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重视人类精子核心功能的检测

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【摘要】 人类精子核心功能是精子核内所有物质(分子)及其结构的正常性, 体现在精子能够将父本基因组完整传递给卵子的能力。目前检测精子 DNA、染色质、非整倍体、核蛋白、核空泡的状态, 可以了解精子核心功能的状态。结合精子基本功能, 重视和完善精子核心功能的检测, 有助于深入认识精子受精潜力和受精失败的精子因素。

【关键词】 男性不育; 精子功能; 精液检查; 男性生殖

Pay attention to detecting the core function of human sperm

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【Abstract】 The core function of human sperm is the normality of all substances (molecules) and their structures within the sperm nucleus, which is reflected in the ability of sperm to transmit the complete paternal genome to the oocyte. At present, detecting the status of sperm DNA, chromatin, aneuploidy, nucleoproteins, and nuclear vacuoles can provide insights into the core function of sperm. Combining the basic functions of sperm, more attention should be paid to the evaluation and improvement of the core function of sperm, which could benefit to a deeper understanding of sperm fertilizing potential and the factors contributing to fertilizing failure.

【Key words】 Infertility, male; Sperm function; Semen examination; Male reproduction

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非梗阻性无精子症患者行第二次 microTESE-ICSI 治疗的临床及新生儿结局分析

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【摘要】 目的 探讨非梗阻性无精子症 (nonobstructive azoospermia, NOA) 患者接受第 2 次显微睾丸取精 (microdissection testicular sperm extraction, microTESE) 结合卵胞质内单精子注射 (intracytoplasmic sperm injection, ICSI) 治疗的临床及新生儿结局。方法 采用回顾性自身前后对照研究和队列研究, 分析 2013 年 10 月至 2024 年 12 月在西北妇女儿童医院生殖中心接受第 2 次 microTESE-ICSI 治疗的 29 例 NOA 患者, 且第 1 次 microTESE 均获得精子。分析比较两次 microTESE-ICSI 治疗后的精子获得率 (sperm retrieval rate, SRR)、双原核率、优质胚胎率、可移植胚胎率、囊胚形成率、妊娠结局及新生儿结局。按第 2 次 microTESE 是否检见精子, 分为检见精子组 ($n=22$) 和未检见精子组 ($n=7$), 比较两组手术间隔时间、术前激素水平、睾丸体积、患者病理类型; 将第 1 周期中至少获得一次生化妊娠的患者记为妊娠组, 未获得生化妊娠的患者记为未妊娠组, 比较两组患者在第 2 次 microTESE-ICSI 治疗的妊娠结局。并分析既往手术录像。结果 患者第 2 次 microTESE 的 SRR 为 75.9% (22/29)。检见精子组和未检见精子组患者间的手术间隔时间、术前激素水平、睾丸体积、患者病理类型组间比较差异均无统计学意义 (均 $P>0.05$), 特发性及非特发性 NOA 第 2 次手术的 SRR 差异无统计学意义 ($P>0.05$)。第 1 周期与第 2 周期的双原核率、优质胚胎率、可移植胚胎率、囊胚形成率差异均无统计学意义 (均 $P>0.05$)。第 2 个 microTESE-ICSI 周期完成随访的患者中, 将所有囊胚及胚胎全部移植完的累积妊娠率及累积活产率分别为 52.4% (11/21) 和 42.9% (9/21)。进一步分析显示, 与未妊娠组患者的累积活产率 [23.1% (3/13)] 相比, 妊娠组患者的累积活产率 [75.0% (6/8)], $P=0.032$ 更高。所有新生儿无出生缺陷。通过回放手术录像显示, 过度显微解剖和低倍镜下电凝止血可能增加术后睾丸内瘢痕。结论 对于首次 microTESE-ICSI 未成功的 NOA 患者, 第 2 次治疗仍可有效获取精子并实现妊娠, 且新生儿结局良好。尤其对于首次治疗曾获生化妊娠患者, 二次手术治疗活产率更高。

【关键词】 非梗阻性无精子症； 睾丸显微取精术； 二次手术； 新生儿结局

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Analysis of clinical and neonatal outcomes of the second microTESE-ICSI treatment in nonobstructive azoospermia patients

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【Abstract】 Objective To investigate the clinical and neonatal outcomes of nonobstructive azoospermia (NOA) patients undergoing a second microdissection testicular sperm extraction (microTESE) combined with intracytoplasmic sperm injection (ICSI). **Methods** A retrospective self-controll study and a cohort study were conducted in 29 NOA patients who underwent the second microTESE-ICSI treatments at the Assisted Reproduction Center of Northwest Women's and Children's Hospital between October 2013 and December 2024, with successful sperm retrieval in the first microTESE for all included patients. The sperm retrieval rate (SRR), the two-pronuclei (2PN) rate, the high-quality embryo rate, the transferable embryo rate, the blastocyst formation rate, the pregnancy and neonatal outcomes between the two microTESE-ICSI cycles were analyzed. According to whether sperm was detected during the second microTESE, the patients were divided into detected sperm group ($n=22$) and without detected sperm group ($n=7$). The surgical interval, preoperative hormone levels, testicular volume, and patient pathological type were compared between the two groups. Patients who had achieved at least one biochemical pregnancy in the first cycle were classified as the pregnancy group, while those who had not achieved a biochemical pregnancy were classified as the non-pregnancy group, and the pregnancy outcomes of patients during the second microTESE-ICSI treatment were compared between the two groups. Previous surgical recordings were also analyzed. **Results** The SRR of the second microTESE was 75.9% (22/29). There were no statistically significant differences in surgical interval, preoperative hormones level, testicular volume, and patient pathological type between detected sperm group and without detected group during the second examination (all $P>0.05$). SRR showed no difference between idiopathic and non-idiopathic NOA ($P>0.05$). 2PN rate, high-quality embryo rate, transferable embryo rate, blastocyst formation rate did not differ statistically between the two cycles (all $P>0.05$). Among patients completing follow-up in the second microTESE-ICSI cycle, cumulative pregnancy and live birth rates after all embryos transfer were 52.4% (11/21) and 42.9% (9/21), respectively. Further analysis revealed that patients in pregnancy group [75.0% (6/8)] had significantly higher cumulative live birth rate than that in non-pregnancy group [23.1% (3/13), $P=0.032$] in the second cycle. No birth defects were observed in neonates. Surgical video review suggested that excessive microdissection and low-magnification electrocautery hemostasis might

increase intratesticular scarring. **Conclusion** For NOA patients with failed initial microTESE-ICSI, the second treatment can effectively retrieve sperm and achieve favorable pregnancy and neonatal outcomes. Patients with prior biochemical pregnancy may benefit from higher live birth rate in subsequent cycles.

【Key words】 Nonobstructive azoospermia; Microdissection testicular sperm extraction; Reoperation; Neonatal outcomes

Fund program: Key Research and Development Project of Shaanxi Province (2021SF-200)

男性不育专栏

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Y 染色体 AZFc 区缺失不育男性的诊疗进展

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【摘要】 无精子症因子 c (azoospermia factor c, AZFc) 区缺失是导致男性不育的常见遗传因素之一, 其临床表型多样, 包括少精子症或无精子症等。随着显微镜下睾丸切开取精术、卵胞质内单精子注射和胚胎植入前遗传学检测等辅助生殖技术的发展, AZFc 区缺失患者获得了生育自己生物学后代的机会。但部分患者仍面临辅助生殖结局不良的情况, 而造成不良结局的关键因素目前尚不完全明确。本文对近年来在 AZFc 区缺失男性不育诊疗方面的相关进展进行综述, 旨在为临床工作提供参考, 并展望未来该领域的研究思路。

【关键词】 不育, 男性; 无精子症; 生殖技术, 辅助; AZFc 区微缺失; 显微镜下睾丸切开取精术

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Advances in the diagnosis and treatment of infertile men with AZFc microdeletion

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【Abstract】 Azoospermia factor c (AZFc) microdeletion is one of the most common genetic factors of male infertility, presenting with different clinical phenotypes, including oligozoospermia and azoospermia. With the development of assisted reproductive technologies such as microdissection testicular sperm extraction, intracytoplasmic sperm injection and preimplantation genetic testing, patients with AZFc microdeletion have gained the opportunity to have their own biological offspring. However, some patients still experience suboptimal outcomes from assisted reproduction treatments. The key factors contributing to these poor outcomes remain unclear. This review summarizes recent advances in the diagnosis and treatment of male infertility caused by AZFc deletions, aiming to provide a reference for clinical work and look forward to future research ideas in this field.

【Key words】 Infertility, male; Azoospermia; Reproductive techniques, assisted; AZFc microdeletion; Microdissection testicular sperm extraction

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男性不育专栏

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胆汁酸代谢与睾丸生精功能的研究进展

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【摘要】 胆汁酸作为关键信号分子, 通过胆汁酸-睾丸轴调控网络动态调节睾丸功能。本综述围绕胆汁酸稳态影响睾丸精子发生及内分泌功能的复杂关系, 介绍了胆汁酸及其受体在男(雄)性生殖健康中的双重作用: 毒性胆汁酸(如胆酸、

鹅去氧胆酸、脱氧胆酸)通过激活 FXR α /TGR5 信号通路抑制睾酮合成和破坏血睾屏障完整性,而有益胆汁酸[如熊去氧胆酸(ursodeoxycholic acid, UDCA)和牛磺熊去氧胆酸]通过抑制内质网应激、抗氧化、维持细胞膜稳定性发挥保护作用。本文解析了胆汁酸-睾丸轴调控网络在男(雄)性生殖健康中的作用,以及当前研究缺乏人类数据的局限性,并进一步指出了胆汁酸谱在诊断和预测中的潜在价值,UDCA 及其衍生物在临床干预中的转化价值。

【关键词】 胆汁酸类和盐类; 精子发生; 不育,男(雄)性; 睾丸激素类; 睾丸功能; 胆汁酸受体

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Research advances on the role of bile acids in testicular spermatogenic function

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【Abstract】 Bile acids (BAs), as critical signaling molecules, dynamically regulate testicular function through the BA-testis axis. This review focuses on the intricate relationship between BAs homeostasis and testicular spermatogenesis and endocrine function, revealing the dual roles of BAs and their receptors in male reproductive health: toxic BAs (such as cholic acid, chenodeoxycholic acid, deoxycholic acid) inhibit testosterone synthesis and disrupt blood-testis barrier integrity via activating FXR α /TGR5 signaling pathways, whereas beneficial BAs [such as ursodeoxycholic acid (UDCA) and tauroursodeoxycholic acid] exert protective effects by inhibiting endoplasmic reticulum stress, exerting antioxidant effects, and maintaining cell membrane stability. This review comprehensively analyzes the regulatory network of the BA-testis axis in male reproductive health, discusses the limitation of the lack of human data in current research, and further proposes the potential diagnostic value of BAs profiling, as well as the translational potential of UDCA and its derivatives in clinical interventions.

【Key words】 Bile acids and salts; Spermatogenesis; Infertility, male; Testicular hormones; Testicular function; Bile acid receptors

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全氟和多氟烷基物质对男性精液质量的影响及机制研究进展

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【摘要】 全氟和多氟烷基物质(per- and polyfluoroalkyl substances, PFAS)是一类广泛存在于环境中的持久性有机污染物, 可通过空气、水体、膳食等多种途径进入人体并在体内蓄积。近年来, PFAS 暴露对男性生殖健康的潜在影响日益受到关注。本文系统综述了男性 PFAS 暴露特征及其对精液质量的影响: 流行病学证据表明 PFAS 暴露与精子浓度、活力及正常形态率下降显著相关; 机制研究揭示其可能通过生殖细胞毒性、支持细胞功能障碍、内分泌干扰、氧化应激及表观遗传调控等多途径引发雄性生殖毒性。本文旨在整合现有证据, 为评估 PFAS 男性生殖风险及制定防控策略提供科学依据。

【关键词】 持久性有机污染物; 全氟和多氟烷基物质; 精液质量; 流行病学研究; 机制研究

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Research progress and mechanism of the effect of per- and polyfluoroalkyl substances exposure on male semen quality

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【 Abstract 】 Per- and polyfluoroalkyl substances (PFAS) are a class of persistent organic pollutants widely present in the environment. They can enter the human body through multiple pathways such as air, water, and diet, and tend to bioaccumulate. In recent years, increasing attention has been paid to the potential impacts of PFAS exposure on male reproductive health. This review systematically summarizes the characteristics of PFAS exposure in men and its effects on semen quality. Epidemiological evidence indicates that PFAS exposure is significantly associated with reduced sperm concentration, motility, and normal morphology rate. Mechanistic studies suggest that PFAS may induce male reproductive toxicity through various pathways, including germ cell cytotoxicity, dysfunction of Sertoli cells, endocrine disruption, oxidative stress, and epigenetic regulation. This review aims to integrate current evidence to support the assessment of male reproductive risks associated with PFAS exposure and to inform the development of preventive strategies.

【 Key words 】 Persistent organic pollutant; Per- and polyfluoroalkyl substances; Semen quality; Epidemiological studies; Mechanism studies

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临床研究

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超重及肥胖不孕患者使用激动剂 长方案和拮抗剂方案的累积活产 率比较: 一项倾向性评分匹配研究

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【摘要】 目的 比较超重及肥胖不孕女性进行体外受精/卵胞质内单精子注射 (*in vitro* fertilization/intracytoplasmic sperm injection, IVF/ICSI) 助孕时使用促性腺激素释放激素 (gonadotropin-releasing hormone, GnRH) 激动剂长方案和拮抗剂方案进行控制性卵巢刺激 (controlled ovarian stimulation, COS) 的累积活产率 (cumulative live birth rate, CLBR)。**方法** 采用回顾性队列研究, 分析 2013 年 1 月至 2019 年 12 月在南京医科大学第一附属医院生殖医学科进行 IVF/ICSI 助孕超重及肥胖患者的临床资料。本研究符合入组标准的超重及肥胖女性进行的 COS 周期共 3 707 个, 包含 1 555 个 GnRH 激动剂长方案周期和 2 152 个拮抗剂方案周期。应用事后随机化和采用 1:1 的倾向性评分匹配 (propensity score matching, PSM) 方法匹配女方年龄、抗苗勒管激素和基础窦卵泡计数, 以纠正混杂因素的影响。主要观察指标为取卵周期 CLBR。按照女方体质质量指数、年龄和是否合并多囊卵巢综合征 (polycystic ovarian syndrome, PCOS) 进行亚组人群分析。**结果** PSM 后最终纳入激动剂长方案 1 248 个周期和拮抗剂方案 1 248 个周期进行分析。使用激动剂长方案的 CLBR 为 71.88% (897/1 248), 高于拮抗剂方案 [62.98% (786/1 248), $P<0.001$]。激动剂长方案自促性腺激素启动至活产分娩日的间隔时间与拮抗剂方案相比, 差异无统计学意义 ($P>0.05$)。PSM 后, $25.0\sim 29.9\text{ kg/m}^2$ 和 $\geq 30.0\text{ kg/m}^2$ 体质质量人群激动剂长方案的 CLBR [71.36% (856/1 195)、77.36% (41/53)] 均高于拮抗剂方案 [63.30% (759/1 199), $P<0.001$; 55.10% (27/49), $P=0.017$]; $20\sim 34$ 岁和 ≥ 35 岁女性激动剂长方案的 CLBR [73.32% (805/1 098)、61.33% (92/150)] 均高于拮抗剂方案 [67.18% (696/1 036), $P=0.002$; 42.45% (90/212), $P<0.001$]; 不合并 PCOS 的患者, 激动剂长方案的 CLBR [71.55% (850/1 188)] 高于拮抗剂方案 [60.95% (654/1 073), $P<0.001$], 合并 PCOS 患者, 两种不同方案的 CLBR 差异无统计学意义 ($P>0.05$)。使用拮抗剂方案时中重度卵巢过度刺激综合征 (ovarian hyperstimulation syndrome, OHSS) 的发生率 [0.64% (8/1 248)] 较激动剂长方案显著降低 [1.76% (22/1 248), $P=0.016$]。**结论** 对于超重及肥胖不孕患者, 激动剂长方案的 CLBR 高于拮抗剂方案, 有效性更高; 对于同时伴有 PCOS 的女性, 两种方案的 CLBR 相当, 而拮抗剂方案中重度 OHSS 的发生率更低。

【关键词】 累积活产率; 超重; 肥胖; 激动剂长方案; 拮抗剂方案; 控制性卵巢刺激

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Comparison of cumulative live birth rate per oocyte retrieval cycle between GnRH-agonist long and GnRH-antagonist protocols in overweight and obese women: a propensity score-matched study

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【Abstract】 Objective To compare the cumulative live birth rate (CLBR) per oocyte retrieval cycle between gonadotropin-releasing hormone agonist (GnRH-a) long protocol and GnRH antagonist (GnRH-A) protocol in overweight and obese women undergoing *in vitro* fertilization/intracytoplasmic sperm injection (IVF/ICSI). **Methods** A retrospective cohort study was conducted to analyze the clinical characteristics of overweight and obese patients who underwent IVF/ICSI at the Center of Reproductive Medicine, the First Affiliated Hospital of Nanjing Medical University between January 2013 and December 2019. A total of 3 707 cycles were executed in overweight and obese patients who fulfilled the prescribed inclusion criteria, comprising 1 555 GnRH-a long protocol cycles and 2 152 GnRH-A protocol cycles. To mitigate confounding factors, post hoc randomization and propensity score matching (PSM) at a 1 : 1 ratio were applied to match female age, anti-Müllerian hormone levels, and antral follicle count. The primary outcome observation indicator was the CLBR of the oocyte retrieval cycle. Analysis of subgroups of the population was conducted by the women's body mass index, age, and polycystic ovarian syndrome (PCOS) status. **Results** After PSM, a total of 2 496 cycles were included comprising 1 248 GnRH-a long protocol cycles and 1 248 GnRH-A protocol cycles. GnRH-a long protocol had a higher CLBR [71.88% (897/1 248)] than that in GnRH-A protocol [62.98% (786/1 248), $P<0.001$]. No statistically significant difference was observed in the interval from gonadotropin initiation to live birth delivery day between the GnRH-a long protocol and GnRH-A protocol ($P>0.05$). Subgroup analysis revealed that after PSM, the CLBR of GnRH-a long protocol in the patients with a body mass index of 25.0–29.9 kg/m² [71.36% (856/1 195)] and ≥ 30.0 kg/m² [77.36% (41/53)] were higher than those of the GnRH-A protocol patients [63.30% (759/1 199), $P<0.001$; 55.10% (27/49), $P=0.017$]. The CLBR of GnRH-a long protocol in women aged 20–34 [73.32% (805/1 098)] and ≥ 35 years [61.33% (92/150)] were higher than those of the GnRH-A protocol patients [67.18% (696/1 036), $P=0.002$; 42.45% (90/212), $P<0.001$]; among patients without PCOS, the CLBR with the GnRH-a long protocol [71.55% (850/1 188)] was significantly higher than that with GnRH-A protocol [60.95% (654/1 073), $P<0.001$]. However, in overweight and obese patients with PCOS, there was no statistically significant difference in CLBR between the two protocols ($P>0.05$). The incidence of moderate-severe ovarian hyperstimulation syndrome (OHSS) was significantly lower in the overweight and obese population using GnRH-A protocol [0.64% (8/1 248)] compared with GnRH-a long protocol [1.76% (22/1 248), $P=0.016$]. **Conclusion** For overweight and obese patients, GnRH-a long protocol demonstrates higher CLBR compared with GnRH-A protocol, indicating superior efficacy. For those with PCOS, both protocols show comparable CLBR, while the incidence of severe OHSS is lower in the GnRH-A.

【 Key words 】 Cumulative live birth rate; Overweight; Obesity; GnRH-agonist long protocol; GnRH antagonist protocol; Controlled ovarian stimulation

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高基础卵泡刺激素水平患者行 IVF/ICSI-ET 治疗的妊娠结局分析

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【摘要】 目的 探讨高基础卵泡刺激素 (basal follicle-stimulating hormone, bFSH) 水平患者经体外受精/卵胞质内单精子注射-胚胎移植 (*in vitro* fertilization/intracytoplasmic sperm injection and embryo transfer, IVF/ICSI-ET) 助孕后的妊娠结局及多周期累积活产率 (cumulative live birth rate, CLBR)。方法 本研究为回顾性队列研究, 选取了 2018 年 1 月至 2022 年 12 月于北京大学第三医院生殖医学中心接受 IVF/ICSI-ET 治疗的临床资料。依据患者在治疗期间的所有周期中最高 bFSH 水平将患者分为 3 组, A 组为 $15 \text{ U/L} \leq \text{bFSH} < 25 \text{ U/L}$, B 组为 $25 \text{ U/L} \leq \text{bFSH} < 40 \text{ U/L}$, C 组为 $\text{bFSH} \geq 40 \text{ U/L}$, 根据女方体质质量指数进行倾向性评分匹配 (propensity score matching, PSM) 后, 比较各组患者周期基线资料、胚胎实验室结果及临床妊娠率等助孕结局, 经二元 logistic 回归分析探讨各因素对活产的影响, 同时研究多周期 CLBR 变化趋势。结果 PSM 后, A 组纳入 340 个周期, B 组纳入 340 个周期, C 组纳入 127 个周期。3 组间窦卵泡计数、bFSH、基础孕激素、基础黄体生成素和抗苗勒管激素水平差异均有统计学意义 ($P=0.004$ 、 $P<0.001$ 、 $P<0.001$ 、 $P<0.001$ 、 $P<0.001$)。3 组患者促排卵方案分析中 A 组及 B 组以常规促排卵方案为主, C 组则以温和刺激方案为主。A 组促性腺激素使用时间 [10 (7, 12) d] 和使用总量 [2 728 (1 650, 3 725) U] 最高, 3 组间比较差异均有统计学意义 (均 $P<0.001$)。人绒毛膜促性腺激素注射日 3 组患者的雌二醇、孕酮水平组间比较差异均有统计学意义 ($P=0.022$ 、 $P=0.048$)。3 组患者间周期取消率差异无统计学意义 ($P>0.05$); 而获卵数 ($P<0.001$)、无可移植胚胎周期率 ($P=0.034$)

差异均有统计学意义。3 组患者所移植的胚胎类型均以卵裂胚为主, 3 组间双原核数和优质胚胎率差异均有统计学意义 ($P=0.003$ 、 $P=0.006$); 优质胚胎率随着 bFSH 水平的上升呈现下降趋势, 且组间比较显示 A 组与 B 组、A 组与 C 组间差异均有统计学意义 (均 $P<0.0167$)。3 组患者的新鲜周期生化妊娠率、临床妊娠率差异均有统计学意义 ($P=0.025$ 、 $P=0.010$), 每启动周期活产率具有边缘显著性 ($P=0.058$), 但流产率、每移植周期活产率组间比较差异均无统计学意义 (均 $P>0.05$)。通过二元 logistic 回归分析显示, bFSH ($OR=0.955$, 95% CI : $0.912\sim1.000$, $P=0.050$) 和获卵数 ($OR=1.104$, 95% CI : $1.009\sim1.207$, $P=0.031$) 为活产的独立影响因素。多个取卵周期 CLBR 曲线分析显示, 随着取卵次数增加, CLBR 逐渐增加, 在第 5 次取卵后逐渐趋于稳定, 为 14.32%。结论 高 bFSH 水平会降低每启动周期活产率, 但不影响每移植周期活产率。年龄升高、获卵数低均可降低活产率。多周期取卵移植能一定程度上提高高 bFSH 水平患者的 CLBR, 但在第 5 周期后逐渐趋于稳定。

【关键词】 体外受精; 生殖技术, 辅助; 妊娠结局; 高基础卵泡刺激素; 累积活产率

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Analysis of pregnancy outcome in patients with high basal follicle-stimulating hormone level undergoing IVF/ICSI-ET treatment

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【Abstract】 **Objective** To investigate the pregnancy outcomes and cumulative live birth rate (CLBR) after *in vitro* fertilization/intracytoplasmic sperm injection and embryo transfer (IVF/ICSI-ET) in patients with high basal follicle-stimulating hormone (bFSH) levels. **Methods** This retrospective cohort study included clinical data from patients who underwent IVF/ICSI-ET treatment at the Reproductive Medical Center of Peking University Third Hospital from January 2018 to December 2022. Patients were divided into three groups based on the highest bFSH level during all cycles of treatment: group A ($15\text{ U/L}\leq\text{bFSH}<25\text{ U/L}$), group B ($25\text{ U/L}\leq\text{bFSH}<40\text{ U/L}$), and group C ($\text{bFSH}\geq40\text{ U/L}$). After propensity score matching (PSM) based on the female body mass index, the baseline data, embryology laboratory outcomes, and assisted reproductive outcomes such as clinical pregnancy rate among the three groups of patients were compared. Binary logistic regression analysis was used to explore the impact of various factors on live birth, and the trend of CLBR across multiple cycles was also studied. **Results** After PSM, 340 cycles were included in group A, 340 cycles were included in group B, 127 cycles were included in group C. There were statistically significant differences among the three groups in antral follicle count, bFSH, basal progesterone, basal luteinizing hormone, and anti-Müllerian hormone levels ($P=0.004$, $P<0.001$, $P<0.001$, $P<0.001$, $P<0.001$). In the analysis of controlled ovarian stimulation (COS) protocols, groups A and B mainly used conventional COS protocol, while group C primarily used mild stimulation protocol. The duration and dosage of gonadotropin used were the highest in group A [10 (7, 12) d, 2 728 (1 650, 3 725) U], with statistically significant differences among the three groups (all

$P<0.001$). On the day of human chorionic gonadotropin injection, there were statistically significant differences in estradiol and progesterone levels among the three groups ($P=0.022$ and $P=0.048$, respectively). The cancellation rate of cycles did not differ significantly among the three groups ($P>0.05$), while the number of oocytes retrieved ($P<0.001$) and the rate of cycles with no transferable embryos ($P=0.034$) showed statistically significant differences. The type of embryos transferred in all three groups was mainly cleavage-stage embryos, and there were statistically significant differences in the rate of two pronuclei and high-quality embryos among the groups ($P=0.003$ and $P=0.006$, respectively). The rate of high-quality embryos decreased with increasing bFSH levels, and comparisons between group A and group B, as well as group A and group C, showed statistically significant differences (all $P<0.0167$). The biochemical pregnancy rate and the clinical pregnancy rate in fresh cycles differed significantly among the three groups ($P=0.025$ and $P=0.010$, respectively), while the live birth rate per initiated cycle showed marginal significance ($P=0.058$). However, the miscarriage rate and the live birth rate per transfer cycle did not differ significantly among the groups (all $P>0.05$). Binary logistic regression analysis revealed that bFSH ($OR=0.955$, 95% CI : 0.912–1.000, $P=0.050$) and the number of oocytes retrieved ($OR=1.104$, 95% CI : 1.009–1.207, $P=0.031$) were independent predictors of live birth. Analysis of CLBR curves across multiple oocyte retrieval cycles showed that CLBR gradually increased with the number of oocyte retrievals and stabilized at 14.32% after the fifth retrieval. **Conclusion** High bFSH levels reduce the live birth rate per initiated cycle but do not affect the live birth rate per transfer cycle. Increasing age and a low number of oocytes retrieved can both decrease the live birth rate. Multiple oocyte retrieval and transfer cycles can improve CLBR in patients with high bFSH level to some extent, but it tends to stabilize after the fifth cycle.

【 Key words 】 *In vitro* fertilization; Reproductive technology, assisted; Pregnancy outcome; Elevated basal follicle-stimulating hormone; Cumulative live birth rate

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玻璃化解冻后移植未扩张囊胚对妊娠及新生儿结局的影响：基于倾向性评分匹配的回顾性队列研究

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【摘要】 目的 探讨移植解冻后 2~4 h 未扩张囊胚对临床妊娠和新生儿结局的影响。方法 采用回顾性队列研究，分析 2015 年 1 月至 2024 年 3 月在中国人民解放军联勤保障部队第九〇一医院生殖医学中心进行的 2 428 个玻璃化冻融单囊胚移植周期的临床资料。根据解冻后 2~4 h 囊胚腔是否扩张，将 110 个未扩张囊胚移植周期设为 A 组，2 318 个扩张囊胚移植周期设为 B 组。通过 1:1 倾向性评分匹配后，A 组与 B 组各 109 个周期，比较两组的妊娠及新生儿结局。结果 倾向性匹配前，两组的优质囊胚移植率、4 期扩张囊胚移植率、不孕原因中子宫内膜异位症及其他占比差异均有统计学意义（均 $P < 0.05$ ）。经倾向性评分匹配后，两组的基础资料相比差异均无统计学意义（均 $P > 0.05$ ）。A 组的临床妊娠率 [27.52% (30/109)]、持续妊娠率 [21.10% (23/109)] 及活产率 [19.27% (21/109)] 显著低于 B 组 [61.47% (67/109)、51.38% (56/109)、47.70% (52/109)]，差异均具有统计学意义（均 $P < 0.001$ ）。新生儿结局显示，两组的出生体质量、新生儿体长、畸形率、单卵双胎率及男孩出生率差异均无统计学意义（均 $P > 0.05$ ）。结论 移植解冻后未扩张囊胚可能降低临床妊娠率，但对新生儿结局无显著负面影响。

【关键词】 体外受精； 囊胚移植； 玻璃化作用； 再扩张； 倾向性评分匹配

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Impact of transferring vitrified-thawed non-re-expanded blastocysts on pregnancy and neonatal outcomes: a retrospective cohort study based on propensity score matching

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【 Abstract 】 Objective To investigate the effect of the transfer of blastocysts that have not re-expanded after 2-4 h of thawing on pregnancy and neonatal outcomes. **Methods** A retrospective cohort study was performed to

analyze the clinical data from 2 428 vitrified frozen-thawed single blastocyst transfer cycles at the Reproductive Medicine Center of the 901st Hospital of the Joint Logistics Support Force of PLA between January 2015 and March 2024. Based on the re-expansion status of the blastocoel cavity after thawing, the cycles were divided into group A (110 non-re-expanded) and group B (2 318 re-expanded). After propensity score matching, there were 109 cycles in each group. Pregnancy and neonatal outcomes between the two groups were compared. **Results** Before propensity score matching, there were statistical differences in percentage of good-quality blastocyst transfer, percentage of degree 4 blastocyst, percentage of endometriosis and others in reasons for infertility between the two groups (all $P<0.05$). After propensity score matching, there were no statistical differences in baseline characteristics between the two groups (all $P>0.05$). The clinical pregnancy rate [27.52% (30/109)], the ongoing pregnancy rate [21.10% (23/109)] and the live birth rate [19.27% (21/109)] in group A were all significantly lower than those in group B [61.47% (67/109), 51.38% (56/109), 47.70% (52/109), all $P<0.001$]. Neonatal outcomes showed no statistically significant differences between the two groups in terms of birth weight, neonatal length, malformation rate, monozygotic twin rate and male neonatal rate (all $P>0.05$). **Conclusion** Transfer of non-re-expanded blastocysts after thawing may reduce clinical pregnancy rate but does not negatively affect neonatal outcomes.

【 Key words 】 Fertilization *in vitro*; Blastocyst transfer; Vitrification; Re-expansion; Propensity score matching

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阿托西班牙对既往种植失败患者冻融胚胎移植中子宫动脉血流动力学参数的影响及临床效果评估

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【摘要】 目的 探讨阿托西班对既往种植失败患者冻融胚胎移植 (frozen-thawed embryo transfer, FET) 中子宫动脉血流动力学参数的影响及临床效果评估。**方法** 采用回顾性队列研究, 分析 2021 年 1 月至 2023 年 6 月于郑州大学第二附属医院生殖医学部行 FET 治疗的 298 个周期的临床资料, 根据是否应用阿托西班将患者分为阿托西班组 ($n=149$) 和对照组 ($n=149$), 比较两组的相关指标和妊娠结局、治疗前后子宫动脉血流动力学参数 [双侧子宫动脉收缩期峰值流速/舒张期流速 (peak systolic velocity/diastolic velocity, S/D)、搏动指数 (pulsatility index, PI)、阻力指数 (resistance index, RI)] 以及血清前列腺素 F2 α (prostaglandin F2 α , PGF2 α)、催产素水平的变化。采用单因素及多因素 logistic 回归分析阿托西班对妊娠结局的影响。通过年龄分层分析阿托西班对活产率的影响。**结果** 阿托西班组的胚胎种植率 [51.92% (135/260)]、临床妊娠率 [67.11% (100/149)]、活产率 [59.06% (88/149)] 明显高于对照组 [41.13% (102/248), $P=0.015$; 51.01% (76/149), $P=0.005$; 40.27% (60/149), $P=0.001$]; 而早期流产率 [9.00% (9/100)] 低于对照组 [19.74% (15/76), $P=0.040$]。多因素 logistic 回归分析显示, 阿托西班是活产率 ($OR=2.236$, 95% $CI: 1.371\sim3.646$, $P=0.001$) 的独立影响因素。阿托西班组治疗后右侧子宫动脉血流 S/D [4.61 (4.00, 5.36)]、PI [1.81 (1.58, 2.05)]、RI [0.79 (0.75, 0.82)] 以及左侧子宫动脉血流 S/D [4.62 (3.83, 5.61)]、PI (1.84 $\pm$ 0.38)、RI [0.79 (0.74, 0.82)] 均低于治疗前 [右侧: S/D 4.93 (4.06, 6.04), $P<0.001$; PI 1.93 (1.60, 2.17), $P=0.001$; RI 0.80 (0.76, 0.83), $P<0.001$; 左侧: S/D 5.05 (4.20, 6.32), $P<0.001$; PI 1.95 $\pm$ 0.43, $P<0.001$; RI 0.81 (0.76, 0.84), $P<0.001$]。阿托西班组治疗后 PGF2 α 水平 [97.01 (85.15, 109.93) ng/L] 及催产素水平 [41.18 (37.16, 46.78) ng/L] 均较治疗前 [119.71 (108.85, 129.99) ng/L, 51.87 (46.44, 55.54) ng/L] 明显降低 (均 $P<0.001$), 且阿托西班组治疗后子宫内 膜蠕动波 [1.00 (0.00, 2.00) 次/min] 明显少于治疗前 [2.00 (1.00, 3.00) 次/min], 差异有统计学意义 ($P<0.001$)。**结论** 阿托西班可以改善既往种植失败患者的子宫动脉血流, 减少子宫内 膜蠕动波, 增加子宫内 膜血流灌注, 降低 PGF2 α 、催产素的水平, 还能够优化 FET 周期的妊娠结局。

【关键词】 阿托西班; 血流动力学; 催产素; 冻融胚胎移植; 活产率; 前列腺素 F2 α

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Effect of atosiban on hemodynamic parameters of uterine arteries and clinical effect evaluation in patients with previous implantation failure undergoing frozen-thawed embryo transfer

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【 Abstract 】 **Objective** To investigate the effect of atosiban on hemodynamic parameters of uterine arteries and clinical effect evaluation in patients with previous implantation failure undergoing frozen-thawed embryo transfer. **Methods** A retrospective cohort study was conducted to analyze 298 cycles of FET in the Department of Reproductive Medicine of the Second Affiliated Hospital of Zhengzhou University from January 2021 to June 2023. Patients were categorized into atosiban group ($n=149$) and control group ($n=149$) according to whether administered atosiban or not. The related indicators and clinical outcomes were compared between the two groups. Hemodynamic parameters of the uterine arteries, including bilateral uterine artery peak systolic velocity/diastolic velocity (S/D), pulsatility index (PI), resistance index (RI), and serum levels of prostaglandin F_{2α} (PGF_{2α}) and oxytocin were compared before and after atosiban treatment. Univariate and multivariate logistic regression analysis were applied to assess the effect of atosiban on pregnancy outcomes. The effect of atosiban on live birth rate was analyzed by age stratification. **Results** The implantation rate [51.92% (135/260)], the clinical pregnancy rate [67.11% (100/149)] and the live birth rate [59.06% (88/149)] in atosiban group were significantly higher than those in control group [41.13% (102/248), $P=0.015$; 51.01% (76/149), $P=0.005$; 40.27% (60/149), $P=0.001$]; and the early miscarriage rate [9.00% (9/100)] was lower than that of control group [19.74% (15/76), $P=0.040$]. Multivariate logistic regression analysis showed that atosiban was an independent influencing factor of live birth rate ($OR=2.236$, 95% CI : 1.371–3.646, $P=0.001$). The post-treatment right uterine artery blood flow S/D [4.61 (4.00, 5.36)], PI [1.81 (1.58, 2.05)], RI [0.79 (0.75, 0.82)], and left uterine artery blood flow S/D [4.62 (3.83, 5.61)], PI [1.84±0.38], RI [0.79 (0.74, 0.82)] were all lower than those before treatment [right S/D 4.93 (4.06, 6.04), $P<0.001$; PI 1.93 (1.60, 2.17), $P=0.001$; RI 0.80 (0.76, 0.83), $P<0.001$; left S/D 5.05 (4.20, 6.32), $P<0.001$; PI 1.95±0.43, $P<0.001$; RI 0.81 (0.76, 0.84), $P<0.001$]. Besides, the levels of PGF_{2α} [97.01 (85.15, 109.93) ng/L] and oxytocin [41.18 (37.16, 46.78) ng/L] after treatment in atosiban group were significantly lower than those before treatment [119.71 (108.85, 129.99) ng/L, $P<0.001$; 51.87 (46.44, 55.54) ng/L, $P<0.001$]. Moreover, the endometrial peristalsis waves in atosiban group were significantly less after treatment [1.00 (0.00, 2.00) times/min] than before treatment [2.00 (1.00, 3.00) times/min], and the difference was statistically significant ($P<0.001$). **Conclusion** Atosiban can improve uterine artery blood flow and reduce endometrial peristalsis waves in women with previous implantation failure, which increases endometrial blood perfusion. Additionally, it can also reduce the levels of PGF_{2α} and oxytocin, and optimize the pregnancy outcome of the frozen-thawed embryo transfer.

【Key words】 Atosiban; Hemodynamics; Oxytocin; Frozen-thawed embryo transfer; Live birth rate; Prostaglandin F2 α

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构建支原体感染的不孕患者治疗依从性的列线图预测模型

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【摘要】 目的 分析影响支原体感染的不孕患者治疗依从性的相关因素, 构建列线图预测模型并验证。方法 采用回顾性病例对照研究, 分析 2022 年 4 月至 2024 年 3 月就诊于江西省赣州市妇幼保健院生殖科的 400 例不孕患者的临床资料。按 7:3 原则通过随机数字法分为建模组 ($n=280$) 和验模组 ($n=120$), 再按依从性的不同, 分为完全依从性亚组和不稳定依从性亚组。多元 logistic 回归模型分析影响支原体感染的不孕患者治疗依从性的危险因素, 方差膨胀因子评估自变量共线性并构建列线图预测模型, 列线图模型的验证及预测效能分别用校正曲线、决策曲线评估。将验模组各变量代入列线图预测模型进行验证。结果 建模组中, 完全依从性亚组和不稳定依从性亚组患者在体质量指数、常住地、职业、结算形式、满意度等方面差异均无统计学意义 (均 $P>0.05$); 不稳定依从性亚组年龄 [(33.22 $\pm$ 3.20) 岁]、文化程度初中及以下比例 [36.81% (67/182)]、月平均支配金额 $\leq$ 2 000 元比例 [36.81% (67/182)]、疾病认知程度较差比例 [62.09% (113/182)] 及不孕不育相关压力量表 (infertility related stress scale, IRSS) 评分 [(45.60 $\pm$ 17.14) 分] 均高于完全依从性亚组 [(31.36 $\pm$ 3.24) 岁, $P<0.001$; 19.39% (19/98), $P=0.003$; 16.33% (16/98), $P<0.001$; 28.57% (28/98), $P<0.001$; (37.64 $\pm$ 16.69) 分, $P<0.001$]。受试者工作特征曲线分析结果显示:

年龄、IRSS 评分的最佳截断值分别为 32 岁、42 分。多元 logistic 回归模型结果显示：年龄 ($OR=1.453$, 95% CI : 1.260~1.794, $P=0.002$)、文化程度 ($OR=1.386$, 95% CI : 1.185~1.564, $P<0.001$)、月平均支配金额 ($OR=1.081$, 95% CI : 1.002~1.246, $P=0.023$)、疾病认知程度 ($OR=1.827$, 95% CI : 1.390~2.359, $P<0.001$)、IRSS 评分 ($OR=1.590$, 95% CI : 1.255~1.902, $P=0.006$) 是影响支原体感染的不孕患者治疗依从性的独立危险因素。建模组 C-index 为 0.872 (0.816~0.927), 校准曲线的截距 (-0.004) 和斜率 (0.995) 接近理想值 0 和 1, Brier 评分为 0.017, 阈值在 0.37~0.96 之间时, 提供临床净收益。验模组 C-index 为 0.816 (0.736~0.896), 校准曲线的截距 (-0.007) 和斜率 (1.015) 接近理想值 0 和 1, Brier 评分为 0.013, 阈值在 0.21~0.98 之间时, 提供临床净收益, H-L 拟合优度检验显示 $\chi^2=7.36$, $P=0.499$, 所构建的列线图预测模型区分度和一致性较好。结论 年龄、文化程度、月平均支配金额、疾病认知程度、IRSS 评分影响支原体感染的不孕患者治疗依从性。本研究基于这些指标所构建的列线图预测模型, 对支原体感染的不孕患者治疗依从性的预测价值较好, 可为临床实施干预措施提供一定参考依据。

【关键词】 支原体感染; 不孕; 依从性; 列线图预测模型

Constructing a nomogram prediction model for treatment compliance in infertile patients with mycoplasma infection

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【 Abstract 】 **Objective** To analyze the relevant factors affecting treatment compliance in infertile patients with mycoplasma infection, construct a nomogram prediction model and validate it. **Methods** In this case-control study, we retrospectively analyzed the clinical data of 400 infertile patients who attended the Department of Reproduction of Ganzhou Maternal and Child Health Hospital, Jiangxi Province from April 2022 to March 2024. They were divided into modeling group ($n=280$) and validation group ($n=120$) according to the 7 : 3 principle with random number method, and further divided into complete compliance subgroup and unstable compliance subgroup based on different levels of compliance. Multiple logistic regression model was used to analyze the risk factors affecting treatment adherence in infertile patients with mycoplasma infection, variance inflation factor was used to assess the collinearity of the independent variables and to construct a columnar plot prediction model, and the validation and predictive efficacy of the columnar plot model were assessed by calibration curves and decision curves, respectively. The validation and predictive efficacy of the column chart model were evaluated by calibration curve and decision curve respectively. **Results** In the modeling group, there was no significant statistical difference between the fully compliant group and the unstable compliant group in terms of body mass index, place of residence, occupation, settlement form, and attitude of medical staff (all $P>0.05$). Age in the unstable adherence subgroup [(33.22±3.20) years], proportion of junior high school and below in education [36.81% (67/182)],

proportion of average monthly disposable amount $\leq 2\ 000$ yuan [36.81% (67/182)], proportion of poor disease awareness [62.09% (113/182)], and infertility related stress scale (IRSS) scores (45.60 ± 17.14) were higher than those in the full adherence subgroup [(31.36 ± 3.24) years, $P < 0.001$; 19.39% (19/98), $P = 0.003$; 16.33% (16/98), $P < 0.001$; 28.57% (28/98), $P < 0.001$; 37.64 ± 16.69 , $P < 0.001$]. The receiver operating characteristic curve analysis results showed that the optimal cutoff values for age and IRSS score were 32 years old and 42 points, respectively. The results of logistic multiple regression model showed that: age ($OR = 1.453$, 95% CI : 1.260–1.794, $P = 0.002$), education level ($OR = 1.386$, 95% CI : 1.185–1.564, $P < 0.001$), average monthly disposable amount ($OR = 1.081$, 95% CI : 1.002–1.246, $P = 0.023$), disease awareness level ($OR = 1.827$, 95% CI : 1.390–2.359, $P < 0.001$), and average monthly disposable amount ($OR = 1.081$, 95% CI : 1.002–1.246, $P = 0.023$), disease awareness ($OR = 1.827$, 95% CI : 1.390–2.359, $P < 0.001$), and IRSS score ($OR = 1.590$, 95% CI : 1.255–1.902, $P = 0.006$) were independent risk factors affecting treatment adherence in infertile patients with mycoplasma infection. The modeling group C-index was 0.872 (0.816–0.927), the intercept (–0.004) and slope (0.995) of the calibration curve were close to the desirable values of 0 and 1, the Brier score was 0.017, and thresholds between 0.37 and 0.96 provided a net clinical benefit. The C-index of the test model set was 0.816 (0.736–0.896), the intercept (–0.007) and slope (1.015) of the calibration curve were close to the ideal values of 0 and 1, the Brier score was 0.013, and the threshold value provided a net clinical benefit when the threshold value ranged from 0.21 to 0.98, and the H-L goodness-of-fit test showed that $\chi^2 = 7.36$, $P = 0.499$, and the constructed predictive model for the column line graphs had good discrimination and consistency. **Conclusion** Age, educational level, monthly average disposable income, disease awareness, and IRSS score are the relevant factors affecting treatment compliance in infertile patients with mycoplasma infection. The nomogram prediction model constructed in this study based on those relevant factors has a good predictive value for treatment compliance in infertile patients with mycoplasma infection, and can provide certain reference for clinical intervention measures.

【Key words】 Mycoplasma infection; Infertility; Compliance; Nomogram prediction model

·现场调查·

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我国 2024 年胚胎植入前非整倍体检测结果质量调查与评价

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【摘要】 目的 调查我国 2024 年胚胎植入前非整倍体检测 (preimplantation genetic testing for aneuploidy, PGT-A) 现状, 为保证胚胎 PGT-A 结果一致化提供建议。**方法** 本研究为全国性的室间质量评价调查研究。国家卫生健康委临床检验中心于 2024 年 6 月和 12 月分别开展两次调查活动, 来自全国 31 家实验室参与调查活动, 每次向实验室发放不同浓度的质控样本, 第一次发放 6 个样本 (批号为 202401~202406), 第二次发放 3 个样本 (批号为 202431~202433), 要求参与实验室上报检测模式、单细胞扩增方法、建库方法、测序仪以及检测结果等相关信息。使用 Microsoft Excel 对收集的数据进行统计分析, 以此评估实验室检测 PGT-A 的能力, 并判断检测结果是否达到预期的质控要求。**结果** 两次调查 31 家实验室均上报了检测结果, 第一次调查 90.3% (28/31) 的实验室达到合格标准, 不及格率为 9.7% (3/31), 6 个批号的样本中, 202401~202403 的及格率为 90.3% (28/31), 202404~202406 的及格率为 100% (31/31)。第二次调查所有实验室均达到预期结果, 3 个批号的样本中, 202431~202433 的及格率为 100%。**结论** 我国 PGT-A 检测质量总体良好但存在差异, 且样本浓度、运输条件及检测方法等因素影响结果一致性。因此, 亟须持续开展全国性的室间质量评价, 及时发现并解决实验室存在的问题, 以保证 PGT-A 检测结果的一致性。

【关键词】 植入前非整倍体检测; 质量控制; 室间质评

Survey and evaluation of the quality of preimplantation aneuploidy testing results in China in 2024

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【 Abstract 】 Objective To investigate the current status of preimplantation genetic testing for aneuploidies (PGT-A) in China in 2024 and to provide recommendations for ensuring the consistency of PGT-A results. **Methods** This study was a nationwide external quality assessment research. The National Center for Clinical Laboratories of the National Health Commission conducted two surveys in June and December 2024, with participation from 31 laboratories across China. During each survey, quality control samples of varying concentrations were distributed: the first survey distributed 6 samples (Batch Nos. 202401–202406) and the second survey distributed 3 samples (Batch Nos. 202431–202433). Participating laboratories were required to submit information including detection platforms, single-cell amplification methods, library construction methods, sequencing instruments, and test results. Collected data were statistically analyzed using Microsoft Excel to evaluate laboratories' PGT-A testing capabilities and determine whether results met predefined quality control requirements. **Results** All 31 laboratories submitted results for both surveys. In the first survey, 90.3% (28/31) met qualification criteria with a 9.7% failure rate (3/31). For individual batches, pass rates were 90.3% (28/31) for batches 202401–202403 and 100% (31/31) for batches 202404–202406. The second survey achieved 100% (31/31) compliance across all three batches (202431–202433), with each batch maintaining a 100% pass rate. **Conclusion** The detection quality of PGT-A in China is generally good, but with differences, and factors such as sample concentration, transportation conditions and detection methods affect the consistency of the results. The study highlights the urgent need for nationwide external quality assessment of PGT-A in China. This will help identify issues in laboratories in a timely manner and ensure the consistency of PGT-A test results.

【 Key words 】 Preimplantation genetic testing for aneuploidies; Quality control; External quality assessment

·现场调查·

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基于 WHO 国际临床试验注册平台的全球避孕药具临床试验注册现状分析

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【摘要】 目的 基于世界卫生组织国际临床试验注册平台 (International Clinical Trials Registry Platform, ICTRP) 注册的避孕药具相关临床试验数据, 分析避孕药具临床注册特点, 为了解避孕药具的研发情况、提高避孕药具临床试验质量提供参考。**方法** 检索 ICTRP 数据库 2025 年 1 月 1 日之前的所有记录, 筛选出避孕药具相关临床试验, 对注册时间、注册平台、国家/地区分布、试验设计和研究内容等方面进行分析。**结果** 共纳入避孕药具临床试验 206 项, 临床试验注册中心和主导申请国家以美国、德国和印度为主。研究对象以育龄期女性为主 [95.63% (197/206)] , 试验类型以干预性研究为主 [89.32% (184/206)] 。其中随机对照试验占 53.26% (98/184) , 随机对照试验以平行组设计为主, 占 82.65% (81/98) 。64.56% (133/206) 的临床试验应用了开放标签, 注册阶段以 III 期试验最多 [47.57% (98/206)] , IV 期试验次之 [16.50% (34/206)] 。干预措施以口服给药 [42.64% (84/197)] 、宫内给药 [15.23% (30/197)] 和阴道给药 [15.23% (30/197)] 为主, 主要结局为临床妊娠率 [54.82% (108/197)] 、药物不良反应发生率 [13.20% (26/197)] 、排卵抑制发生率 [8.63% (17/197)] 以及阴道感染发生率 [4.06% (8/197)] 等。**结论** 全球避孕药具临床试验注册国家分布不均, 研究类型以干预性随机试验为主, 以育龄期女性为主要研究对象, 主要干预措施为口服给药、宫内给药和阴道给药。

【关键词】 避孕; 临床试验; 世界卫生组织; 国际临床试验注册平台; 注册现状

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Analysis of the status of clinical trial registration for contraceptives based on WHO International Clinical Trials Registry Platform

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【Abstract】 Objective To analyze the registration status of clinical trials related to contraceptives based on the data of World Health Organization International Clinical Trials Registry Platform (ICTRP), so as to understand the situation of contraceptives development, and provide reference for improving the quality of clinical trials. **Methods** All records in the database of ICTRP before January 1, 2025 was researched to screen out contraceptives clinical trials, and the

registration time, registration platform, regional distribution, trial design and research content were analyzed. **Results** A total of 206 clinical trials related to contraceptives were included. The projects were mainly carried out in the United States, Germany, and India. About 95.63% (197/206) of the study subjects were women of reproductive age. The main type of study was intervention [89.32% (184/206)], among which random trials accounted for 53.26% (98/184), and parallel group trials were the most common [82.65% (81/98)]. Over 64.56% (133/206) of the trials were indicated with open-label. Most of the clinical trials were in phase III [47.57% (98/206)] and phase IV [16.50% (34/206)]. The interventions in female studies were mainly in three aspects: oral contraceptive [42.64% (84/197)], intrauterine delivery [15.23% (30/197)], and vaginal delivery [15.23% (30/197)], and the primary outcome included pregnancy rate [54.82% (108/197)], adverse drug reactions [13.20% (26/197)], ovulation inhibition [8.63% (17/197)], and vaginal infection [4.06% (8/197)]. **Conclusion** The clinical trials of contraceptives were unevenly distributed, the research types were mainly randomized interventional trials, the included participants were mainly women of reproductive age, the intervention measures were mostly oral contraceptive, intrauterine delivery and vaginal delivery.

【 Key words 】 Contraception; Clinical trial; World Health Organization; International Clinical Trials Registry Platform; Registration status

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个案报道

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子宫内膜样癌Ⅱ级ⅠA期合并染色体平衡易位患者保留生育功能治疗后 PPOS 方案促排卵成功助孕 1 例

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【摘要】 本文报道 1 例 32 岁女性患者, 2020 年 9 月因 B 超提示宫腔占位, 外院宫腔镜检查, 病理提示子宫内膜局部内膜样癌 II 级, 分子分型为无特殊分子特征型。促性腺激素释放激素激动剂联合来曲唑治疗后疾病达到完全缓解, 检查双方染色体核型, 女方 46,XX,t(9;14)(q22;q24), 男方为 46,XY。行左炔诺孕酮宫内释放系统保护下高孕激素状态下促排卵方案促排卵, 共获卵 17 枚, 其中成熟卵母细胞 14 枚, 采用卵胞质内单精子注射受精 13 枚, 第 3 天胚胎 10 枚, 囊胚培养后形成 6 枚囊胚, 进行胚胎植入前染色体结构重排检测, 获得整倍体胚胎 1 枚(B6BB), 激素替代周期冷冻胚胎复苏移植后成功妊娠, 并分娩一健康男婴。本案例提示子宫内膜样癌 II 级 I A 期患者经药物联合治疗可达到完全缓解并妊娠, 但治疗之前应全面评估并告知相关风险。合并染色体平衡易位, 应积极采用胚胎植入前遗传学检测治疗, 阻断非整倍体胚胎种植。

【关键词】 子宫内膜样癌 II 级; 保留生育功能治疗; 染色体平衡易位; 高孕激素状态下促排卵; 植入前遗传学检测

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A case of successful ovulation induction and pregnancy with the PPOS regimen after fertility preservation treatment for stage I A grade 2 endometrioid carcinoma combined with balanced chromosomal translocation

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【Abstract】 In this case, the patient was 32-year-old. In September 2020, hysteroscopy was performed due to the indication of intrauterine lesion shown by ultrasound. Pathological examination suggested local grade II endometrioid carcinoma, and the molecular classification was no specific molecular profile. The patient was treated by gonadotropin-releasing hormone agonist and letrozole and achieved complete response. The chromosome karyotype examination suggests that the female was 46,XX,t(9;14)(q22;q24), and the male was 46,XY. The progestin primed ovarian stimulation regimen for ovulation induction was carried out under the protection of levonorgestrel-releasing intrauterine system. A total of 17 oocytes were retrieved, among which 14 were mature oocytes. Intracytoplasmic sperm injection was used for fertilization, and 13 oocytes were fertilized. On the 3rd day, there were 10 embryos. After blastocyst culture, 6 blastocysts were formed. Six

blastocysts were biopsied for preimplantation genetic testing for structural rearrangements, and 1 euploid embryo (B6BB) was obtained. Successful pregnancy was delivered after hormone replacement therapy-frozen embryo transfer, and a healthy male infant was obtained. This case indicates that patients with grade II endometrioid carcinoma can achieve complete remission and pregnancy through combined drug treatment. However, a comprehensive assessment should be conducted, and relevant risks should be informed before treatment. For those with balanced chromosomal translocation, preimplantation genetic testing should be actively adopted to block the implantation of aneuploid embryos.

【Key words】 Grade II endometrioid carcinoma; Fertility preservation treatment; Balanced chromosomal translocation; Progestin primed ovarian stimulation; Preimplantation genetic testing

Fund program: Young Eagle Program of Shanghai Anti-Cancer Association (SACA-CY22C08); Youth Project of Shanghai Municipal Health Commission (20224Y0084)

综述

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单胺类神经递质对多囊卵巢综合征临床表现相关影响的研究进展

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【摘要】 多囊卵巢综合征 (polycystic ovary syndrome, PCOS) 是一种常见的生殖障碍及代谢紊乱性疾病, 患者的症状常表现为月经失调、多毛、痤疮、肥胖等。研究表明PCOS患者相较于非PCOS女性有更高的焦虑抑郁和睡眠障碍患病率,

可能与 PCOS 患者神经支配异常有关。其中单胺类神经递质（5-羟色胺、多巴胺和去甲肾上腺素）在中枢层面水平较低，外周层面水平较高，在两个层面上均可通过多种不同途径影响 PCOS 的多种临床表现，包括代谢紊乱、生殖障碍、焦虑抑郁以及睡眠障碍的形成和发展。本文对单胺类神经递质在 PCOS 患者体内生理特征及疾病临床表现影响的研究进展进行综述，希望对 PCOS 患者神经内分泌特征及发病机制探讨有进一步启迪。

【关键词】 多囊卵巢综合征； 多巴胺； 去甲肾上腺素； 5-羟色胺； 发病机制； 临床表现

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Research progress on the effects of monoamine neurotransmitters on clinical manifestations of polycystic ovary syndrome

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【Abstract】 Polycystic ovary syndrome (PCOS) is a common reproductive and metabolic disorder, with symptoms of menstrual disorders, hirsutisms, acne, and obesity. Studies have found that PCOS patients have a higher prevalence of anxiety, depression and sleep disorders than non-PCOS women, which may be related to the abnormal innervation. Meanwhile, it has been found that PCOS patients exhibit lower central level and higher peripheral levels of monoamine neurotransmitters (5-hydroxytryptamine, dopamine and norepinephrine). These imbalances can affect various clinical manifestations of PCOS, including the formation and development of metabolic and reproductive disorders, as well as anxiety and sleep disorders, through multiple pathways. This review summarizes recent research progress on the role of monoamine neurotransmitters in the physiological characteristics and clinical manifestations of PCOS patients, aiming to provide new insights into the neuroendocrine characteristics and pathogenesis of the syndrome.

【Key words】 Polycystic ovary syndrome; Dopamine; Norepinephrine; 5-hydroxytryptamine; Pathogenesis; Clinical manifestations

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综述

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富血小板血浆治疗宫腔粘连的机制与临床应用进展

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【摘要】 宫腔粘连是子宫内膜基底层损伤导致的子宫壁粘连, 会影响女性月经和生育能力。目前通过手术和药物治疗效果不理想, 容易复发。富血小板血浆 (platelet-rich plasma, PRP) 是一种通过离心自体血液获得的富含高浓度血小板的血浆, 含有多种生物活性因子 (血小板衍生生长因子、转化生长因子 β 、血管内皮生长因子和胰岛素样生长因子 1 等), 在宫腔粘连治疗中可显著促进细胞增殖与分化、血管再生、抗炎与预防感染、降低纤维化以及发挥生物支架作用, 可显著改善子宫内膜形态, 减少纤维化, 提高生育能力。鉴于 PRP 在宫腔粘连中的治疗优势, 本文将从 PRP 的特性、治疗宫腔粘连的机制和临床应用等方面展开论述, 以期使人们进一步了解 PRP 在治疗宫腔粘连中发挥的重要作用, 为其临床推广应用奠定基础。

【关键词】 富血小板血浆; 宫腔粘连; 生长因子; 组织修复

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Progress in the mechanism and clinical application of platelet-rich plasma in the treatment of intrauterine adhesions

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【Abstract】 Intrauterine adhesions are adhesions of the uterine wall caused by damage to the basal layer of the endometrium, which will affect women's menstruation and fertility. At present, the effect of surgery and drug treatment is not ideal, and it is easy to relapse. Platelet-rich plasma (PRP) is a kind of plasma with high concentration of platelets obtained by centrifuging autologous blood, containing a variety of bioactive factors (platelet-derived growth factor, transforming growth factor- β , vascular endothelial growth factor, insulin-like growth factor 1, etc.), which can significantly promote cell proliferation and differentiation, angiogenesis, relieve inflammation and prevent infection, reduce

fibrosis and be used as biological scaffold in the treatment of uterine adhesion. It can significantly improve endometrial morphology, reduce fibrosis and improve fertility. In view of the advantages of PRP in the treatment of intrauterine adhesions, this paper will discuss the characteristics, mechanism and application of PRP in the treatment of intrauterine adhesions, so as to further understand the important role of PRP in the treatment of intrauterine adhesions and lay a foundation for its clinical application.

【Key words】 Platelet-rich plasma; Intrauterine adhesions; Growth factor; Tissue repair

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综述

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子宫内膜微环境在不良妊娠结局中作用机制的研究进展

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【摘要】 不良妊娠结局 (adverse pregnancy outcome, APO) 是指正常活产以外的其他妊娠结局, 主要包括子痫前期、胎儿生长受限、复发性妊娠丢失等, 严重威胁母婴健康。多数 APO 源自妊娠前子宫内膜微环境异常。一旦女性确定妊娠, 此时再对子宫内膜进行干预, 往往为时已晚。子宫内膜作为胚胎着床和发育的关键场所, 其微环境的异常可导致 APO。因此, 深入探究孕前子宫内膜微环境与 APO 之间的关系, 有助于阐明 APO 发生机制, 并为早期防治提供关键思路与方法。本文对子宫内膜微环境与 APO 作用机制的最新研究进行综述, 主要从免疫失衡、炎症反应、

能量代谢异常和子宫内膜基质细胞衰老等方面系统梳理了该领域的研究进展及主要结论。

【关键词】 子痫前期； 胎儿生长受限； 复发性妊娠丢失； 不良妊娠结局； 子宫内膜微环境

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Research progress on the mechanism of endometrial microenvironment in adverse pregnancy outcomes

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【Abstract】 Adverse pregnancy outcome (APO) refers to any pregnancy outcome other than a normal live birth, mainly including preeclampsia, fetal growth restriction, recurrent pregnancy loss, etc., which seriously threaten the health of both the mother and the fetus. Most APOs originate from abnormal uterine endometrial microenvironment before pregnancy. Once a woman confirms pregnancy, intervening in the uterine endometrium at this stage is often too late. The uterine endometrium, as a key site for embryo implantation and development, its abnormal microenvironment can lead to APO. Therefore, in-depth exploration of the relationship between the pre-pregnancy uterine endometrial microenvironment and APO is helpful for clarifying the mechanism of APO occurrence and providing key ideas and methods for early prevention and treatment. This article reviews the latest research on the mechanism of action between uterine endometrial microenvironment and APO, systematically summarizing the research progress and main conclusions in this field from several aspects such as immune imbalance, inflammatory response, abnormal energy metabolism, and senescence of uterine endometrial stromal cells.

【Key words】 Pre-eclampsia; Intrauterine growth restriction; Recurrent pregnancy losses; Adverse pregnancy outcomes; Endometrial microenvironment

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综述

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香烟烟雾影响卵巢储备及功能的研究进展

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【摘要】 卵巢储备功能减退 (diminished ovarian reserve, DOR) 是指卵巢内存留的可募集卵泡数量减少、卵母细胞质量下降, 进而影响卵泡发育、排卵及性激素分泌, 导致生育能力降低。香烟烟雾中的有害化学成分, 如尼古丁、苯并芘等, 能够干扰下丘脑-垂体-卵巢轴, 通过细胞凋亡、细胞自噬、氧化应激及 DNA 损伤等多种途径损害卵巢储备及功能, 其能够直接作用于卵巢颗粒细胞和卵母细胞, 引发卵母细胞发育障碍、颗粒细胞凋亡增加, 破坏生殖内分泌稳态, 导致 DOR, 影响女性生育力。目前, 香烟烟雾导致 DOR 的分子机制研究尚不完全明确。本文对香烟烟雾暴露影响卵巢组织及介导卵巢功能的分子机制进行综述, 旨在为研究香烟烟雾导致 DOR 及影响卵巢功能提供理论参考, 为处在不良环境及不良生活习惯的不孕女性提供助孕指导。

【关键词】 卵巢储备; 香烟烟雾; 细胞凋亡; 氧化应激; DNA 损伤

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Research progress on the effects of cigarette smoke on ovarian reserve and function

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【Abstract】 Diminished ovarian reserve (DOR) is a decrease in the number of available follicles in the ovaries and the quality of oocytes, which in turn affects follicle development, ovulation and sex hormone secretion, resulting in decreased fertility. Harmful chemical components in cigarette smoke, such as nicotine and benzopyrene, can interfere with the hypothalamic-pituitary-ovarian axis and impair ovarian reserve and function through apoptosis, autophagy, oxidative stress and DNA damage, which can directly affect ovarian granulosa cells and oocytes, causing oocyte development disorders, increased apoptosis of granulosa cells, destroy reproductive endocrine homeostasis, lead to DOR and affect female fertility. At present, the molecular mechanism of premature ovarian dysfunction caused by cigarette smoke is not fully understood. In this paper, the molecular mechanism of cigarette smoke exposure affecting ovarian tissue and mediating ovarian function was reviewed, aiming to provide theoretical reference for the study of cigarette

smoke induced DOR and affecting ovarian function, and to provide pregnant guidance for infertile women in bad environment and bad living habits.

【Key words】 Ovarian reserve; Cigarette smoke; Apoptosis; Oxidative stress; DNA damage

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综述

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肥胖对卵子质量和早期胚胎发育影响的研究进展

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【摘要】 本文就肥胖对女性生育能力、卵子质量、早期胚胎发育以及辅助生殖技术 (assisted reproductive technology, ART) 的影响进行探讨, 并评估了肥胖与妊娠并发症之间的关系, 提出了相应的预防和治疗策略。肥胖可以通过慢性炎症、氧化应激和代谢途径的失调, 对卵母细胞质量产生不利影响, 包括减数分裂缺陷、线粒体功能受损和表观遗传改变。肥胖还影响早期胚胎发育, 可能导致胎盘功能障碍和胎儿生长受限。在 ART 领域, 肥胖女性面临更多的挑战, 如妊娠糖尿病风险增加和体外受精成功率下降。此外, 肥胖与多种妊娠并发症风险增加相关, 包括妊娠期高血压疾病、妊娠糖尿病、早产等, 且肥胖可能增加因妊娠并发症而实施剖宫产的风险。本文强调了孕前和孕期体质量管理的重要性, 并提出了通过生活方式改变、药物治疗和手术治疗来改善肥胖女性生育力的策略。最终, 本文为肥胖女性的生育健康提供了个性化建议, 以改善生育能力和妊娠结局, 确保母亲和孩子的健康状况。

【关键词】 肥胖； 生殖技术，辅助； 妊娠并发症； 卵子质量； 早期胚胎发育

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Research progress on the impact of obesity on oocyte quality and early embryo development

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【Abstract】 This paper comprehensively discusses the impact of obesity on female fertility, oocyte quality, early embryonic development, and assisted reproductive technology (ART), and evaluates the relationship between obesity and pregnancy complications, proposing corresponding prevention and treatment strategies. Studies have shown that obesity adversely affects oocyte quality through chronic inflammation, oxidative stress, and disruption of metabolic pathways, including meiotic defects, mitochondrial dysfunction, and epigenetic alterations. Obesity also affects early embryonic development, potentially leading to placental dysfunction and restricted fetal growth. In the field of ART, obese women face more challenges, such as increased risk of gestational diabetes and decreased success rates of *in vitro* fertilization. Additionally, obesity is associated with an increased risk of various pregnancy complications, including hypertensive disorders of pregnancy, gestational diabetes, preterm birth, and cesarean section. This paper emphasizes the importance of preconception and prenatal weight management and proposes strategies to improve the fertility of obese women through lifestyle changes, pharmacological treatment, and surgical intervention. Ultimately, this thesis provides personalized recommendations for the reproductive health of obese women to improve fertility and pregnancy outcomes, ensuring the health status of both mother and child.

【 Key words 】 Obesity; Reproductive technology, assisted; Pregnancy complications; Oocyte quality; Early embryonic development

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