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The Analysis of Short-Term Efficacy of Ectopic Pregnancy Treatment and the Outcome of Reproduction

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Abstract

Purpose: To evaluate the short term efficacy and related reproduction outcomes, of different Ectopic Pregnancy (EP) treatment approaches, using retrospective analysis. Methods EP patients (N = 557) were divided into four treatment groups, including (1) observation, (2) drug treatment, (3) laparoscopic surgery, (conservative surgery), and 4) radical surgery. The failure rates and reproductive outcomes were analyzed.

Results: The failure rate of the observation group and the drug treatment group was higher than that of the surgery groups. The factors that were obviously relevant to the failure rate included the level of β-human chorionic gonadotropin (β-hCG) in blood on admission, the level of Progesterone (P) in blood on admission and the diameter of adnexal mass.

2. As far as β-hCG in blood on the fourth day of treatment, there was significant difference between the expectant treatment and the drug treatment, while there was no difference between the two surgery groups. The hospitalization days of drug treatment were longer than those of the other three treatments.

For the Intrauterine Pregnancy (IUP): there was no statistically significant difference among observation, the drug treatment and the conservative surgery after two years. For the Repeat Ectopic Pregnancy (REP), the expectant treatment and the drug treatment had the same result after two years, which was true of the conservative surgery and the radical surgery group, but the REP of the expectant and drug treatment groups was different from that of the surgery groups.

Older age: history of miscarriage, history of ectopic pregnancy, and high level of β-hCG in blood on admission all correlated with a decrease in IUP rate and an increase in REP rate.

Conclusions: The failure rate of the expectant treatment and drug treatment is higher than that of the surgical treatment. The decline magnitude of β-hCG in blood on the fourth day of treatment is predictive of the short-term efficacy. The conservative surgery can reduce the concentration of β-HCG in blood more quickly. The expectant treatment and drug treatment of EP have a more ideal IUP, and the IUP rate after the conservative surgery is higher than that of the radical surgery.

Keywords: Ectopic pregnancy; Expectant treatment; Drug treatment; Conservative surgery; Reproduction outcome

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Background

EP is an abnormal pregnancy in which implantation of the fertilized egg(s) occure somewhere outside of the uterine body cavity, usually in one of the fallopian tubes. EP is a common acute abdomen in obstetrics and gynecology [1]. Left untreated, EP can become a medical emergency, resulting in pregnancy deaths. Deaths can include that of the fetus, as the pregnancy cannot continue normally, and that of the mother, due to risk of rupture and internal bleeding. Identification of EP has been advanced by 1) the development of transvaginal ultrasound, allowing visualization of the reproductive organs and pelvic region, and 2) detection of levels of the beta subunit of human chorionic gonadotrophin (β-hCG), a hormone that detects pregnancy, but which can also be indicative of ectopic pregnancy. These tests have resulted in more than 85% of the patients being diagnosed before the rupture of pregnancy capsule. Still, however, EP has been documented as accounting s for 4-10% of the pregnancy deaths, an obvious adverse pregnancy outcome [1]. Based on this risk, choosing the best treatment for EP is essential, and is a current research topic. Our study contributes to this area of research.

Treatment

The treatment of EP is divided into three types: expectant" treatment, drug treatment and surgical treatment.

Expectant treatment is suitable for β-hCG less than 2500IU/L and β-hCG is down trend.

Drug treatment: When β-hCG is less than 2500 IU/L, trophoblast cells mainly invade the mucosa of fallopian tube, causing little damage to the muscle layer, less diffusion outside the lumin, and a higher success rate for drug treatment [2]. The current standard for drug treatment, Methotrexate (MTX) with mifepristone, was first combined with good therapeutic effect by Perdu, in (year) [3]. Perdu's findings showed no statistical difference between the effectiveness of MTX conservative treatment and the laparoscopic fallopian tube sparing surgery, when β-hCG were less than 1500 IU/L, but the recovery time of drug treatment was long [4-5].

Surgical treatment: Two types of surgical treatment are used. First is conservative surgery, making an opening into the fallopian tube itself to correct the problem (salpingostomy), often done laparoscopically. Second is the more radical abdominal surgery (salpingectomy) of removal of the affected fallopian tube. According to findings of the meta-analysis of Cheng, et al. (year), IUP was higher and REP increased after salpingostomy [6], and salpingectomy without infertility could reduce the occurrence of Persistent Ectopic Pregnancy (PEP) [7].

The reproductive capacity after EP treatment is significantly related to ovarian reserve function, fallopian tube status. The outcome of fertility after treatment is usually good within 2 years after treatment [8]. Currently, the reproductive outcomes after EP still need further research. In the thesis, EP cases were selected for data analysis and follow-up in order to analyze the pregnancy rate, IUP rate and REP rate after treatment and influencing factors of the outcome of reproduction.

Materials and Methods

Case selection

Medical records of cases chosen for was monocentric retrospective analysis met the following inclusion criteria:

(1) The patient was admitted to the Huazhong University of Science and Technology Union Shenzhen Hospital, Shenzhen Nanshan People's Hospital due to EP from January 1, 2014 to January 1, 2016;

(2) The patient met the standard diagnostic criteria for EP: [9]: Menelipsis, abdominal pain or vaginal bleeding, β-hCG of urine or blood was positive, vaginal ultrasound showed no gestational sac in the body cavity of the uterus, and abnormal sonogram was detected by the side of the uterus;

(3) The patient was between the ages of 18 and 40;

(4) The patient met a fertility requirement that there was villi in extra uterine tissue pathology postoperatively or gestational sac by ultrasound.

Exclusion criteria for cases included:

(1) Age less than 18 or over 40;

(2) Patients with unclear diagnosis;

(3) Patients with incomplete medical records and incomplete follow-up;

(4) Abnormity of vital organs;

(5) Tumor of pelvic organ and/or malformation of reproductive organ.

Groups and treatment descriptions

Group A, Group A was the expectant treatment group (51 cases). Criteria for this group included: (1) no rupture signs and stable vital signs; (2) the diameter of adnexal mass was <4 cm with no primary cardiac pulsation; (3) the amount of internal hemorrhage in the abdomen was <100 ml; (4) the β-hCG in blood was <1500 IU/L and continued to decline; and (5) the follow-up visit was reliable. In Group A, the observation intervention included monitoring the changes in β-hCG in blood, and observing patients' signs and symptoms until the β-hCG decreased to a normal level. The β-hCG in blood was tested for three consecutive days after admission.

Group B was the drug treatment group (176 cases). Criteria for this group included: (1) stable vital signs; (2) the diameter of adnexal mass was ≦4 cm; (3) no significant intraperitoneal bleeding or fallopian tube rupture; (4) the β-hCG in blood was ≦2000 IU/L; and (5) no drug contraindications. Drug treatment involved (1) anintramuscular injection of MTX (50 mg/m^2) in the gluteus muscle, and (2) administration of 50mg of oral mifepristone on an empty stomach, twice a day at a 12-hour intervals, for a 5 days course of treatment. On the 4th and 7th days after administering the drugs, the β-HCG in blood is checked. If, by day 7 the β-HCG has not decreased to 15 % below its peak value, the MTX and mifepristone regimen should be repeated once again.

Group C was the conservative, or laparoscopic surgery group (43 cases). For the conservative surgery, the surgical team injected Pituitrin 2 U (5 U/mL diluted in 10 mL saline) to the mesosalpinx with the suspected lesions, to reduce bleeding. On the opposite side of the mesosalpinx with lesions, where the bulge of masses was the most obvious, we cut a 1-1.5 cm incisionalong the conduit, and took out the content in the lumen, using a noninvasive nipper. Before closing, we douched the fallopian tube repeatedly with normal saline and injected 5 mL of 0.9% sodium chloride solution plus 20 mg of MTX near the location of oviduct fenestration or the umbrella-end of the oviduct.

Group D was the radical surgical group (260 cases). Criteria for both surgical groups included: (a) patients had severe abdominal pain or unstable vital signs; (2) the diameter of adnexal mass was >4 cm; (3) intraperitoneal hemorrhage: (4) the β-hCG in blood was > 2000 IU/L; and (5) follow-up visit was not reliable. Radical surgery involved excising the oviduct on the lesion side with an ultrasound knife, and removing the oviduct and pregnancy material. During the surgery, we observed the vital signs, abdominal pain and vaginal bleeding, tested the β-hCG value and used transvaginal ultrasonography for guidance. On days 4 and 7 after the surgery, we tested the β-hCG in blood. If it decreased, we tested it at a 7-days interval until it recovered to a normal level.

Data collection

For all groups of records, we recorded patient information including age, pregnancy frequency, delivery frequency, the history of cesarean delivery, the history of miscarriage (induced abortion and medical abortion), the history of ectopic pregnancy, the history of pregnancy with IUD in situ, the length of menelipsis, the diameter of accessory masses, the volume of accumulation of blood in the pelvis, β-hCG and P value in blood on admission, the condition of abdominal pain, whether there was pregnancy with IUD in situ, the length of hospital stay, treatment expense, treatment methods, treatment results and the IUP and REP in six months, 1 year and 2 years after treatment.

Treatment outcomes

To record treatment outcomes, we developed judgment standards for treatment failures and defined other reproductive outcomes we wanted to measure

Judgment standards of a failure: A failure of Group A, observation, or Group B, drug treatment, was defined by the following criteria: (1) the β-hCG in blood continuously remained high without the trend of decreasing or with the trend of increasing, or failure to decrease to the desired value (the decrease of β-hCG in blood at a three-days interval < 15% of peak value); (2) hypogastralgia, fall of blood pressure, raised heart rate, (3) the diameter of adnexal masses expands or pelvic effusion increases, or primitive heart tube beat emerges.

A failure of Groups C and D, surgical treatments, was defined by the following criteria: (1) PEP emerged within 24 hours after the surgery;

(2) the β-hCG in blood failed to decrease to below 50% of that before the surgery or in 12 days after surgery, it failed to decrease to below 10% of that before the surgery; or (3) the lesion was undetermined and another treatment was required.

Reproductive outcome indicators: Data regarding reproductive outcomes after treatment for EP that we gathered from patient records included (1) the IUP rate after the treatment, that is, a natural intrauterine pregnancy during the follow-up period, including delivery and abortion; and (2) the REP rate after the treatment, that is, another EP occurrence during the follow-up period.

Statistical analysis

We used the SPSS 17.0 software package (IBM Corp., New York, NY). The measurement data was mean ± standard deviation (±s) and the comparison between the two groups was tested with LSD-t. The enumeration data was in percentage and the comparison between the two groups was tested with $\chi 2$. The multiple-factor analysis was applied with bivariate logistic regression analysis, and statistical significance was determined if $P<0.05$.

Results

Patient information

From a potential 931 patient records who appeared to meet inclusion criteria, we removed 374 cases, including (1) 35 cases of patients who had no fertility requirements; (2) 91 cases with incomplete data; (3) 189 cases of patients who were not able to be contacted by phone; and (4) 59 cases of patients with the combination of uterine fibroids and ovarian cysts. This left 557 patients who were followed up by telephone and had fertility requirements; of those, 27 patients were transferred to other treatment plans after the first treatment failed.

Except for the delivery frequency, the diameter of adnexal masses, the volume of accumulation of blood in pelvis, β-hCG in blood on admission, the length of the hospital stays and treatment expense, there were no other statistically significant differences (Table 1).

Comparison of short-term efficacy

Comparison of the failure rate. There were statistically significant differences in the failure rate among the four treatments. The failure rate in the non-surgery groups was higher than that in the surgery groups and the failure rate of observation group was higher than that in drug treatment group. There was no statistical significance between failure rates of the two different surgery methods, however (Table 2).

Analysis of factors related to Group A, Observation, failure rate. aThere were no statistically significant differences between age, the length of menelipsis, the volume of accumulation of blood in pelvis and the rate of treatment failure. There was a statistically significant difference between the diameter of adnexal masses, β-hCG、P value in blood on admission and the failure rate. If β-hCG in blood on admission was above 1000 IU/L, the failure rate was increased dramatically (Table 3).

Analysis of factors of drug treatment failure. There were no statistically significant differences between age, the length of menelipsis, the volume of accumulation of blood in pelvis and the rate of treatment failure. There was, however, a statistically significant difference between the diameter of adnexal masses, β-hCG in blood on admission and P value and the failure rate. If β-hCG in blood on admission was above 500IU/L, the failure rate was increased dramatically (Table 4).

Comparison of hormonal changes. On the fourth day after the treatment, there were statistically significant differences in the drop of β-hCG in blood among patients in Group A (observation group), Group B (drug treatment group) and Groups C and D (surgery treatment groups). There was no obvious difference in the drop of β-hCG of blood between the conservative surgery and the radical surgery groups, however. There was a statistically significantly longer length of hospital stay for the drug treatment group than for the other three groups (Table 5). Comparison of fertility outcome. In the post-hospitalization follow-up, patients in each of the four treatment groups was followed for 2 years, receiving phone calls at 6 months, 1 year and 2 year points in time. The rate of pregnancy in Group A, Group B, Group C and Group D was respectively 62.7%, 69.9%, 67.4% and 50.8%. The 2-year IUP rate was 47.1%, 55.7%, 44.2% and 30.0% respectively and there were no obvious differences among Group A, Group B and Group C, but a statistically significant difference between Group D and the other three groups. The 2-year REP rate was 15.7%, 14.2%, 23.3% and 20.8% respectively. There were no significant differences in the rate of re-pregnancy between the non-surgery groups or the surgery groups, but there were comparatively significant differences between the non-surgery group and the surgery group (Table 6).

Analysis of factors influencing fertility outcome

The multivariate Logistic regression analysis of IUP: There was an obvious negative correlation between the following factors and IUP after EP: age, delivery frequency, history of miscarriage, history of ectopic pregnancy and β-hCG in blood on admission. That is, patients with older age、higher delivery frequency、higher abortion frequency、more ectopic gestations、and higher β-hCG in blood on admission, had lower IUP rates (Table 7).

The multivariate Logistic regression analysis of REP. There was an obvious positive correlation between the following factors and REP: age, history of miscarriage, history of ectopic pregnancy and β-hCG in blood on admission. That is, patients with older age、higher abortion frequency、more ectopic gestations、and higher β-hCG in blood on admission, had higher REP rates (Table 8).

Discussion

In economically developed countries, the death rate of women related to EP during the early pregnancy has reached 2.7% [1,10]. In this study, as far as the 4 different treatment methods were concerned, there were correlations between the diameter of adnexal masses, the volume of pelvic hemorrhage, the β-hCG in blood on admission, the length of hospital stay and the treatment expense. Based on these relationships, the most beneficial treatment scheme can be best informed by overall consideration of the diameter of adnexal masses, the volume of pelvic hemorrhage, and the original value of β-hCG in blood on admission.

Short-term efficacy

The failure factors of expectant and drug treatments: The failure rate of expectant treatment and drug treatment were higher than that of the other two treatment methods, and there were statistical differences in the two failure rates. The β-hCG in blood is detected on the first day of zygote embedding in the mother's body, stimulating the corpus luteum graviditatis to generate progesterone at the early stage of pregnancy [1,11]. In most cases, the β-hCG in blood of IUP increases by 66% every 48 hours while the EP needs a longer time for increasing [12]. During the first eight weeks of pregnancy, P is generated by the corpus luteum, while during the later stage, it is generated by the placenta, decreasing the tension of uterine muscles and increasing the sensitivity threshold of muscle fiber for Pitocin so as to keep a pregnancy [12]. There was no significant influence of the length of menelipsis, age and the volume of pelvic hemorrhage on the failure rate of drug treatment; there were influences of the β-hCG in blood on admission, P and the diameter of adnexal masses on the failure rate of the two treatment methods. The high value of β-hCG in blood on admission indicates a high villus activity and an abundant blood-supply. On the other hand, there is a synergistic effect with P, and as long as the level of P is high, promoting the growing of adventitious embryo, the failure rate would

Table 1: Comparison of the general situation of patients.

	A group	B group	C group	D group	F/$\chi 2$	*P*
age (y)	29.33±4.66	29.93±4.74	29.79±4.93	30.29±5.01	0.64	0.59
Pregnancy (n)	2.67±1.65	2.96±1.80	2.74±1.45	3.02±1.66	0.84	0.47
Parity (n)	0.65±0.74	0.68±0.71	0.58±0.82	0.88±0.84	3.78	0.01
Cesarean (%)	12 (23.5%)	34 (19.3%)	6 (14.0%)	60 (23.1%)	3.78	0.29
Abortion (%)	25 (49.0%)	101 (57.4%)	24 (53.3%)	153 (58.8%)	2.38	0.5
EP (%)	10 (19.6%)	34 (19.3)	8 (18.6%)	35 (13.5)	1.58	0.66
Pregnancy with IUD (%)	6 (11.7%)	11 (6.2%)	1 (2.3%)	20 (7.7%)	7.99	0.05
Menopause (d)	46.43±10.43	47.91±9.48	50.37±9.21	48.75±9.97	1.52	0.21
Adnexal diameter (mm)	27.63±9.93	23.47±8.93	41.58±22.90	42.53±25.90	34.89	0
Pelvic blood volume (mm)	9.28±8.95	15.02±11.24	16.51±11.65	21.99±18.00	14.65	0
β-Hcg (IU/L)at admission	400.01±325.43	687.64±481.88	14012.81±15020.83	9342.29±15587.81	29.6	0
P (ng /L) at admission	6.99±6.48	7.22±6.57	8.24±5.96	8.27±5.37	1.5	0.25
Hospital length (d)	5.67±2.45	14.74±7.35	6.30±1.44	6.56±2.67	123.33	0
Ccost(yuan)	1462.75±853.62	3342.45±2673.84	8671.80±1231.86	8775.76±1395.94	431.48	0

Note: 1. P < 0.05: statistically significant; P≧ 0.05: no statistical significance.

Table 2: 4 treatments failure rates (%).

item	Failure number	Failure rate	$\chi 2$	*P*
			35.99	0.00
A group	11	17.7%		
B group	16	8.3%		
C group	0	0%		
D group	0	0%		

Table 3: failure rate of different observation indexes.

	number	Successful rate	failure rate	$\chi 2$	*P*
Age (y)				1.22	0.36
≦30 y	34	24 (85.3%)	5 (14.7%)		
>30 y	28	16 (78.6%)	6 (21.4%)		
Menopause (d)				3.56	0.08
≦49 d	44	35 (79.5%)	9 (20.5%)		
>49 d	18	16 (88.9%)	2 (11.1%)		
Pelvic blood volume (mm)				1.44	0.49
≦5 mm	24	19 (79.2%)	5 (20.8%)		
5-15 mm	25	21 (84.0%)	4 (16.0%)		
>15 mm	13	9 (84.6%)	2 (15.4%)		
Adnexal diameter (mm)				14.88	0.00
≦20 mm	16	15 (93.7%)	1 (6.3%)		
20-30 mm	19	16 (84.2%)	3 (15.8%)		
>30 mm	27	20 (74.1%)	7 (25.9%)		
β-hCG(IU/L)				57.58	0.00
≦500 IU/L	45	37 (82.2%)	8 (17.8%)		
500-1000 IU/L	10	10 (100%)	0 (0%)		
1000 IU/L-1500 IU/L	7	4 (57.1%)	3 (42.9%)		
P (ng /L)				20.1	0.00
≦5 ng/L	30	26 (86.7%)	4 (13.3%)		
5-15 ng/L	24	20 (83.3%)	4 (16.7%)		
>15 ng/L	8	5 (62.5%)	3 (37.5%)		

Table 4: failure rate of different observation indexes.

	number	Successful rate	failure rate	$\chi 2$	*P*
age (y)				0.58	0.61
≦30 y	101	94 (93.1%)	7 (6.9%)		
>30 y	91	82 (90.1%)	9 (9.9%)		
menopause (d)				1.61	0.31
≦49 d	109	102 (91.7%)	7 (6.4%)		
>49 d	83	74 (91.6%)	9 (10.8%)		
pelvic blood volume (mm)				3.08	0.22
≦5 mm	56	49 (87.5%)	7 (12.5%)		
5-15 mm	38	35 (92.1%)	3 (7.9%)		
>15 mm	98	92 (93.9%)	6 (6.1%)		
Adnexal diameter (mm)				11.9	0.00
≦20 mm	65	63 (96.9%)	2 (3.1%)		
20-30 mm	86	79 (91.9%)	7 (8.1%)		
>30 mm	41	34 (82.9%)	7 (17.1%)		
β-hCG(IU/L)				5.99	0.04
≦500 IU/L	83	80 (96.4%)	3 (3.6%)		
500-1000 IU/L	59	53 (89.8%)	6 (10.2%)		
1000 IU/L-1500 IU/L	50	43 (86.0%)	7 (14.0%)		
P (ng /L)				90.79	0.00
≦5ng/L	86	86 (100%)	0 (0%)		
5-15 ng/L	77	74 (96.1%)	3 (3.9%)		
>15 ng/L	29	16 (55.2%)	13 (44.8%)		

increase. The high failure rate of expectant treatment indicates that this selection is adviseable only for patients with a small diameter of the ectopia fertilized egg, a low level of β-hCG in blood on admission and a low level of P.

The hCG of short-term efficacy index: On the fourth day after the drug treatment, the average drop of β-hCG in blood was less? Than 22%, and an enhanced drug treatment was required and the risks of transit surgeries doubled [13]. This finding from our study is consistnent with Celik E's thought that, on the fourth day after the treatment, the drop

Table 5: Comparison of recent curative effects ($\bar{x}\pm S$).

		A group	B group	C group	D group	F	*P*
β-hCG descend day 4 after treatment	decreasing amplitude	0.23±0.16#	0.31±0.24#	0.93±0.56	0.93±0.33	34.38	0.00
	absolute value(IU/L)	74.85±59.05	189.98±200.44	13308.02±14505.86#	8845.64±15144.74#	822.06	0.00
hospital length (d)		5.79±2.48#	14.90±7.29	6.03±1.44#	6.56±2.67#	134.90	0.00

#*P*<0.05。

Table 6: Comparison of fertility outcomes after treatment.

		A group	B group	C group	D group	*χ2*	*P*
Pregnancy rate within 2 years		32 (62.7%)#	123 (69.9%)#	29 (67.4%)#	132 (50.8%)	8.93	0.03
IUP	0.5y	13 (25.5%)#	49 (27.8%)#	10 (23.3%)#	28 (10.8%)	10.00	0.02
	1y	17 (33.3%)#	68 (38.6%)#	12 (27.9%)#	47 (18.1%)	11.40	0.01
	2y	24 (47.1%)#	98 (55.7%)#	19 (44.2%)#	78 (30.0%)	14.14	0.00
REP	0.5y	4 (7.8%)	12 (6.8%)*	8 (18.6%)	44 (16.9%)*	10.14	0.02
	1y	7 (13.7%)	19 (10.8%)	9 (20.9%)	49 (18.8%)	4.46	0.20
	2y	8 (15.7%)	25 (14.2%)	10 (23.3%)	54 (20.8%)	3.52	0.32

#*P*<0.05; **P*≧0.05。

Table 7: IUP multi-factor logistic regression analysis.

Risk factor	parameter estimate (β)	standard error	OR	P	95% trusted region interval
Age (y)	-0.133	0.032	0.876	0.000	0.823-0.932
Parity (n)	-0.961	0.207	0.382	0.000	0.255-0.574
Cesrean (%)	-0.374	0.312	0.688	0.230	0.374-1.267
Abortion (%)	-0.977	0.146	0.376	0.000	0.283-0.501
EP (%)	-2.371	0.420	0.093	0.000	0.041-0.213
Adnexal diameter (mm)	-0.011	0.006	0.989	0.070	0.978-1.001
β-hCG(IU/L)	-0.127	0.021	0.881	0.000	0.845-0.918
P (ng /L)	-0.008	0.021	1.008	0.689	0.968-1.051

Table 8: REP multi-factor logistic regression analysis.

Risk factor	parameter estimate (β)	standard error	OR	P	95% trusted region interval
Age (y)	0.247	0.042	1.278	0.000	1.180-1.389
Parity (n)	0.040	0.215	1.041	0.852	0.684-1.585
Cesrean (%)	0.200	0.282	1.221	0.479	0.703-2.121
Abortion (%)	0.634	0.114	1.885	0.000	1.508-2.357
EP (%)	2.362	0.312	10.616	0.000	5.755-19.583
β-hCG(IU/L)	0.044	0.012	1.045	0.000	1.021-1.070

of β-hCG value of serum is the best prediction factor for assessing EP [14]. On the fourth day after the treatment, in our study, there were significant differences in the drop of β-hCG between the non-surgery groups while no significant difference was found between surgery groups and there were also significant differences between the non-surgery groups and the surgery groups. It indicates that the surgical efficacy is better than that in the non-surgery group. The conservative surgery is a relatively ideal treatment method, which could keep the natural conception with a rapid decrease in β-hCG in blood.

The influence on reproduction

There was no dramatic difference in IUP rates among group A, group B and group C, which was similar to reports in existing literature [15]. After the drug treatment, the IUP rate was relatively high while the REP rate was relatively low, the reason for which might be the pregnancy dissolving and absorbing itself, and the oviduct being free of damage caused by surgery and low activity of trophocyte. There was no statistical difference in six month REP rate between group A and group B, or between group C and group

D; there was, however, a significant difference between surgery group and non-surgery group.

Desroque D put forward that conservative surgery is the gold standard of treating EP [16]. In this study, there was no significant difference in IUP between conservative surgery, expectant treatment and drug treatment, which was similar to the findings by Lesavre M [17]. After surgery, the IUP of our conservative surgery group was higher than that of our radical surgery group, which was similar to findings of de Bennetot M [18]. There were differences in REP between conservative surgery, expectant treatment and drug treatment, while no difference was found between conservative and radical surgery. It might be caused by operative procedures such as repeated pulling during cutting of the oviduct, clamping pregnancy tissue, electro coagulation for tube wall hemostasis, or multilayer suture, damaging the cilium of oviduct, basal lamina and myofiber. In the reparative process, the forming of scar tissue makes the lumen of oviduct smaller, stiffness, blocked, oviduct adhesion and hydrosalpinx [19]. After the surgery, in the follow-ups at six months, 1 year and 2 years, the IUP of group D was dramatically lower than that of group A, group B and group C. This lends evidence for the likelihood that radical surgery damages the completeness of the female reproductive system and influences the ovarian blood-supply as well as ovulation. There were no dramatic differences in REP rate between the two surgeries, but the absolute value of REP rate in the surgery group was high, which might be due to the complications of fallopian tube adhesion and ovary adhesion.

The factors influencing the reproduction outcome

According to this study, the IUP tends to be lower and the REP tends to be higher in patients that are older, have higher delivery frequency, more history of miscarriage, more ectopic pregnancies, and higher β-hCG in blood on admission. There is a negative correlation between the age and IUP, which might be due to the retrogression of oviduct structure and the microenvironment of genital tract occurring with the increasing of age, influencing the gametogamy and the zygote transportation. Shaw JL asserts that [20], as the age increases, there are going to be chromosome variations in blastocyst cell tissues and a decline in oviduct function delaying the zygote transportation.

In the cases with history of miscarriage, the REP risk was 1.885 times of that in cases without such history, which might be related to the secondary pelvic infection after miscarriage, intrauterine adhesion and scar caused by damage of endometrium. In the past cases of EP, as soon as the IUP decreased, the REP increased, which was similar to the results of other reports [18]. The possible reasons include: (1) oviduct maldevelopment or inflammation of oviduct mucosa; (2) pelvic adhesion, oviduct adhesion and adhesion of ovarian capsule cause by the past EP. There was a negative correlation between the β-hCG in blood on admission and the benign pregnancy outcome after treatment. Elito thinks that the higher the value of β-hCG is, the greater the damage of pregnancy tissue to oviduct, and the harder to get an ideal pregnancy outcome [21].

In conclusion, the following points can be drawn from our research findings: (1) There is positive correlation between the failure rate of expectant treatment and drug treatment and the diameter of adnexal masses, β-hCG、and P level in blood on admission. (2) On the fourth day after conservative surgery, the β-hCG value of blood decreases relatively quickly in cases with a short recovery time. (3) The IUP of expectant treatment and drug treatment is relatively high while the IUP of conservative surgery is higher than radical surgery. (4) The older a patient is, the more miscarriages and ectopic gestations are and the higher the β-hCG on admission is, the lower IUP is and the higher the REP is. However, due to short follow-up and a small sample size of monocentric retrospective study, long-term efficacy remains unclear, which needs to be clarified in large prospective studies.

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