrial dynamics; Endometrial receptivity; Mitochondrial damage; Mitochondrial transplantation

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时差成像深度学习评分模型在胚胎评估中的研究进展

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【摘要】 传统形态学评分受胚胎学家主观经验影响, 重复性较差且预测能力有限。时差成像系统通过连续、无创的监测方式, 为胚胎动态发育评估提供了标准化数据基础。近年来, 基于深度学习的人工智能模型逐步应用于胚胎评估领域, 旨在实现胚胎评估的客观化与精准化。本文系统综述了时差成像技术的优势与争议, 重点分析了与之结合的深度学习模型, 如卷积神经网络-长短期记忆网络混合模型、三维卷积神经网络等的技术原理与发展路径, 并对 KIDScore、iDAScore 等代表性临床评分系统在不同临床场景下的验证证据进行梳理, 进一步探讨了当前技术的局限性与未来发展方向, 为优化胚胎选择策略与提升体外受精成功率提供新的理论参考和实践方向。

【关键词】 延时成像; 人工智能; 胚胎植入; 体外受精; 深度学习; 胚胎选择

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Research progress on deep-learning scoring systems for embryo evaluation using time-lapse system

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【Abstract】 Traditional morphological scoring for embryo assessment is hampered by the subjective experience of embryologists, poor reproducibility, and limited predictive power for clinical outcomes. Time-lapse imaging systems provide a continuous, non-invasive monitoring platform, establishing a standardized data foundation for the evaluation of dynamic embryonic development. In recent years, deep learning-based artificial intelligence models have been progressively integrated into this field, aiming to achieve objective and precise embryo assessment. This article systematically reviews advantages and controversies and ongoing debates surrounding time-lapse technology. It focuses on analyzing the technical principles and evolution of combined deep learning models (e.g. convolutional neural network+long short-term memory network, three-dimensional convolutional neural network) and summarizes the validation evidence for representative clinical scoring systems, such as KIDScore and iDAScore, across diverse clinical scenarios. Furthermore, it discusses the current limitations of these technologies and future research directions, aiming to provide new theoretical insights and practical guidance for optimizing embryo selection strategies and enhancing the success rates of *in vitro* fertilization.

【Key words】 Time-lapse imaging; Artificial intelligence; Embryo implantation; Fertilization *in vitro*; Deep learning; Embryo selection

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生精细胞死亡的多模态调控机制研究进展

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【摘要】 精子发生是一个复杂精细的调控过程，其中生精细胞死亡和增殖的平衡是维持精子发生的核心环节。在精子发生和成熟过程中，广泛存在的细胞死亡机制对于消除异常的生精细胞和确保遗传信息的准确传递至关重要。但环境污染、生物毒素、疾病状态等不良因素可通过多方面途径诱导生精细胞过度死亡，导致男性不育症。近年来，对细胞死亡的机制已有较深入的研究，现已知的生精细胞死亡机制主要包括凋亡、自噬、焦亡、铁死亡以及铜死亡。各种细胞死亡方式动态转换以及 DNA 甲基化、组蛋白修饰、非编码 RNA 介导的基因沉默等表观遗传调控机制也共同作用于生精细胞的死亡调控。然而，关于生精细胞死亡的机制仍未完全明确，持续深入研究生精细胞死亡机制对于进一步揭示男性不育症病理基础具有重要意义。本文就生精细胞死亡、死亡动态转换以及表观遗传调控机制等多模式调控机制进行综述，旨在为男性不育症的病理基础研究提供思路 and 参考。

【关键词】 生殖细胞； 细胞死亡； 死亡动态转换； 表观遗传调控

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Research progress on multimodal regulatory mechanisms of spermatogenic cell death

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【Abstract】 Spermatogenesis is a complex and intricate regulatory process, in which the balance between spermatogenic cell death and proliferation is the core link in maintaining spermatogenesis. Although the widespread cell death mechanism during spermatogenesis and maturation is important for eliminating abnormal spermatogenic cells and ensuring accurate transmission of genetic information, factors such as environmental pollution, biotoxins, and disease states can induce excessive cell death through various ways, leading to male infertility. In recent years, there have been in-depth researches on the mechanism of cell death. The currently known mechanism of spermatogenic cell death is multimodal regulation, mainly including apoptosis, autophagy, pyroptosis, ferroptosis and cuproptosis. The dynamic transformation of various cell death modes, as well as epigenetic regulatory mechanisms such as DNA methylation, histone modification, and non-coding RNA mediated gene silencing, also work together to regulate the death of germ cells. However, the mechanism of germ cell death is still not fully understood, and continuous in-depth research on the mechanism of germ cell death is of great significance for further revealing the pathological basis of male infertility. This article reviews the multimodal regulatory mechanisms of spermatogenic cell death, dynamic transformation of death, and epigenetic regulation, aiming to provide ideas and references for the pathological basis research of male infertility.

【 Key words 】 Germ cells; Cell death; Dynamic conversion of death; Epigenetic regulation

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