

REVIEW

Acupuncture for Infertility: Is It An Effective Therapy?*

HUANG Dong-mei (黄冬梅)¹, HUANG Guang-ying (黄光英)¹, LU Fu-er (陆付耳)¹, Dieterle Stefan^{2,3}, Neuer Andreas³, and Greb Robert³

ABSTRACT Acupuncture has been used to treat infertility extensively, including ovulatory dysfunction, *in vitro* fertilization and embryo transfer (IVF-ET), and male infertility. This review summarizes the recent studies which investigated the role of acupuncture in infertility. In conclusion, most of the existing studies suggest a positive effect of acupuncture in infertility treatment. Firstly, acupuncture may improve ovulation by modulating the central and peripheral nervous systems, the neuroendocrine and endocrine systems, the ovarian blood flow, and metabolism. Secondly, acupuncture can improve the outcome of IVF-ET, and the mechanisms may be related to the increased uterine blood flow, inhibited uterine motility, and the anesis of depression, anxiety and stress. Its effect on modulating immune function also suggests helpfulness in improving the outcome of IVF-ET. Finally, the studies suggest that acupuncture plays a positive role in male infertility, the mechanism of which is not yet clear. Even though a positive effect of acupuncture in infertility has been found, well-designed multi-center, prospective randomized controlled studies are still needed to provide more reliable and valid scientific evidence. Furthermore, it is urgent and necessary to clarify the mechanism of acupuncture for infertility.

KEYWORDS acupuncture, ovulation, *in vitro* fertilization and embryo transfer, infertility

Acupuncture is one of the therapeutic methods in Chinese medicine (CM), with a history of several thousands of years of use. Acupuncture is based on the theory that there are pathways (meridians) within the body where qi and blood flow. Along these meridians there are specific points (acupoints). By needling the acupoints, acupuncture can regulate the flow of qi and blood in the meridian system, rectify the disturbance and dysfunction of organs in the body, and restore their normal functions.

Currently, acupuncture has been booming worldwide. In the United Kingdom, 7% of the adult population visited an acupuncture practitioner within their lifetime⁽¹⁾. In the 2002 National Institutes of Health interview-survey conducted in the United States, 4.1% of the respondents reported lifetime use of acupuncture, and 1.1% reported recent use of acupuncture⁽²⁾.

Recently, acupuncture has been used to treat infertility extensively, including ovulatory dysfunction, *in-vitro* fertilization and embryo transfer (IVF-ET), and male infertility. The effect of acupuncture has aroused the interest of clinicians and medical scientists from all over the world. More and more clinical and animal researches have been conducted to evaluate the efficacy of acupuncture for infertility and explore its mechanisms. Some reports approved the efficacy of acupuncture for infertility, while others

doubted or refuted it. Therefore, multi-center studies with adequate design and sample size as well as appropriate control are lacking and needed^(3,4), and the mechanism of action of acupuncture in the management of infertility still remains to be elucidated.

In order to keep up with the up-to-date progress on the effect of acupuncture in the treatment of infertility, this article reviews recent researches in the following aspects: Firstly, it discusses infertility from the perspective of CM. Secondly, it discusses how to treat infertility using acupuncture according to syndrome differentiation. Thirdly, it summarizes the effect and the mechanism of acupuncture on the management of ovulatory dysfunction and IVF-ET. Finally, it reviews the effect of acupuncture on male infertility.

Infertility from a CM Perspective

According to the theory of CM, the Shen (肾)

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1. Institute of Integrated Traditional Chinese and Western Medicine, Tongji Hospital, Huazhong University of Science and Technology, Wuhan (430030), China; 2. Division of Reproductive Endocrinology and Infertility, Department of Obstetrics and Gynaecology, University of Witten/Herdecke, Dortmund, Germany; 3. Infertility Center of Dortmund, Germany
Correspondence to: Dr. HUANG Dong-mei, Tel: 86-27-83663275, Fax: 86-27-83663237, E-mail: hdmjcr@qq.com
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governs the reproduction of the body. Infertility is always associated with a deficiency of Shen qi, yin or/and yang^(5,6). Furthermore, qi deficiencies and stagnation, blood level imbalances (insufficiency and blocked circulation), and blockages due to dampness and phlegm are also important causes of infertility.

Acupuncture for Infertility

Zhongji (CV3), Guanyuan (CV4), Sanyinjiao (SP6), and Zigong (EX-CA1) are commonly chosen to treat infertility. However, individual acupuncture protocols should be adopted according to syndrome differentiation. Generally, for asthenia of Shen yang, Mingmen (GV4) and Shenshu (BL23) are added and moxibustion is often used. For asthenia of Shen yin, Taixi (KI3) is often added. For phlegm and dampness, Yinlingquan (SP9), Fenglong (ST40), Zusanli (ST36) and Pishu (BL20) are chosen. For blood stasis, Geshu (BL17) and Xuehai (SP10) are added. For qi stagnation, Ganshu (BL18) and Taichong (LR3) are used⁽⁷⁾.

Acupuncture for Ovulatory Dysfunction

Efficacy of Acupuncture in Ovulatory Dysfunction

Repeated acupuncture in women with polycystic ovarian syndrome (PCOS) and women with undefined ovulatory dysfunction showed long-lasting beneficial effects on endocrinologic parameters and anovulation, without negative side effects⁽⁸⁻¹¹⁾.

A non-randomized, longitudinal, prospective study by Stener-Victorin, et al⁽⁸⁾ evaluated the efficacy of electro-acupuncture (EA) for ovulation induction on 24 oligo/amenorrheic women with PCOS. The percentage of ovulatory cycles in all subjects was improved from 15% (in a total of 3 months before treatment) to 66% up to 3 months after acupuncture. Responsive patients were noted to have significantly lower body mass index (BMI), waist-to-hip circumference ratio, serum T concentration, serum T/sex hormone-binding globulin ratio, and serum basal insulin level. Stener-Victorin, et al suggested that in these selected patients with PCOS, acupuncture could be considered as an alternative or adjunct treatment to pharmacological ovulation induction.

Chen, et al⁽⁹⁾ reported that 6 of 13 anovulatory cycles treated with EA showed ovulation. The role of beta-endorphins in the mechanism of EA ovulation induction was suggested.

Gerhard, et al⁽¹²⁾ observed the effect of auricular acupuncture on 45 infertile women suffering from ovulatory dysfunction, such as oligomenorrhea, luteal phase defect, etc. Patients received auricular acupuncture once each week. Suitable auricular points were located during an examination of the ear with a small electric hammer and simultaneous pulse rate determinations. The most frequently selected points were: the gonadotropin point, the ovarian point, the uterus point, the gestagen point, the kidney point, points of the hypothalamic-pituitary area, the spleen point, secondary psychosomatic points, and omega points. Depending on the electrical potential of the selected point, either gold or silver needles were inserted into the skin to a depth of 0.5 mm and left there for 30 min. The control group received drug treatment including dexamethasone, levothyroxine, clomiphene citrate (CC), and gonadotropin. Although the resumption of ovulatory cycles occurred significantly more often in the acupuncture group compared to the control group, pregnancy rates (PR) were not significantly different between the two groups. However, because of the heterogeneity of the patient population and treatment modalities, it was very difficult to evaluate the study data.

In a clinical trial, of the 11 cycles affected by ovarian hyperstimulation syndrome (OHSS) induced by human menopausal gonadotropin (HMG), ovulation was induced by acupuncture as a substitute for human chorionic gonadotropin, and the symptoms of OHSS were significantly ameliorated, or even disappeared, in 10 cycles⁽¹³⁾.

Underlying Mechanisms of Acupuncture in Ovulatory Dysfunction

Acupuncture has an impact on the hypothalamus-pituitary-ovarian axis and the menstrual cycle through neuropeptides in the central nervous system, particularly beta-endorphins, and the release of hypothalamic gonadotropin releasing hormone (GnRH) and pituitary secretion of gonadotropin^(8, 11, 14-16). Wang, et al.⁽¹⁷⁾ found that EA increased the expression of GnRH in the medial preoptic area, the arcuate nuclei and the nuclei periventriculares of the hypothalamus, with significantly more expression in the diestrus and the metaoestrus of PCOS rats. Various investigators have proved that in ovulatory or anovulatory cycles, acupuncture influences serum levels of follicle-stimulating hormone (FSH), luteinizing

hormone (LH), estradiol (E2), and progesterone (P)^(10,18,19).

Acupuncture can increase the ovarian blood flow possibly due to its sympatho-inhibitory effects. After acupuncture, sympathetic nerve activity, as measured by norepinephrine level, skin temperature, blood pressure, and pain tolerance threshold, decreased⁽²⁰⁾. In experimental rat studies, low-frequency EA increased ovarian blood flow. The response was mediated via ovarian sympathetic nerves as a reflex response and controlled by supraspinal pathways^(21,22). The needles were placed in the abdomen and hind limb, which have the same somatic innervation as the ovaries and uterus⁽²¹⁻²³⁾. It was found that EA modulated sympathetic nerve activity in the ovaries by decreasing ovarian concentrations of endothelin, corticotrophin-releasing factor and nerve growth factor^(24,25).

The metabolic syndrome, especially insulin resistance (IR) with compensatory hyperinsulinemia, is a prominent feature of PCOS⁽²⁶⁾. It was estimated that approximately up to 50% of PCOS patients showed IR and hyperinsulinemia⁽²⁷⁾. EA or acupuncture reduces food intake and body weight, increases insulin sensitivity, and reduces blood glucose and lipid levels in both rats^(28,29) and humans⁽³⁰⁻³⁴⁾, which may relate to the influence of acupuncture on leptin and adiponectin expression^(28,29, 33,34). Low-frequency EA stimulates glucose transport in skeletal muscle independent of insulin and increases the insulin sensitivity of glucose transport in rats⁽³⁵⁻³⁷⁾. Acupuncture could lead to weight reduction and menstrual improvement via regulating the activities of leptin, the thyroid gland system and the hypothalamus-pituitary-adrenal cortex axis⁽³⁸⁾.

In conclusion, acupuncture and low-frequency EA may improve ovulation via modulation of endogenous regulatory systems including the central and peripheral nervous system, the neuroendocrine and endocrine system, the ovarian blood flow, and metabolism.

Acupuncture for IVF-ET

Efficacy of Acupuncture in Improving IVF-ET Outcome

Manheimer, et al⁽³⁹⁾ made a meta-analysis of 1 366 women undergoing IVF treatment in 7 randomized controlled studies published from 2002 to 2007⁽⁴⁰⁻⁴⁶⁾. The 1 366 women received either meridian

point acupuncture, sham or placebo acupuncture, or no adjuvant treatment within 1 day of ET. They found that at the time of embryo transfer acupuncture was associated with significant and clinically relevant improvements in clinical PR [odds ratio (OR) 1.65, 95% confidence interval (CI) 1.27 to 2.14; number needed to treat (NNT) 10 (7 to 17); seven trials], ongoing PR (1.87, 1.40 to 2.49; NNT 9 (6 to 15); five trials), and live birth rates [1.91, 1.39 to 2.64; NNT 9 (6 to 17); four trials]. On average, 10 women would need to be treated with acupuncture to bring about 1 additional clinical pregnancy.

Yu Ng EH, et al⁽⁴⁷⁾ made a meta-analysis of 10 randomized studies^(40-44, 48-52). In five studies⁽⁴⁰⁻⁴⁴⁾, acupuncture was administered on the day of embryo transfer. In another five studies⁽⁴⁸⁻⁵²⁾, acupuncture was performed during transvaginal ultrasound-guided oocyte retrieval. This meta-analysis revealed a significant improvement in the clinical PR for acupuncture treatment OR 1.42, 95% CI 1.17–1.72). A subgroup analysis based on the day of acupuncture detected a significant improvement in the clinical PR for acupuncture treatment when acupuncture was administered on the day of ET (OR 1.83, 95% CI 1.40–2.39). However, there was no improvement in PR when acupuncture was given on the day of the oocyte retrieval only (OR 1.07, 95% CI 0.81–1.42). These data suggested that acupuncture should be offered to patients on the day of ET.

Anderson, et al⁽⁵³⁾ summarized eleven studies. They suggested that acupuncture improve the success rate of IVF, may improve the quality of life of patients undergoing IVF, and may be a safe adjunct therapy for IVF patients. But they also pointed out that the majority of available studies had significant design limitations^(8,40-42,48-49,51,54-56).

In 2002, Paulus and colleagues⁽⁴⁰⁾ published the first randomized, controlled, prospective study on the impact of acupuncture before and after embryo transfer on PR in 160 IVF patients with good quality embryos. The women who received acupuncture 25 min before and again 25 min after embryo transfer had a 42.5% clinical PR compared to a 26.3% rate ($P=0.03$) in the control group who lay quietly for an equivalent amount of time.

Interestingly, Paulus, et al⁽⁴¹⁾ conducted a

subsequent study using the same protocol as in the first study but III with the control subjects receiving placebo acupuncture. The clinical PR for real acupuncture was 43% and for placebo acupuncture 37% ($P=0.39$). They proposed that the placebo needles might have induced an "acupressure effect", thus leading to a higher clinical PR in those patients.

Westergaard, et al⁽⁴²⁾ randomized 300 patients into three groups: group I received acupuncture shortly before and after ET; group II received acupuncture on the day of ET and again 2 days later, and group III served as control without acupuncture. The acupoints used were the same as those of Paulus, et al⁽⁴¹⁾. Similar acupoints were used repeatedly 2 days after ET. The clinical PR of group I was significantly higher than that of group III (39% vs. 26.0%; $P=0.04$). As the PR of group I and group II were comparable, it seemed that there was no additional benefit from acupuncture 2 days after ET in group II. However, placebo or sham acupuncture was not used in this study, and the patients were not blinded to the treatment assignment. In addition, the acupuncture treatment was administered by nine nurse practitioners, thus leading to a great variation in the administration of acupuncture.

Dieterle, et al⁽⁴³⁾ randomized 225 infertile patients into verum and sham acupuncture groups with different sets of acupoints. The study used an acupuncture protocol that was different from the one used in the study of Paulus, et al⁽⁴¹⁾. Two sessions of acupuncture were given to patients, immediately after ET and 3 days later, with auricular acupuncture given at the same time. The study showed that the clinical and ongoing PR of the verum acupuncture group were significantly higher than those of the control group (33.6% vs. 15.6% and 28.4% vs. 13.8%; $P<0.01$).

Smith, et al⁽⁴⁴⁾ performed a single-blind, randomized controlled trial. Two hundred and twenty-eight women were randomly allocated to acupuncture or noninvasive sham acupuncture with placebo needles. All women received three sessions, the first on day 9 of ovarian stimulation, the second before ET, and the third immediately after ET. The acupuncture protocol before and after ET was similar to that of Paulus, et al⁽⁴¹⁾ with some minor modifications, but the details of the acupuncture on day 9 of ovarian stimulation were not given. The clinical PR was 31%

in the acupuncture group and 23% in the control. For those subjects receiving acupuncture, the odds of achieving pregnancy were 1.5 times higher than for the control group but was not statistically significant. The ongoing PR at 18 weeks was higher in the treatment group (28% vs. 18%) but the difference was not statistically significant. The authors pointed out that even though there were no significant differences in PR between groups, a smaller treatment effect could not be excluded.

Benson, et al⁽⁴⁵⁾ compared two different acupuncture protocols, needle and laser acupuncture, with sham laser acupuncture, relaxation, or no interventional treatment on implantation and PR in women undergoing IVF. Two hundred and fifty-eight patients were randomly assigned to one of five study treatment regimens: needle acupuncture (53 case), laser acupuncture ($n=53$), sham laser acupuncture (placebo, 52 case), relaxation (50 case), or no intervention treatment (50 case). All treatments were administered 25 minutes before ET and immediately after ET. The patient and acupuncturist were unaware of whether the laser system was active, which allowed for a double-blind control group for the laser acupuncture treatment. Conception and implantation rates were the highest with traditional needle acupuncture. IVF treatment outcomes did not differ between patients treated with laser or sham laser acupuncture. This study did not have the statistical power to detect treatment differences in PR between needle acupuncture and no treatment (at least 200 subjects are needed to detect differences in clinical PR of 54.7 and 44% with 80% power). However, while not statistically significant, needle acupuncture produced a more than 10% increase in clinical PR compared with relaxation or no treatment.

Domar, et al⁽⁴⁶⁾ included 150 patients who were randomized to either the acupuncture or control group during IVF. The patients received the same protocol as described by Paulus, et al⁽⁴⁰⁾. The acupuncture subjects had a 30.8% clinical PR compared to a 33.8% rate in the controls ($P=0.69$). However, acupuncture patients reported significantly less anxiety post-transfer and reported feeling more optimistic about their cycle and enjoyed their sessions more than the control subjects.

Craig, et al⁽⁵⁷⁾ conducted a multi-center,

prospective, randomized study. One hundred and seven patients undergoing IVF were randomized to acupuncture or control group. The treatment group received acupuncture for 25 min before and after embryo transfer using a modified Paulus protocol⁽⁴¹⁾ with the addition of CV6 before and KI3 after transfer. The control group underwent embryo transfer without any other intervention. The clinical PR was higher in the control group than that in the acupuncture group (69.6% vs. 43.8%, respectively; $P < 0.03$). The authors suggested that acupuncture before and after embryo transfer lowered PR compared to the control.

There are other studies published as abstracts⁽⁵⁸⁻⁶⁵⁾. In three retrospective studies on IVF outcome following electro-acupuncture treatment combined with auricular acupuncture⁽⁵⁸⁻⁶⁰⁾, the investigators found a significant increase in clinical PR after acupuncture treatment^(59,60) and suggested that patients with good prognosis would benefit from acupuncture treatment.

However, Lehl, et al⁽⁶¹⁾ found that acupuncture pre- and post-embryo transfer as an adjunct to ART treatment did not appear to improve outcomes in their retrospective analysis. But their reports lacked treatment randomization descriptions.

In another retrospective study, 52 cycles with acupuncture and 59 cycles without acupuncture were included⁽⁶²⁾. Acupuncture was performed at specific points of the body, including the ear, immediately before and after embryo transfer. The clinical PR per cycle was 51.9% in the acupuncture group and 35.6% in the control group ($P = 0.083$). Although there was a higher PR in the acupuncture group, this difference was not statistically significant, probably because of the small number of patients in both groups.

Quintero, et al⁽⁶³⁾ conducted a randomized double-blind but cross-over study using a needle-like device as the sham acupuncture. In such study, only 17 patients were recruited, and seven of them completed both arms of the study. There was no difference in PR between the two groups.

Wang, et al⁽⁶⁴⁾ observed the effect of acupuncture on PR when acupuncture started on day 5 of the cycle and was performed twice a week until two weeks after oocyte retrieval. Thirty-two matched pairs

were evaluated. Ultrasound evidence of pregnancy was 40.6% vs. 53.1% in the controls. Ongoing or delivered pregnancy was 37.5% vs. 43.7% in controls. The acupuncture protocol in this study began in the follicular phase. However, the authors did not compare the numbers of oocytes retrieved, oocytes fertilized, or embryo transferred between those receiving acupuncture and the controls.

Magarelli, et al⁽⁶⁵⁾ investigated the impact of acupuncture on the population demographics of patients in 232 IVF cycles in a retrospective way, specifically based on infertility diagnosis and age groups of the patients. They found that patients with tubal factor, PCOS and male factor had better outcomes when IVF was combined with acupuncture. With multivariate statistical analysis, they determined that the "ideal" patients who would benefit from adding acupuncture to their IVF treatments were >38 with male factor infertility.

Underlying Mechanisms of Acupuncture for Improving IVF-ET Outcome

Acupuncture improves the outcome of IVF-ET possibly by increasing uterine blood flow, inhibiting uterine motility and relieving depression, anxiety and stress.

Acupuncture reduces blood flow impedance and increases uterine blood flow. A high uterine artery pulsatility index (PI) is associated with a decreased pregnancy rate following IVF-ET⁽⁶⁶⁾. Stener-Victorin, et al⁽⁶⁷⁾ demonstrated that the mean PI of uterine vessels was significantly reduced shortly after EA was given twice a week, eight times, to subfertile women with $PI \geq 3.0$. This decrease was sustained for 10-14 days after the EA treatment period.

Acupuncture at the acupoint Hegu (LI 4) was reported to inhibit uterine motility through reducing the expression of COX-2 enzyme in the uterus of pregnant rats⁽⁶⁸⁾. High-frequency uterine contractions on the day of embryo transfer might reduce the pregnancy rate of IVF treatment, possibly by expelling embryos out of the uterine cavity⁽⁶⁹⁾.

Acupuncture relieves stress, anxiety and depression. Patients undergoing IVF treatment are often under great stress. Stress can influence the outcome of IVF-ET negatively^(70,71). Severity and prevalence of depression increase as the number of IVF treatment failure increases⁽⁷²⁾. Acupuncture

may provide stress reduction in women undergoing subfertility treatment^(14,73,74). Domar, et al⁽⁴⁶⁾ found that acupuncture patients reported significantly less anxiety post-transfer and reported feeling more optimistic about their treatment and enjoyed their sessions more than control subjects. Feelings of relaxation were reported by 86% of patients following acupuncture⁽⁷⁵⁾. Acupuncture reduces depression, anxiety and stress possibly by modulating neuropeptide Y levels in the amygdala⁽⁴⁹⁾, increasing the production of opioid peptides especially β -endorphin⁽⁷⁶⁾, attenuating the sympathetic nervous system, and enhancing vagal nervous activity⁽⁷⁷⁾.

It has been proposed that acupuncture improves IVF outcome by modulating immune factors, especially cytokines⁽⁵³⁾, and modulates the immune function of the body⁽⁷⁸⁾. Immune modulation, especially local and systemic Th2 dominance, is critical for successful implantation and pregnancy. However, there is no direct evidence supporting the theory that acupuncture can modulate the immune function related to implantation and pregnancy.

Effect of Acupuncture on Male Infertility

Efficacy of Acupuncture on Male Infertility

Male factor infertility accounts for up to half of all cases of infertility and affects one man in 20 in the general population⁽⁷⁹⁾. Oldereid, et al⁽⁸⁰⁾ reported that about 20% of men involved in subfertility investigations sought help from alternative medicine including acupuncture.

Siterman, et al⁽⁸¹⁾ assessed the effect of acupuncture on 16 men with abnormal sperm parameters in a prospective controlled study. Acupuncture was administered twice a week for five weeks. Semen analysis done one month after the acupuncture session demonstrated a significant improvement in total functional sperm fraction, percentage of viability, total motile sperm per ejaculation, and the integrity of the axonema with an increased fertility index, compared with those before acupuncture.

Siterman, et al⁽⁸²⁾ also investigated the effect of acupuncture on patients including five oligozoospermic and 15 azoospermic men. One month after acupuncture, semen analysis revealed a significant increase in sperm count per ejaculation in 10 (67%) of

the 15 azoospermic patients. In seven of these males, the sperm production increased significantly from 0 to an average of $(1.5 \pm 2.4) \times 10^6$ spermatozoa per ejaculation ($P \leq 0.01$).

In the study of Zhang, et al⁽⁸³⁾, acupuncture was given to 22 patients who failed in intracytoplasmic sperm injection (ICSI) for idiopathic male infertility twice weekly for eight weeks, followed by ICSI treatment again. Rapid sperm motility after acupuncture ($18.3\% \pm 9.6\%$) was significantly improved when compared with that before treatment ($11.0\% \pm 7.5\%$, $P < 0.01$). The normal sperm ratio was increased after acupuncture ($21.1\% \pm 10.4\%$ vs. $16.2\% \pm 8.2\%$, $P < 0.05$). The fertilization rate after acupuncture (66.2%) was higher than that before treatment (40.2%, $P < 0.01$).

In a prospective controlled study, Pei, et al⁽⁸⁴⁾ observed 28 patients receiving acupuncture twice a week over a period of 5 weeks, with 12 patients as controls. The authors found an improvement in sperm quality after acupuncture, specifically in the ultrastructural integrity of spermatozoa as shown by transmission electron microscopy.

He⁽⁸⁵⁾ randomized 108 males with idiopathic normogonadotrophic oligospermia to receive acupuncture and clomiphene (25 mg every day) versus clomiphene monotherapy. Acupuncture was administered every other day for 3 months, with the addition of electrical stimulation or moxibustion to specific points. Normalization of semen parameters was achieved in 74% of patients receiving the combination therapy of acupuncture and clomiphene, compared with 52% of those receiving clomiphene monotherapy; the difference was statistically significant.

Gurfinkel, et al⁽⁸⁶⁾ performed a prospective, randomized, blinded control study to investigate the effect of acupuncture combined with moxibustion in patients with abnormal semen analysis. Each session consisted of 25-min acupuncture followed by 20-min moxibustion, and was given twice a week for 10 weeks to 19 patients. In the control group, acupuncture and moxibustion were applied at "nontherapeutic indifferent points". This study revealed that acupuncture and moxibustion significantly increased the percentage of normal-form sperm in

infertile patients with oligoasthenozoospermia.

Gerhard, et al⁽⁸⁷⁾ reported the effect of a 10-day course of acupuncture combined with moxibustion after the seventh treatment. Improvement in sperm motility was mild but significant from the 1st to the 12th week after treatment. Forward progressive motility increased from 21% to 26%, and total motility increased from 42% to 50%.

Recently, Dieterle, et al⁽⁸⁸⁾ conducted a prospective, randomized, single-blind, placebo-controlled trial. Fifty-seven patients with sperm concentrations <1 million sperm/mL were divided into group I (28 case), treated with acupuncture, and group II (29 case), receiving placebo acupuncture twice weekly for 6 weeks. The following acupoints were chosen for both groups: Zusanli (ST 36, bilateral), Sanyinjiao (SP 6, bilateral), Taixi (KI 3, bilateral), Taichong (LIV 3, bilateral), Shenshu (BL 23, bilateral), Ciliao (BL 32, bilateral), Guilai (ST 29, bilateral), Xuehai (SP 10, bilateral), and Guanyuan (Ren 4). The study showed a significant effect of acupuncture on the percentage of total motile sperm ($P=0.035$). There were no significant differences in each category before and after acupuncture. There was a significant increase in sperm concentration after placebo acupuncture ($P=0.018$), but not after acupuncture. A decrease in semen volume after acupuncture ($P=0.041$) was found. In conclusion, the study supported the significance of acupuncture in male patients with severe oligoasthenozoospermia.

Furthermore, needling picking therapy as well as a combined treatment of acupuncture and Chinese herbs was also proven to improve semen quality, hormone profile, and pregnancy rate^(89,90).

Although these studies have suggested a positive effect of acupuncture on male infertility, most of them are uncontrolled case reports or case series in which the sample sizes were small.

Underlying Mechanisms of Acupuncture for Male Infertility

Little is known about the mechanism of acupuncture for male infertility. In one study, serum concentrations of FSH, LH, and testosterone were found to increase significantly following a 10-day course of acupuncture combined with moxibustion

given seven times, and the increase in serum testosterone was correlated with improvement of sperm motility⁽⁸⁷⁾.

Conclusion

Most of the studies suggested that acupuncture plays a positive role in the management of infertility including ovulation dysfunction, IVF-ET, and male infertility. Acupuncture may improve ovulation via modulation of the central and peripheral nervous system, the neuroendocrine and endocrine system, the ovarian blood flow, and metabolism. Acupuncture can improve the outcome of IVF-ET, and the mechanisms may be related to an increased uterine blood flow, inhibition of uterine motility, and a reduction of depression, anxiety and stress. Its effect in modulating immune function also suggests helpfulness in improving the outcome of IVF-ET. Acupuncture may play a positive role in male infertility.

Most of the randomized controlled trials were conducted outside of China. The effect of acupuncture in those randomized controlled trials did not reflect the essence of the CM perspective. In CM, acupoints are chosen individually based on the diagnosis (syndrome differentiation), according to the signs and symptoms of the patient. However, in the above clinical acupuncture trials, fixed protocols were administered to all patients. This standardization might reduce the effect of acupuncture in individual patients.

Multi-center, well-designed, prospective randomized controlled studies are still needed to provide more reliable and valid scientific evidence. Furthermore, it is necessary to further investigate and elucidate the mechanisms of acupuncture for the management of infertility. We wish for all the clinicians and scientists all over the world who are interested in this area to unite in conducting multi-center, prospective, randomized controlled studies.

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