CURRENT DIAGNOSTIC ROLE OF HYSTEROSALPINGOGRAPHY IN MODERN INFERTILITY PRACTICE

(A Study Based on Laparotomy Verification of Hysterosalpingographic Findings for Tubal Patency and Function)

by

R. Rajan,* M.D., D.G.O.

and

K. C. Joseph,** M.D.

Hysterosalpingography (HSG) is a commonly used diagnostic technique in gynaecologic practice and is an essential part of a complete infertility investigation (Rozin, 1965; Siegler, 1967, Parekh and Arronet, 1972; Kierse and Vandervellen, 1973; Gabos, 1976; El-Minawi *et al.*, 1978; Ansari, 1979; and Stumpf and March, 1980). Being a simple procedure which is less hazardous to the patient and easy to perform, since 1977 (April) we have depended on HSG as the initial diagnostic procedure to commence the infertility work-up (Rajan and Joseph, 1979 and Rajan *et al* 1980). Over the past 4 years, 850 HSGs were performed for evaluation of tubal and uterine factors in infertile women.

Currently laparoscopy has been recognised to be superior to HSG in the detection of peritoneal and tubal causes of infertility (Mathius *et al* 1972, Rolend *et al* 1973, Hutchinson, 1977, Sheth and Krishna, 1979 and Cumming and Taylor, 1980). No infertility investigation is considered thorough by modern standard unless it includes endoscopic assessment of tubal function (Pitkin, 1978) and some authors even believe that laparoscopy is the only test for evaluation of the fallopian tubes (Swolin and Rosencrantz, 1972 and Templeton and Kerr, 1977). However, as reported earlier (Rajan and Usha, 1980), we have amployed laparoscopy for confirming HSG findings before considering tubal reconstructive surgeries.

That laparoscopy is not free from diagnostic errors has been documented by Moghissi (1979). Recent studies comparing HSG and laparoscopy have proved that both procedures provide only the crudest possible information regarding the functional capacity of the fallopian tubes (Gabos, 1976). According to Ansari (1979) both should be complementary procedures, because HSG provides information about the tubal lumen and uterine cavity and laparoscopy unveils peritubal and pelvic pathology. For the same reason HSG and laparoscopy should not be considered competitive or naturally exclusive but should be used in a progressive manner in the evaluation of infertile woman (Moghissi, 1979).

Notwithstanding the controversies many clinicians still emphasize initial depend-

---

**Associate Professor of Obstetrics and Gynaecology, Medical College Hospital, Alleppey-688 001, (Kerala).*

***Assistant Professor of Radiology, Medical College Hospital, Gandhi Nagar, Kottayam-686 008, (Kerala).*

Accepted for publication on 20-1-81.

ence upon HSG for the evaluation of tubal patency and function. Hence we set out to determine the diagnostic accuracy of HSG by comparing with laparotomy findings, which unlike laparoscopy is the most direct and accurate approach to evaluation of tubal patency and function. The analytical data of this comparative study has enabled us to discuss the following: By modern standards are we justified in the continued use of HSG for diagnosis of tubal disorders? Should it be completely replaced by laparoscopy? Or should it play a limited but definite role in the present day evaluation of infertility? And if employed how best the results could be interpreted?

Materials and Methods

Among the 1329 infertile couple registered over a period of 3 years and 8 months beginning from May 1977, pelvic surgeries for infertility were performed in 100 women. Laparotomy diagnosis and the details of operative procedures are given in Table I. All these subjects had a prior HSG evaluation, and some had laparoscopic confirmation of HSG findings prior to tubal surgeries. Age of the patients operated ranged from 23 to 40 years and their duration infertility from 2 to 18 years.

HSG was performed as an outdoor procedure employing water-soluble contrast medium (presently Verografin) injected through the Leech-Wilkinson type of cannula. The first antero-posterior film with 1 to 3 ml of constrast medium was used to study the uterine cavity. Maintaining a constant flow-low pressure technic the second film was taken to study the tubal lumen. After 5 to 10 minutes the third film was taken to study the nature of peritoneal spill. If necessary, follow-up films were taken at intervals. The entire procedure was completed under fluoroscopic control. The technic is detailed in our earlier communication (Rajan *et al* 1981).

As important as mastering the technic of HSG is the careful interpretation of the findings keeping in mind the limitations of this diagnostic procedure. Our criteria for diagnosing the different tubal and peritonial (peritubal) factors by HSG are summarised in an earlier report (Rajan and Joseph, 1981).

TABLE I

Operative Procedures in the 100 Infertile Women

Diagnosis	Operative Treatment	No. of patients
1. Tubal disorders	Tubal reconstructive surgeries	33
2. Endometriosis	Resection of endometrial implants and release of adnexal adhesions	24
3. Unexplained infertility	Fertility laparotomy	22
4. Fibroid uterus	Myomectomy	8
5. Fibroid with endometriosis	Myomectomy, resection of endometriomata, and release of pelvic adhesions	5
6. Uterine malformations	Metroplasty	3
7. Tubal sterilisation	Tubal recanalisation	3
8. Intra-uterine	Hysterotomy and release of uterine adhesions	2

Currelation between Radiographic and Laparotomy Findings

HSG performed in the 100 women prior to the pelvic surgeries showed bilateral tubal patency in 60, bilateral tubal block at different levels in 34 and unilateral tubal block in 6. Among those showing peritoneal spill, peritoneal factor suggested by 'pocketted spill' (localised dye distribution) was diagnosed in 36 and uniform peritoneal spill indicative of absence of pelvic factor was diagnosed in 31 patients. (Table II). At the time of laparatomy these radiographic findings were carefully compared and the degree of agreement for the tubal and peritoneal factors was determined.

TABLE II

Hysterosalpingographic Findings in the 100 Infertile Women

Tubal factors		Peritoneal factors	
Findings	No. of patients	Findings	No. of patients
Bilateral tubal patency	60	Localised accumulation of contrast material in the peritoneal cavity suggestive of pelvic adhesions	36
Bilateral proximal occlusion	16		
Hydrosalpinx (unilateral)	9		
Hydrosalpinx (bilateral)	6	Uniform dye distribution in the peritoneal cavity suggestive of absence of peritoneal factors	30
Unilateral tubal occlusion	6		
Bilateral distal occlusion	3		

Bilateral Tubal Patency: Among the 60 patients with both tubes showing filling and spilling of contrast medium into the peritoneal cavity on the delayed film, the findings were confirmed at laparotomy in 58. Two patients had different findings, with 1 showing bilateral distal tubal block and the other unilateral ampullary block. This result suggests 96.66% diagnostic reliability for bilateral tubal patency, with a false negative impression in 3.34%.

Unilateral Tubal Patency: By contrast, unilateral tubal filling with peritoneal spill at HSG, correlated very poorly with laparotomy diagnosis. Of the 6 patients with unilateral tubal patency the findings could be confirmed in only 2 patients (33.33%) and the remaining 4 patients had normal tubal function bilaterally.

Bilateral Hydrosalpinx: Distal tubal occlusion with ampullary dilatation and localised persistence of contrast material on the delayed film demonstrated on both sides by HSG had totally concordant results at laparotomy for all the 6 patients.

Unilateral Hydrosalpinx: However, among the 9 patients with unilateral hydrosalpinx, the findings were in agreement only in 7 patients, (77.78%). The other 2 patients had bilateral pelvic adhesions due to endometriosis. Even in the 7 patients with accurate diagnosis for the unilateral pathology, there was some discrepancy between the HSG and laparotomy findings for the contralateral tube. Two patients with HSG diagnosis of unilateral hydrosalpinx and contralateral proximal tubal occlusion were proved to have bilateral hydrosalpinx at laparotomy.

Bilateral Proximal Occlusion: The HSG AND Laparotomy results were in total agreement for bilateral proximal tubal occlusion for 11 of the 16 patients operated (68.75%). In the 5 patients with dissimilar findings, 1 had unilateral proximal tubal occlusion, 2 had bilateral tubal patency with peritubal adhesions and 2 had normal tubal patency and function.

Bilateral Distal Tubal Occlusion: Bilateral distal tubal occlusion without ampullary dilatation and sacculation was diagnosed by HSG in 3 patients requesting recanalisation following tubal sterilisation. HSG results compared favourably with laparotomy findings in all the 3 subjects.

Peritoneal Factor: Peritoneal factor (peritubal adhesions) was diagnosed by the appearance of abnormal dye distribution in the peritoneal cavity, especially in the delayed film. The HSG interpretation of peritoneal adhesions in 36 patients was confirmed in 29 (80.55%). These patients were having pelvic endometriosis or inflammatory adhesions involving the pelvic peritoneum and or tubal/ovarian adhesions. The remaining 7 patients were found to have normal tubal patency and functions, suggesting a false positive HSG diagnosis of 19.45% for peritoneal factors.

Normal (Uniform) Peritoneal Spill: Just as the nearly 20% incidence of false positive diagnosis, HSG showed false negative findings in 20% for peritoneal factors. Among the 30 patients with HSG appearance of uniform peritoneal spill, 6 subjects had significant pelvic pathology which included endometriosis and inflammatory tubal adhesions.

Diagnostic Reliability of H.S.G. (Table III)

TABLE III
Diagnostic Accuracy of Hysterosalpingography

Abnormal HSG findings	Laparotomy verification					
	Complete agreement		Partial agreement		False positive findings	
	No.	%age	No.	%age	No.	%age
Pelvic adhesions (36)	29	80.55	nil		7	19.45
Bilateral proximal occlusion (16)	11	68.75	3	18.75	2	12.50
Unilateral Hydrosalpinx (9)	7	77.78	2	22.22	nil	
Bilateral Hydrosalpinx (6)	6	100.00	nil		nil	
Unilateral tubal occlusion (6)	2	33.33	nil		4	66.67
Bilateral distal block (3)	3	100.00	nil		nil	
Abnormal findings (76)	58	76.32	5	6.58	13	17.10

Normal HSG findings	Laparotomy verification			
	Complete agreement		False negative findings	
	No.	%age	No.	%age
Bilateral patency (60)	58	96.66	2	3.34
Uniform tubal spill (30)	24	80.00	6	20.00
Normal HSG findings (90)	82	91.11	8	8.89

Correlation between radiographic and laparotomy findings have varied for normal and abnormal HSG findings. Where the HSG findings were normal, this techniç has failed to diagnose significant pelvic pathology on 8 occasions (8.89%), and the discripancies were mainly related to peritoneal factors. Abnormal HSG findings in 76 women have overdiagnosed pelvic pathology in 13 normal women (17.10%), and misdiagnosed some other type of tubal pathology in 5 subjects (6.58%). So much so, abnormal HSG findings had a complete agreement with laparotomy findings in 76.32%, and partial agreement in 6.58%, leaving 17.10% as totally false positive HSG results.

Discussion

Our study clearly demonstrates that both normal and abnormal HSG findings could be associated with diagnostic errors. Occasionally, HSG fails to diagnose significant pelvic pathology and more often the procedure overdiagnoses non-existant pelvic disorders. If this is true the continued use of HSG must be questioned in modern infertility practice.

Although HSG has certain diagnostic limitations, it is still a simple and safe procedure which gives valuable information about the tubal function at a low cost to the patient. Morever, it forms a permanent record for the patient. Our study shows that the greatest discrepancy is in the diagnosis of peritoneal and peritubal adhesions. Being essentially a luminal study, HSG cannot be expected to provide accurate informations regarding endometriosis or adnexal adhesions. It more often demarcates the tubal lumen with the longitudinal mucosal folds, diagnoses tubal patency with reasonable precision and precisely demonstrates hydrosalpinx. An abnormal HSG finding has a diagnostic accuracy of 76.32%, and bilateral tubal patency by HSG is 96.66% confirmed at laparotomy.

These results indicate that HSG provides valuable information regarding the anatomy of the inner aspect of the fallopian tubes. In addition, the uterine configuration is also well studied by HSG. These informations are obviously not obtained by laparoscopy. Hence HSG should be considered an indispensable part of the infertility study, and should be method of choice to begin the infertility work-up.

Quite often tubal patency test is performed just to complete the infertility work-up, where the cause of infertility has already been determined. Treatment of oligospermia, therapeutic insemination and correction of ovulation disorders are some of the examples, where HSG should suffice as the method of tubal patency study. Similarly, couple with short period infertility also need only a preliminary survey where HSG could be utilised, being a less complex procedure. Only if HSG reveal some abnormality it has to be further investigated by laparoscopy. Same is true for women with no explainable cause for infertility, including a normal HSG, who fails to conceive within a reasonable period, or when conception does not occur even after correction of the known disorders. In such situations the possibility of a false negative HSG report should be carefully considered, especially for the peritoneal factors, and confirmed at laparoscopy.

HSG has also a definite role in the follow-up studies on women undergoing tubal surgeries. We employ HSG to evaluate the tubal function in patients who fail to conceive within a reasonable period after tubal reconstructive procedures. In this respect HSG may be a superior procedure when one considers the limitations of laparoscopy following abdominal surgeries.

Conclusion

This study convincingly proves that HSG must be the method of choice for the initial investigation of tubal function, and should be performed routinely as a part of the infertility work-up. If one considers its limitations and does not expect peritoneal factors to be diagnosed, HSG, primarily a luminal study, gives valuable informations about the fallopian tubes and the uterine cavity. We are of opinion that study of tubal patency and function is best accomplished by means of hysterosalpingography complemented by laparoscopy. It goes without saying that perfection of the technic and careful interpretation of HSG findings are the two prime factors improving the diagnostic accuracy.

References

1. Ansari, A. H.: Pertil Steril. 31: 469,1979.
2. Cumming, D. C. and Taylor, P. J.: Fertil. Steril. 33: 475, 1980.
3. El-Minawi, M. F., Abdel-Hadi, M., Ibrahim, A. L. A. and Waby, O.: Obstet. Gynec. 51: 29, 1978.
4. Gabos, P.: Fertil. Sterill. 27: 238, 1976.
5. Hutchinsons, C.: Obstet. Gynec. 49: 325, 1977.
6. Keirse, N. J. and Vandervellen, R.: Obstet. Gynec. 41: 685, 1973.
7. Mathius, J. B., Horbach, J. G. M. and Van Hall, E. V.: Fertil. Steril. 23: 428, 1972.
8. Moghissi, K. M.: Clin. Obstet. Gynec. 22: 11, 1979.
9. Parekh, K. C. and Arronet, G. H.: Clin. Obstet. Gynec. 15: 1, 1972.
10. Pitkin, R. M.: Year Book, Obstet. Gynec. 1978. P. 374.
11. Rajan, R., Joseph, K. C. and Usha, K. R.: J. Obstet. Gynec. India. 30: 155, 1980.
12. Rajan, R. and Usha, K. R.: J. Obstet. Gynec. India. 30: 342, 1980.
13. Rajan, R. and Joseph, K. C.: J. Obstet. Gynec. India. 31: 1981.
14. Rajan, R., Joseph, K. C. and Ambika Devi, K.: J. Obstet. Gynec. India. 31: 1981.
15. Rozin, S.: Uterosalpingography in Gynaecology, Charles, C. Thomas Illinois, USA., Chap. 3, P. 13, 1965.
16. Siegler, A. M.: Obstet. Gynec. Survey. 22: 284, 1967.
17. Sheth, S. S. and Krishna, U. R.: J. Obstet. Gynec. India. 21: 511, 1979.
18. Stumpf, P. G. and March, C. M.: Fertil. Steril. 33: 487, 1980.
19. Swolin, K. and Rosencrantz, M.: Fertil. Steril. 23: 270, 1972.
20. Templeton, A. A. and Kerr, M. G.: Brit. J. Obstet. Gynec. 84: 760. 1977.

Abdomino-Vaginal Radical Hysterectomy—Chaudhury pp. 609-616

Fig. 5
The parametrial tissue are isolated after pulling the uterus to the opposite side.

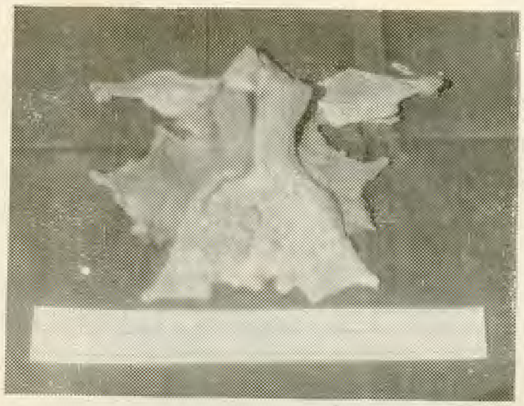


Fig. 6
The specimen.

Advanced Secondary Abdominal Pregnancy—Shukla and Kothari p. 701

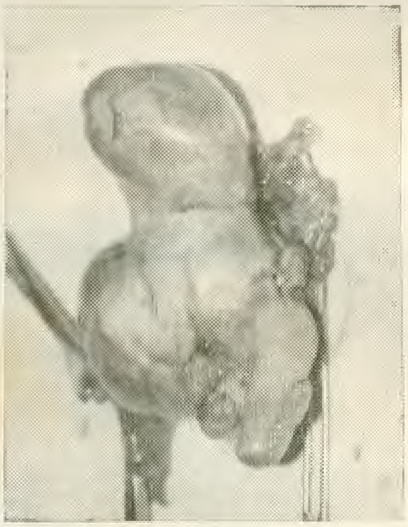


Fig. 1
Laparotomy findings showing uterus with ruptured rudimentary horn and malformed foetus lying in abdominal cavity placenta lying inside the ruptured rudimentary horn.

Fig. 2
Ruptured rudimentary horn (after excision) along with foetus.

Naegle's Pelvis—Iyer and Raval pp. 699-700

Fig. 1
An antero posterior X-ray view of the pelvis.

Fig. 2
X-ray showing the presence of a double renal pelvis on the right side.

Bilateral Dermoid Tumour of the ovary—Deshpande and Kothari pp. 711-712

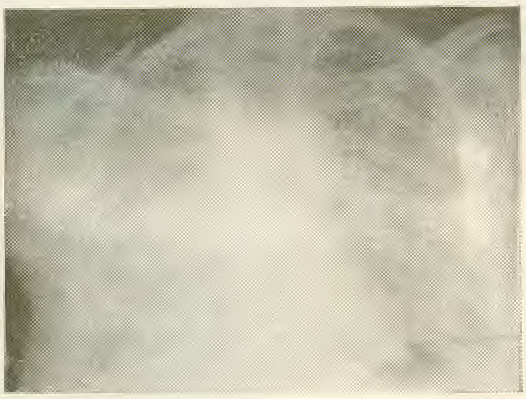


Fig. 1
X-ray chest P.A. view showing an homogenous dense shadow in middle lobe of the right lung with miliary carcinomatosis and cotton wool appearance—both lung fields.

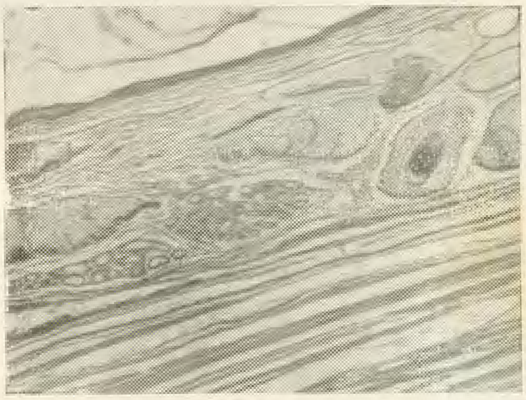


Fig. 2
Histopathology section showing a classical picture of benign dermoid tumour.

Uterus Didelphys with Complete Unilateral Vaginal—Parikh p. 698

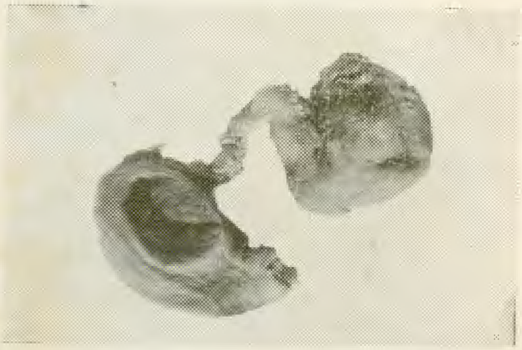


Fig. 1
Specimen shows cut open left uterus with haematosalpinx.

Incomplete Testicular Feminization—Dutta and Choudhury pp 715-716

Fig. 1
Shows feminine appearance of the patient with little prominent jaw. The breasts are not well developed.

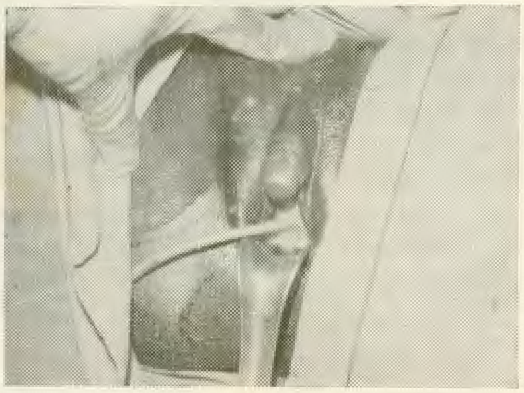


Fig. 2
Shows the speculum in the vagina, a rubber catheter in the urethra and enlarged clitoris.

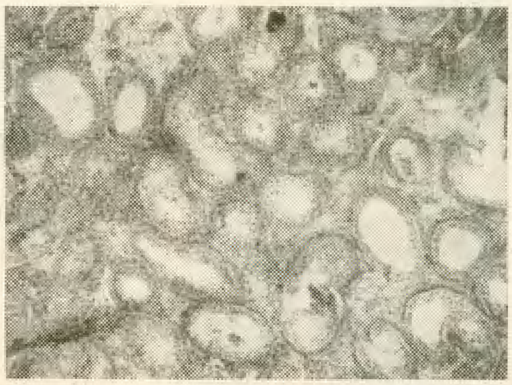
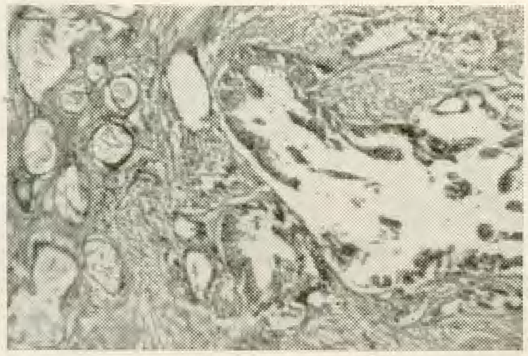


Fig. 3
Shows appearance of testis with hypoplastic seminiferous tubules.

Papilary Hidradenoma of Vulva—Santosh et al. pp. 719-720



Fif. 1
Hindradenoma of vulva showing adenomatous structures of variable sizes, mostly lined by two layers of cells, some cystic structure show capillary infolding and decapitated secretion. H. & E. x 100.

Dermatofibrosarcoma Protuberans of Vulva—Kulkarni et al. pp. 717-718

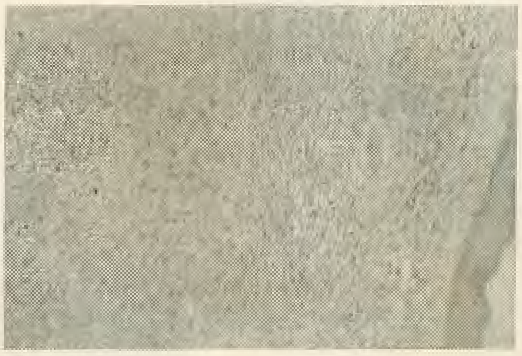


Fig. 1
Microphotograph of Dermatofibrosarcoma protuberans.

Brenner Tumour of ovary Associated with Mucinous— Gourikutty and Rajagopalan p. 714

Fig. 1
Area showing epithelial cells with nuclei with longitudinal growing. (Brenner Tumour).

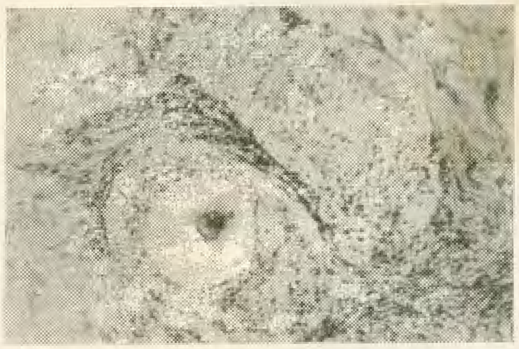


Fig. 2
Area showing columnar mucinous secreting cells (Mucinous cystadenoma).

THE FEDERATION OF OBSTETRIC AND GYNAECOLOGICAL SOCIETIES OF INDIA

The XXVII All India Obstetric and Gynaecological Congress will be held at Trivandrum, Kerala in last week of December 1983. The subjects for discussion will be as follows:

1. Primary Health care in Obstetrics and Gynaecology.
2. Teen age pregnancy and labour.
3. Menopause.
4. Miscellaneous papers.

Dr. R. D. Pandit
Hon. General Secretary

Dr. A. C. Mehta
Dr. V. B. Patwardhan
Jt. Hon. Secretaries

The Ninth Asian & Oceanic Congress of Obstetrics and Gynaecology will be held in September, 1983, in Seoul, Korea,

Preliminary Congress Themes are:

(i) High Risk Pregnancy (ii) Fertility Regulation—Population Control (iii) Obstetrics & Gynaecological Endocrinology (iv) Trophoblastic Tumours (v) Gynaeological Malignancy and (vi) Endoscopy.

All correspondence to:

Secretary General
Prof. Seung. J. Kim, M.D.,
Dept. of Obstetrics & Gynaecology,
Kangnam St. Mary's Hospital
505 Banpo-dong, Kangnam-ku
Seoul 134-03, Korea.

For any further information you can write to Dr. R. D. Pandit, Hon. General Secretary of the Federation of Obstetric and Gynaecological Societies of India.