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ORIGINAL ARTICLE

Prognostic, Diagnostic and Therapeutic Value of Hysterosalpingography after Salpingostomy in Patients with Hydrosalpinx

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ABSTRACT

Background: There are few studies which assess the therapeutic role of salpingostomy and HSG in patients with hydrosalpinx regarding rates and outcomes of pregnancy. This study aimed to assess therapeutic effects of salpingostomy, diagnostic and therapeutic effects of HSG after salpingostomy in patients with hydrosaplinx.

Methods: We assessed clinical findings of 60 patients diagnosed with hydrosalpinx and underwent HSG before and after performing laparoscopic salpingostomy

Results: There is statistically significant relation between improvement of oviduct and pregnancy time (p-0.007). Rates of spontaneous pregnancies were 46.88% in the improvement group, versus 13.33% in the non-improvement group. Rates of pregnancy in both groups were statistically significant (p=0.028). Average time to pregnancy in the improvement group was 13 (11–15) months and in the non-improvement group was 16 (14-18) months.

Conclusions: Performing HSG after laparoscopic salpingostomy might be a good choice for treatment of infertile patients diagnosed with hydrosalpinx.

Keywords:hysterosalpingography; salpingostomy; hydrosalpinx.

INTRODUCTION

Tubal factors of infertility in females forms about 25% of casesand hydrosalpinx is considered the commonest and most dangerous tubal lesion forms up to 30% of cases[1]. There are many risk factors for hydrosalpinx such as pelvic inflammatory diseases, appendicitis, endometriosis, pelvic and abdominal surgery[2]. Recently, Chlamydia infection was incriminated in causing salpingitis and hydrosalpinx[3]. Pathogenicmechanisms of hydrosaplinxare altered homeostasis, activation of complement and immune cell dysfunctions[4].Chronic Salpingitis and hydrosalpinx were found tonegatively affect natural conception and assisted withreproductive techniques thus decreasing rates of natural pregnancy and embryo transfer [5-7]. Additionally, hydrosalpinx might lead to embryo toxicity and reduced receptivity of the endometrium [8].Therefore, adequate management of

hydrosalpinx increasesrates of success rate of assisted reproductive techniques [9].

Salpingostomy is a plastic surgery of distal tubal part using scissors, laser or electrosurgery for management of hydrosalpinx aiming at preserving fallopian tube functions to allow patients to attempting natural conception[1]. Distal tubal end is opened in the avascular area, and then the created new opening is sutured to the mesosalpinx [2]. Rates and outcomes of pregnancy differ among studies [10]. Additionally, rates and outcomes of pregnancy are related to patient age, stage of tubal disease, presence of adhesions, the performed operative technique and presence of Chlamydia infection [11]. Recent studies showed that normal pregnancies occur within 18 months after performing salpingostomy in hydrosalpinx patients[12]. The evaluation of tubal improvement is done by performing hysterosalpingography (HSG), to assess individualized management of such patients [13].

There are few studies which assess the therapeutic role of salpingostomy and HSG in patients with hydrosalpinx regarding rates and outcomes of pregnancy.

The aim of the present study is to assess therapeutic effects of salpingostomy, diagnostic, and therapeutic effects of HSG after salpingostomy in patients with hydrosaplinx regarding rates and outcomes of pregnancy, in addition to assessingnatural pregnancy rates after salpingostomy and HSG in patients with hydrosalpinx.

METHODS

We assessed clinical findings of patients diagnosed with hydrosalpinx and underwent HSG before and after performing laparoscopic salpingostomy in Gynecology and Obstetrics Department, Faculty of Medicine, Zagazig University in the period from January 2019 to December 2022. This study was approved by the local institutional review board of faculty of medicine, Zagazig University. We acquired a written informed consent.

***Inclusion criteria*:**

Patients who failed to have a live pregnancy for more than one year without using contraceptive methods; Patients whom sperm analysis results were within normal;Cases diagnosed with hydrosalpinx using HSG whetherunilateral or bilateral;Patients refused tubal separation and IVF as accepted management.

Exclusion criteria:

Patients with congenital abnormalities in the reproductive tract; Patients with history of bilateral tubal ligation; Preoperative diagnosis of tubal tuberculosis using HSG; Normal other tube; Patients were advised to separate dilated ones only.

Diagnostic criteria of hydrosalpinx using HSG (Simpson et al. 2006):

Partial filling of the fallopian tube; Fallopian tubes swelling without contrast in peritoneal cavity; Accumulated water-based media on the umbrella end of the oviduct; Absence of diffusion of water-based media in to the pelvic area

Criteria of hydrosalpinx improvement:

Whole fallopian tube filling; Absence of hydrosalpinx signs at umbrella end; Presence of water-based media inside the pelvic area.

We performed pelvic adhesions scoring depending on laparoscopic salpingostomy and preoperative HSG. we divided them intono adhesions, 0; mild degree of adhesions, 1–9; moderate degree of adhesions, 11–20 and severe degree of adhesions, 20.

Scoring of distal tubal obstruction was graded as follows: grade I, 2–5; grade II, 7–10; grade III, 12–15; grade IV, more than 15. According to the degree of improvement of fallopian tube as evaluated by preoperative and postoperative HSG, we divided included patients into 2 groups. The first group is the improvement, and the second group is the non-improvement one.

HSG procedure and all laparoscopic surgical procedures were performed as previously described by Yao *et al*. [1].

Finally,we assessed degree of fallopian tube patency by injecting 10–20ml of diluted methylene blue solution through the uterine cavity, seeing patency of fallopian tube and taking the suitable measures. Also, we assessed clinical data of patients aspreoperative and postoperative HSG images, rates, mode and outcomes of pregnancy within 18 months.

Statistical analysis:

We performed statistical analysis using SPSS version 26.0 (IBM, Armonk, NY). Expressing continuous data as mean±SD, categorical data as n (%). We compared categorical data using the Chi-square test. We performed Cox regression analysis. We considered $p<0.05$ statistically significant.

RESULTS

The present study included 60 patients and divided into the improvement group that included (40 cases) and the non-improvement group that included (20 cases) according to the status and degree of fallopian tube improvement, as evaluated using postoperative HSG.

This study included 60 patients of them, 43.3% aged more than 35 years. About 68% had primary infertility, 26.7% had bilateral; hydrosalpinx, 88.3% had two fallopian tubes, 71.7% had irrelevant clinical history, 26% had severe pelvic adhesion and 20% had grade IV distal tube obstruction. Pregnancy occurred naturally in 65% and 45% of patients got pregnant. Concerning pregnancy outcome, 77.8% had lived birth by the end (Table 1). Forty patients (66.7%) showed improvement in the oviduct (Figure 1)

There were no statistically significant differences between both groups as regards clinical data and base line findings. There is a statistically significant difference between both groups in pregnancy rate. The pregnancy rate in the improvement group was 65.62% while it was 20% in the non-improvement group (Table 2). There is a statistically significant difference between the groups studied regarding incidence of pregnancy (55% versus 25% in improvement and non-improvement groups got pregnant).

There is a statistically non-significant difference between the studied groups regarding either age, pregnancy outcome or other clinical data (p=0.007)(Tables 2,4).

The rate of ectopic pregnancy was (9.52%) in the improvement group while in the non-improvement group it was (33.33%).

There is a statistically significant relation between improvement of oviduct and pregnancy time (significantly higher cumulative pregnancy rate in patients with improvement). Age≤35 years, primary infertility, unilateral hydrosalpinx, irrelevant clinical history increases pregnancy rate by 1.56, 1.61, 1.2, and 1.4 folds respectively. Distal tube obstruction and pelvic adhesion score and presence of one fallopian tube associated with lower pregnancy rate. Improvement of oviduct significantly increase pregnancy rate by 3.37 folds in univariate analysis and in multivariate analysis, it increases pregnancy rate by 3.341 folds with sustained significance level. Table 5

Rates of spontaneous pregnancies were 46.88% in the improvement group, versus 13.33% in the non- improvement group. The rates of pregnancy in both groups were statistically significant.

Univariate cox regression results showed that the age of patients, scores of pelvic adhesions, scores of distal fallopian tube obstruction and fallopian tube improvement as diagnosed by performing postoperative HSG were related to rates of pregnancy in infertile patients.

Rates of pregnancy in infertile patients below 35 years are higher than older females, the more severe pelvic adhesions the less rates of pregnancy.

Pregnancy rates in the group with fallopian tube improvement were higher than rates in the non- improvement group. Average time to pregnancy in the improvement group was 13 (11–15) months and in the non-improvement group was 16 (14-18) months (Table 6)

Thus, the improvement group has higher rates of pregnancy, less rates of ectopic pregnancy and shorter time to conception in comparison with the non-improvement group (p=0.028)

There is a statistically non-significant relation between improvement of oviduct in patients with unilateral and bilateral hydrosalpinx and pregnancy rate (60.7% of patients with unilateral hydrosalpinx and improvement in oviduct got pregnant versus 31.2% in those without improvement). About 42% of patients with bilateral hydrosalpinx and improvement in oviduct got pregnant versus 0% in those without improvement.

There is a statistically non-significant relation between improvement of oviduct in patients with unilateral and bilateral hydrosalpinx and outcome (p=0.018).

Table (1): Clinical data of studied patients**.**

	N=60 (%)
Age:	
≤35 years	34 (56.7%)
>35 years	26 (43.3%)
Infertility:	
Primary	41 (68.3%)
Secondary	19 (31.7%)
Hydrosalpinx:	
Unilateral	44 (73.3%)
Bilateral	16 (26.7%)
Fallopian tube:	
One	7 (11.7%)
Two	53 (88.3%)
Clinical history:	
No	43 (71.7%)
Yes	17 (28.3%)
Pelvic adhesion score	
Absent	5 (8.3%)
Mild	18 (30%)
Moderate	21 (35%)
Severe	16 (26.7%)
Distal tube obstruction	
Grade I	9 (15%)
Grade II	25 (41.7%)
Grade III	14 (23.3%)
Grade IV	12 (20%)
Pregnancy mode:	
Natural	39 (65%)
IVF	21 (35%)

	N=60 (%)
Pregnancy: Negative Positive	33 (55%) 27 (45%)
Outcome of pregnancy Live birth Ectopic pregnancy Abortion	N=27 21 (77.8%) 5 (18.5%) 1 (3.7%)

Table (2): Relation between improvement in oviduct and clinical data**.**

	Improvement group	Non-improvement group	χ^2	p
	N=40 (%)	N=20(%)		
Age: ≤35 years >35 years	 23 (57.5%) 17 (42.5%)	 11 (55%) 9 (45%)	0.034	0.854
Infertility: Primary Secondary	 29 (72.5%) 11 (27.5%)	 12 (60%) 8 (40%)	0.963	0.326
Hydrosalpinx: Unilateral Bilateral	 28 (70%) 12 (30%)	 16 (80%) 4 (20%)	0.682	0.409
Fallopian tube: One Two	 3 (7.5%) 37 (92.5%)	 4 (20%) 16 (80%)	Fisher	0.208
Clinical history: No Yes	 27 (67.5%) 13 (32.5%)	 16 (80%) 4 (20%)	1.026	0.311
Pelvic adhesion score Absent Mild Moderate Severe	 2 (5%) 10 (25%) 16 (40%) 12 (30%)	 3 (15%) 8 (40%) 5 (25%) 4 (20%)	3.087¥	0.079
Distal tube obstruction Grade I Grade II Grade III Grade IV	 7 (17.5%) 17 (42.5%) 8 (20%) 8 (20%)	 2 (10%) 8 (40%) 6 (30%) 4 (20%)	0.423¥	0.516
Pregnancy mode: Natural IVF	 25 (62.5%) 15 (37.5%)	 14 (70%) 6 (30%)	0.33	0.566
Pregnancy: Negative Positive	 18 (45%) 22 (55%)	 15 (75%) 5 (25%)	4.848	0.028*

	Improvement group	Non-improvement group	χ^2	p
	N=40 (%)	N=20(%)		
Outcome of pregnancy Live birth Abortion Ectopic pregnancy	 21 (91.3%) 1 (4.3%) 1 (4.3%)	 4 (66.7%) 2 (33.3%) 0 (0%)	MC	0.267

χ^2Chi square test, ¥Chi square for trend test, *p<0.05 is statistically significant, **p≤0.001 is statistically highly significant.

Table (3): Comparison between the groups studied regarding pregnancy time**.**

	Total	Event(%)	Mean ± std error	95% CI	p
Group Improvement group Non-improvement group	 40 20	 22(55%) 5(25%)	 15.6 ± 0.97 18.33 ± 0.69	 13.7 – 17.5 16.97 – 19.69	0.007*
Overall	60	27(45%)	16.61 ± 0.69	15.26 – 17.59	

p for Mantel cox test, CI confidence interval of mean, *p<0.05 is statistically significant, **p≤0.001 is statistically highly significant.

Table (4):univariate and multivariate cox regression analysis of factors associated with pregnancy rate**.**

	Univariate		p	Multivariate		p
	CHR	95% CI		AHR	95% CI	
Improvement group	3.37	1.28 – 8.92	0.014*	3.341	1.23 – 9.08	0.018*
Age (<35 years)	1.56	0.68 – 3.58	0.523			
Primary infertility	1.61	0.68 – 3.83	0.279			
Unilateral hydrosalpinx	1.2	0.45 – 3.19	0.71			
One Fallopian tube	0.31	0.04 – 2.28	0.309			
Irrelevant clinical history	1.4	0.56 – 3.47	0.473			

	Univariate		p	Multivariate		p
	CHR	95% CI		AHR	95% CI	
Pelvic adhesion score Absent Mild Moderate Severe	1 0.783 0.461 0.44	 0.272 – 2.256 0.146 – 1.457 0.118 – 1.649	0.44 0.65 0.187 0.224			
Distal tube obstruction Absent Mild Moderate Severe	1 0.543 0.115 0	 0.228 – 1.294 0.146 – 0.387 0 -	0.067 0.045* 0.012* 0.951	1 0.416 0.243 0	 0.176 – 0.982 0.08 – 0.773 0	0.248 0.161 0.05 0.951

CHR crude hazard ratio AHR adjusted hazard ratio, CI confidence interval

Table (5): Relation between pregnancy outcome and improvement in oviduct among studied patients.

	Improvement group		Non-improvement group		χ^2	p
	Unilateral n=28 (%)	Bilateral N=12 (%)	Unilateral N=16 (%)	Bilateral N=4(%)		
Pregnancy No Yes	 11 (39.3%) 17 (60.7%)	 7 (58.3%) 5 (41.7%)	 11 (68.8%) 5 (31.2%)	 4(100%) 0 (0%)	MC	0.067

MC Monte Carlo test χ^2Chi square test.

Table (6): Relation between pregnancy outcome and improvement in oviduct among studied patients.

	Improvement group		Non-improvement group		χ^2	p
	Unilateral n=17 (%)	Bilateral N=5 (%)	Unilateral N=5 (%)	Bilateral N=0(%)		
Outcome Live birth Abortion Ectopic	 14 (82.4%) 2 (11.8%) 1 (5.9%)	 4 (80%) 1 (20%) 0 (0%)	 3 (60%) 2 (40%) 0 (0%)	 - - -	MC	0.556

MC Monte Carlo test χ^2Chi square test

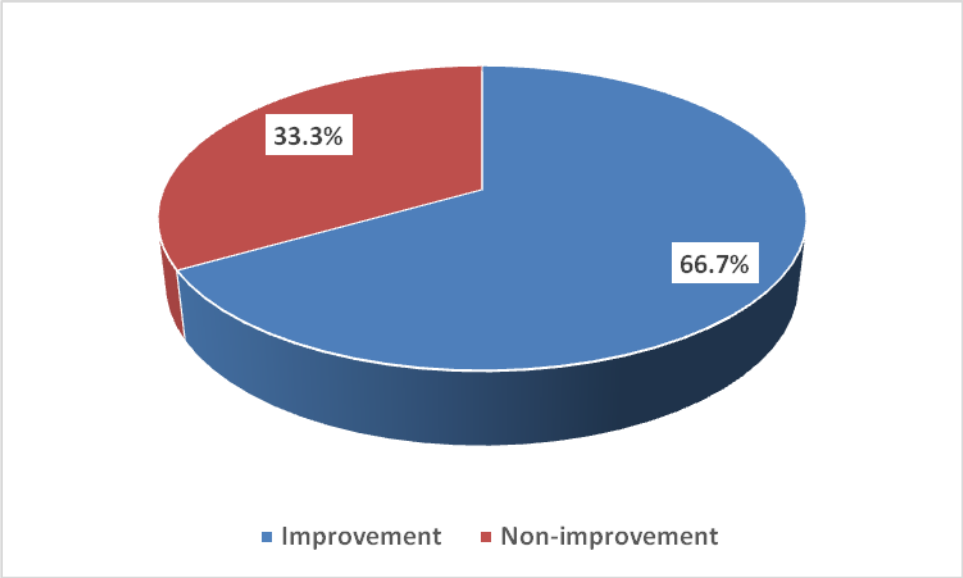

Figure (1): Pie chart showing distribution of patients according to improvement in oviduct.

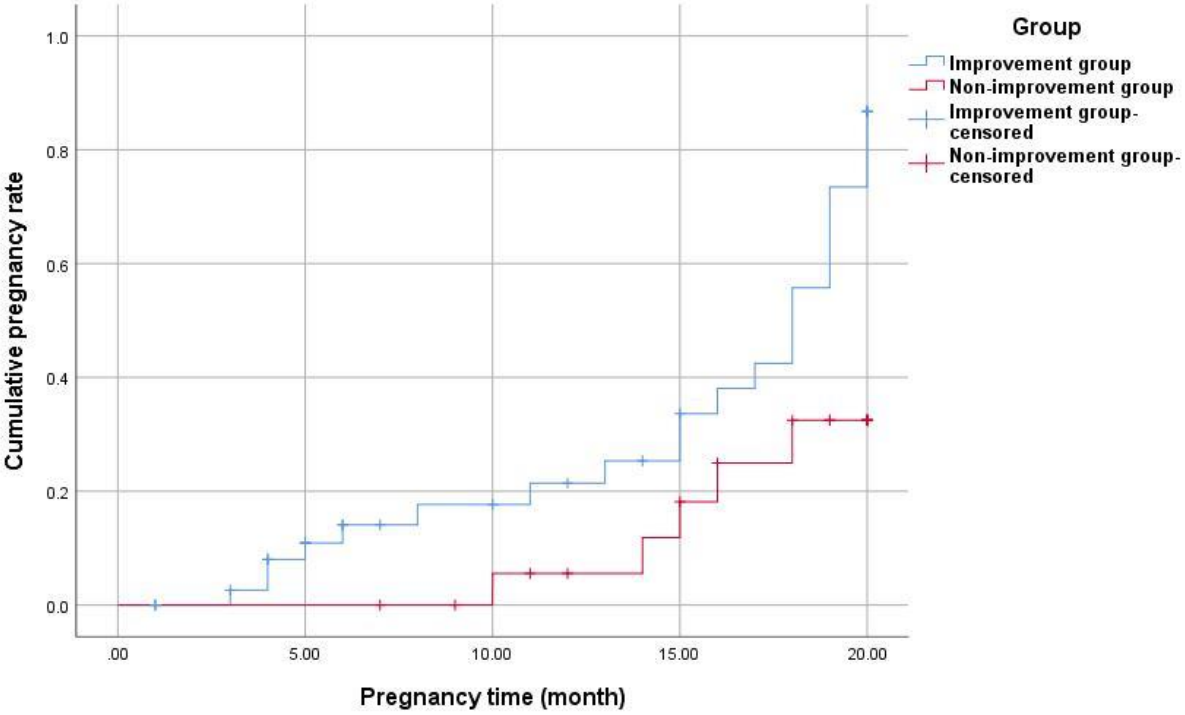

Figure (2): Kaplan Meier plot showing significant relation between two groups regarding pregnancy rate.

DISCUSSION

In the present study we showed that in infertile patients with unilateral or bilateral hydrosalpinx as a tubal factor of infertility,improving of oviduct after salpingostomy as diagnosed by HSG was associated with higher incidence of pregnancy rates, less incidence of ectopic pregnancy and shorter time to conception than infertile patients in the non-improvement group, these results were similar to those shown by Yao *et al*. [1] whodemonstrated that improvement in oviduct according to performed HSG after salpingostomy is associated with elevated rates of pregnancy in infertile patients.

The results collectively showed that HSG examination isbeneficial in evaluating improvement of fallopian tube in hydrosalpinx patients which gave an insight into the next step in treatment

The higher rates of pregnancy in the improvement groupmight be related to the presence of a non-serious damage in mucosa of fallopian tube thus complete restoration of function could happen.

Additionally,iodised oil diffusion into the pelvic cavity fromimproved distal fallopian tube might have a role[1].

It was previously found that using contrast for evaluating fallopian tube patency might remove debris and mucus from even the unobstructed fallopian tube, that lead to higher rates ofpregnancy. Moreover, oil contrast might have a positive effect on the activity of peritoneal macrophages and endometrial receptivity, socould enhance fertility via implant-mediated mechanisms which leads to increasing the rates of pregnancy [14, 15].

We showed thatthe rate of pregnancy wasinversely correlated with age, similarly, results of previous studies [16]. The baseline female infertility probability is about 1%, that does not change with increasing age. But the actual percentage of increases with age [17].

We showed that the rates of pregnancy wereinversely related to presence of pelvic adhesion scores and scores of distal tubal obstructions, similarly, results of Audebert and Pouly [11].

This study demonstrated that postoperative HSG that assessed improvement of hydrosalpinx was an important factor that affects rate of pregnancy similarly Yao *et al*. [1].

Thus, the group of patients with improvement had higher rate of pregnancy and shorter time to pregnancy occurrence in comparison tothe non-improvement group our results were consistent with Audebert and Pouly[11]. Furthermore,we showed that the rates of normal pregnancy were higher and rates of ectopic pregnancy in the improvement group were less than that in the non- improvement group which was similar to results of [9,12].

CONCLUSIONS

Performing HSG after laparoscopic salpingostomy might be a good choice for treatment of infertile patients diagnosed with hydrosalpinx, for evaluating improvement in fallopian tube functions that lead to increasing rate of pregnancy and improving its outcome.

Conflict of interest: The authors declared that they have no conflicts of interest with respect to the authorship and publication of this article.

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Figures legends

Figure (1): Pie chart showing distribution of patients according to improvement in oviduct.

Figure(2): Kaplan Meier plot showing significant relation between two groups regarding pregnancy rate.

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