Correlation Between Salpingoscopic Score and Subsequent Pregnancy Outcome in Patients with Tubal Infertility

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Purpose: This study evaluated the efficacy of the salpingoscopic scoring system of tubal function.

Methods: Twenty-seven infertile patients, including 10 patients with proximal tubal occlusion, 12 with endometriosis and 5 with inflammatory hydrosalpinx, were studied. All 54 tubes were examined using a 0.5-mm-diameter salpingoscope and scored.

Results: The mean scores for patients with proximal tubal occlusion, endometriosis, and inflammation were 18.6 ± 2.0 , 15.6 ± 0.7 , and 20.8 ± 3.4 , respectively. Eight patients (29.6 %) conceived; their mean tubal score was 12.6 ± 0.5 (12–16). Nineteen patients did not conceive, and their mean score was 18.8 ± 1.4 (12–31). There was a significant difference between these two scores ($P < 0.001$).

Conclusions: Scoring of the tubes by salpingoscopic examination is useful for evaluating tubal function with regard to prediction of pregnancy and also for selecting IVF or tubal reconstructive surgery as the preliminary treatment.

KEY WORDS: endometriosis; fallopian tube; inflammation; laparoscopy; salpingoscopy.

INTRODUCTION

Tubal factor represents 40% of the cases of female infertility (1). Identifiable causes of tubal infertile factor are postinfectious tubal damage, endometriosis, and postsurgical adhesions. The presence of intraluminal fallopian tubal disease is of importance in subsequent pregnancy outcome, but until recently this factor could not be adequately assessed, except by histopathologic examination. Traditionally, indirect findings obtained at hysterosalpingography, laparoscopy, or laparotomy

have been used to accomplish this assignment. Although the results of conceptions are considered to be based on endosalpingeal abnormalities appreciated at salpingoscopy, they may not always correlate with those derived from findings obtained at laparoscopy or other procedures. Recently the American Fertility Society (AFS) classifications (2) recognized the importance of intraoperative salpingoscopy to visualize the entire length of the ampullary mucosa as an important prognostic parameter. However, salpingoscopic findings were not included in the score system, as salpingoscopy was being practiced at very few centers. This study was undertaken to correlate the salpingoscopic scoring system with the reproductive outcome after reconstructive surgery and, simultaneously, to evaluate the usefulness of this scoring system for selecting in vitro fertilization or microsurgery.

MATERIALS AND METHODS

The study consisted of the intraoperative assessment of 27 women with suspected tubal disease or unexplained infertility after Hospital Ethics Committee approval. Ten patients were considered to have proximal tubal occlusion, 12 patients had endometriosis, and 5 had tubal inflammation. In all, 54 tubes were examined. Normal semen analyses and documentation of ovulatory status were obtained in all couples before surgery. All procedures were performed during the early follicular phase of the menstrual cycle. After assessment, the intended pelvic microsurgery or transcervical tuboplasty (everting catheter system, Imagyn Medical, Inc) was performed.

Salpingoscopic scores were derived for each tube using a modification of a scoring system described previously by Kerin *et al.* (3) for transcervical fallopscopy. The other side, transfibrial approach was performed as follows. The fimbriated end of the fallopian

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tube was cannulated with a 0.5-mm-diameter salpingoscope (Nippon Kodan Co Ltd) through the ampullary-isthmic junction until a point of resistance was encountered. The tubal lumen was distended with heparinized lactated Ringer's solution infused through an extension tube with a handhold syringe. Each fallopian tube was examined by two independent observers (TS and KT). One to four points were attributed separately for the isthmic, ampullary, and fimbrial regions of each tube (Fig. 1); accordingly cumulative scores for each tube could range from 12 to 39 or more. After 2 years, these patients were investigated to determine whether or not pregnancy had occurred spontaneously.

Mean salpingoscopic scores calculated for each group were used in Student's *t* test. Statistical significance was associated with *P* values less than 0.05.

RESULTS

Salpingoscopic View of the Tubes

In the normal tube, minor folds extended from the isthmic-ampullary junction to the ostium in a longitudinal direction. Tubal wall vessels ran subepithelially and had a thick diameter and a tortuous course. Ampullae were marked with regular major folds and multiple parallel capillaries. Fimbria were made up of concen-

trated folds that were similar to those seen in the ampulla. On the other side, in the abnormal tube, these were characterized by alterations of their basic components, which are the major and minor folds and their pattern of vascularization. Vascularization lost its typical pattern as irregular forms and the folds flattened progressively. Complete absence of inner structures was a common finding in some of the hydrosalpinx (Fig. 2).

Tubal Scores by Respective Cases

Tubal scores averaged 18.6 ± 2.0 (range, 12–31) for the 10 proximal occlusion cases recanalized with everting catheter after treatment. The scores averaged 15.1 ± 0.7 (range, 12–21) for the 12 endometriosis cases (average AFS scores = 36 ± 10.6). The scores averaged 20.8 ± 3.4 for the five tubal disorder cases due to inflammation. A significant difference was observed between the endometriosis cases and the proximal occlusion cases or inflammation cases ($P < 0.001$). The postoperative pregnancy rate in each group was four cases (40.0%), two cases (16.7%), and two cases (40.0%), respectively, or eight cases (29.6%) in total (Table I).

Tubal Scores in Pregnancy Cases

Pregnancy occurred in 8 (29.6%) of the 27 cases. The average tubal scores for these cases were $13.4 \pm$

CHARACTERISTIC	ISTHMIC		AMPULLARY		FIMBRIAL	
side of tube	R	L	R	L	R	L
PATENCY						
patency----- 1						
stenosis----- 2						
obstruction----- 3						
EPITHELIUM						
normal folds----- 1						
moderate attenuates----- 2						
flat, featureless----- 3						
VASCULARITY						
normal----- 1						
hypervascular----- 2						
erythema, bleeding----- 3						
poor, palor----- 4						
ADHESIONS						
none----- 1						
thin, weblike----- 2						
thick----- 3						
OTHERS 2 - 3						
CUMULATIVE SCORE						

Fig. 1. A salpingoscopic classification and scoring system for the tubal lumen disease [modified from Kerin *et al.* (3)]. The cumulative scores for each segment of each tube were 12 or less for normal tubal lumen, 13–15 for mild changes, 16–19 for moderate changes, and 20 or greater for severe changes. Hydrosalpinx is assigned a score of 3. Mucous plugs or tubal debris, endotubal polyps, endometriosis, salpingitis isthmica nodosa, and neoplastic conditions are each assigned a score of 2 to 3, depending on the significance of the lesion.

Fig. 2. Salpingoscopic view of a normal ampulla (A) An intraluminal adhesion is shown in the isthmus (B) and a flattened major fold in the ampullary portion (C).

Table I. Salpingoscopic Score and Pregnancy Rate in Patients with Tubal Abnormalities

Case	No. of cases	Mean tubal scores	Range of tubal scores	Pregnancies
Proximal occlusion	10	$18.6 \pm 2.0^*$	12-31	4 (40.0%)
Endometriosis	12	$15.6 \pm 0.7^*$	12-21	2 (16.7%)
Inflammation	5	20.8 ± 3.4	12-29	2 (40.0%)
Total	27	17.7 ± 1.1	12-31	8 (29.6%)

* $P < 0.001$

0.5. The average tubal scores for the better tube of each of these cases were 12.6 ± 0.5 (range, 12-16). The scores were significantly lower than the average scores of 18.8 ± 1.4 (range, 12-31) for nonpregnancy cases ($P < 0.001$). The time to pregnancy in the pregnancy cases was 12.6 months. The highest score seen in the pregnancy occurrence cases was 16. This case turned out to be a tubal pregnancy (Table II).

DISCUSSION

The pregnancy outcome after tubal reconstructive surgery is known to correlate with the intensity and

extent of peritubal and intratubal adhesions (4,5). Pelvic scoring systems are based on pelvic adhesion intensity and extent, and the laparoscopic scoring system advocated by the AFS in 1988 is frequently used (2). In this study, parameters of the tubal score are divided by extent and type of adhesion, distal end occlusion status, tubal wall thickness and rigidity, tubal fimbrial diameter, mucosal fold, etc. Surrey and Surrey (6) pointed out the importance of lumen observation because minor adhesions do not correlate with luminal findings, though severe distal end lesions agree with laparoscopic findings. In view of these many reports, tubal lumen examination is considered to have a very important meaning for postoperative pregnancy. Bowman and Cooke (7) used the modified Kerin's fallopscopy system (3) in 20 patients and observed a strong correlation between intratubal damage and pelvic adhesion extent by the AFS classification. Dubuisson *et al.* (8) showed the importance of tubal mucosal surface observation on the basis of examination of laparoscopic neosalpingotomy or fimbrioplasty performed in 81 cases. Although salpingoscopy is used for observation of luminal findings, two methods of transfimbrial and transcervical are used at present. The method presented by Kerin *et al.* is well-known as the

Table II. Cumulative Pregnancy Outcome According to Salpingoscopic Score

Case	No. of cases	Mean tubal score	Mean min tubal score (range)	Duration to pregnancy (mo)
Pregnancy	8	13.4 ± 0.5	$12.6 \pm 0.5^*$ (12-16)	12.6
Nonpregnancy	19	19.7 ± 1.3	$18.8 \pm 1.4^*$ (12-31)	

* $P < 0.001$.

transcervical method that was also mainly used in this study. Scudamore *et al.* (9), Herschlag *et al.* (10), and Kawakami (11) reported a good correlation between histology by light microscopic and electron microscopic findings and lumen salpingoscopy findings.

Examination of score difference by the type of proximal occlusion, endometriosis, and distal tubal diseases and lesions as reported by us in this study has not yet been reported. The endometriosis cases were found to have abnormal lumen findings such as hypervascularity, although findings from outside by laparoscopy appeared normal. These cases are considered to need examination by a salpingoscope. The most important point in this study is the relation between the scoring system and the postoperative pregnancy results. Scores were significantly lower for pregnancy cases and were practically of the same level as those of completely normal tubal lumens. As reported by Surrey and Surrey (6) and Marana *et al.* (12), tubal function assessed by salpingoscopy scoring indicates very strong relations to postoperative pregnancy occurrence. In view of the fact that the highest score in the pregnancy cases in our present study was 16 and that this case concluded in an ectopic pregnancy, salpingoscopic scores of 15 or less are considered to be the adequate scores suggesting normal tubal function.

In summary, correct diagnosis and assessment of tubal infertility have an important meaning, in particular in the selection of tubal microsurgery or assisted reproductive technology (13). The present study indicates a very strong relation of tubal lumen status to postoperative pregnancy. Preoperative tubal lumen exploration, assessment, and scoring may have important meaning in avoiding unnecessary tubal surgery and in guiding patients in selecting in vitro fertilization without placing excessive expectations on surgery.

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