

Ultrasound Studies on Implantation of Embryos in ART Cycles

Sudarsan Ghosh Dastidar • Kakoli Ghosh Dastidar
Infertility Clinic & I. V. F. Centre, Calcutta - 700 029.

Summary : During routine transvaginal ultrasound done after embryo replacement in I.V.F. /Micro-manipulation programme, we noticed a typical echoalteration of those endometrium which later showed growth of gestational sac. Summarising this alteration to be an immediate post-implantation sign we followed it up on a larger series which confirmed our finding that even before the gestational sac is seen, the trophoblast migration is recognisable by transvaginal ultrasound studies.

Introduction & Objective

Hackeloer (1984) and many other workers have described the echo pattern of normal secretory phase endometrium. In the non-pregnant state this endometrium tends to be hyperechoic and regular in its outline throughout the anterior and posterior endometrial / myometrial interphase.



Fig.1 : Hyperechoic Type 'A' endometrium with regular outline

Hyperechogenicity of Proliferative phase endometrium has also been reported by many workers like Zaidi et al, (1995), and Fleischer et al, (1991). We too have noticed such altered echocharacter in proliferative phases of stimulated and unstimulated cycles. Gonen et al, (1990)



Fig.2 : Irregular, outline of trophoblast / decidual interaction

have named this variety of endometrium as type 'A'.

Both these types of hyperechoic endometrium seen either in proliferative or secretory phase has an evenly regular outline (Fig. 1). There is the third variety that we have reported earlier, Ghosh Dastidar et al (1997) which resembles these varieties of endometrium in echotexture but has an extensively irregular, broken outline suggesting the burrowing of the embedding trophoblast into the decidua. (Fig. 2).

It is well appreciated by all workers involved in A.R.T.,

Table-1
Data Analysis of Fifty Cycles studies

Total No. of Patients Studied	No. of Patients in Whom the implantation Sign was seen on day 6 Post ET or IUI	Gestational Sac With embryonic Cardiac Activity Seen Later	Early Abortions Taking Place Later	On Going Pregnancy	Multiple Gestation
ICSI - 8 ET	2 (25%)	1 (12.5%)	Nil	1	1 Set of triplet
IVF -20 ET	7 (35%)	5 (25%)	1	4	Nil
IUI - 22	8 (36.5%)	9 (40.9%)	1	8	1 Set of twin

that implantation with ultimate visualization of the gestational sac is immensely satisfying both to the clinician and recipient couple. The appearance of the sac takes place around the 18 to 27 post transfer day as reported by Pellicer et al (in 1991). During T.V.U.S. studies done by us after embryo transfer it was noticed that in a few instances the hyperechoic endometrium was irregular in one area of interphase which is in contrast to the even outline of the endometrium discussed earlier. It is in this region that the gestational sac eventually appeared. The irregularity resembled the myometrial infiltration by malignant endometrial lesions reported earlier by Doren et al (1995), Osmers et al (1995). We think this irregularity seen by us is due to the migration of trophoblast cells as they proliferate and embed into the decidua.

After seeing this we started preponing the day of post transfer study from day 18 closer to day of transfer and it was the 6th post transfer day when our sign could be detected earliest.

Materials & Method

Since a prospective study by us in a larger number of patients confirmed the finding, Ghosh Dastidar, et al (1997) we have now started doing this study routinely in our IUI

patients also. This present series was done in 50 stimulated cycles of treatment including ICSI-ET, IVF-ET and IUI. The ultrasound exposure time was kept approximately 30 to 45 seconds. The machine being used is Philips SDR 1550 XP with a dual frequency transvaginal probe. Serum β HCG was done on blood drawn on same day as ultrasound study in all patients.

Result Analysis

The number of ongoing pregnancies at the moment is 1 in ICSI-ET (12.5%), 4 in IVF-ET (20%) and 8 in IUI (36.5%). The serum β HCG on D6 post embryo transfer and post IUI ranged between 4.2 to 46.5 mIU/ml. The patient in whom β HCG was 46.5 mIU/ml. was the triplet and in the patient now carrying the twin, serum β HCG was 32mIU/ml. on D6.

Our "trophoblast burrowing sign" failed to detect implantation in 1 of the IUI cycles, and the sign was seen but sac did not appear in 1 case of ICSI-ET and in 2 cases of IVF-ET.

Discussion

Birth of Louise Brown in 1978 in England created his-

tory, the laurels of which was taken up by science in the field of A.R.T. Techniques of controlled ovarian hyperstimulation, retrieval of pre-ovulatory oocytes by vaginal route and culture protocols for I.V.F. have undergone a sea-change. Yet the unconquered area is the implantation which has been reported to occur later than in normal in-vivo fertilization (Englert et al 1984). Till this is confirmed, apprehension and expectation levels in the couple undergoing treatment is high. To add to this is the recurrent expenditure of luteal support. If implantation failure can be detected early, it is easier for the couple to adjust psychologically and also curtail the further cost not only in terms of luteal support but also loss of workhour by bed rest.

Though early sign of implantation in the form of endometrial echotextural alteration, proposed to be related to vascular changes has been reported earlier, Cadkin et al (1991), such features have been said to be seen in other conditions like degenerative changes of endometrial polyp and cystic endometrial hyperplasia also. Enhanced endometrial flow around the time of implantation has been studied and correlation with serum β HCG of 156 mIU/ml. On D27 has been reported (Applebaum et al 1992). Our "trophoblast migration sign", giving a visual impression of trophoblast burrowing is diagnostic at a mean β HCG of 16mIU/ml. and on approximately the D21 of the cycle. Though it has been reported that in stimulated cycles the "texture of endometrium is different than in spontaneous cycles", (reported by Fleischer et al 1989), and can falsely be confused with gestational sac-like echo, our "trophoblast migration sign" has never been recorded in absence of implantation. Though in 3 cases the sac failed to appear, histology later proved presence of chorionic tissue in these cases.

Conclusion

We feel, early detection of implantation failure can not

only help reduce cost by withdrawing expensive luteal support in an economically backward country like ours but also help the couple psychologically by alleing their doubts about success.

We are doing a further study to see the velocimetric pattern of this implanting trophoblast, which will be reported shortly.

Reference

1. Applebaum M, Cadkin AV; Decidual flow - an early sign of pregnancy, *Ultrasound Obstet Gyne* (abstract), 2;65;1992.
2. Cadkin AV, Applebaum M., *Am. J. Obstet Gynecol* (letter), 165; 236; 1991.
3. Doren M., Schneider HPG, Holzgreve W., *Ultra Obstet Gyne*; 66;300; 1995.
4. Englert Y, Roger M, Belaisch - Allart J, gondet M; Frydmen R; Testart J; *Fertil Steril* 42:835:1984.
5. Fleischer AC, Pittaway DE, Beard LA, Thieme GA, Bundy AL; James AE JR; Wentz AC; *J. Ultrasound Med*, 3:341:1984.
6. Fleischerk Arthur C., Herbert Carl M., Hill George A., Donna M., Kepple John, Worrell A., *J. Ultrasound Med* 10:93;1991.
7. Ghosh Dastidar S., Ghosh Dastidar K., *J. of Asst. Repro and Genetics*, 14:3;1997.
8. Ghosh Dastidar K., Ghosh Dastidar S., Abstract book of 10th World Congress on In vitro Fertilisation and Asisted Reproduction, Vancouver, Canada, May 24-28, 1997.
9. Gonen Y, Casper R.F, *J. In Vitro Fertil Embryo Transfer*, 7:146-1990.
10. Hackeloer B.J., *J. in Vitro Fertil Embryo Trans.* 1:217;1984.
11. Osmer R. G. N., Osmer M., Kuhn W., *Ultrasound Obstet Gynecol*, 6:103;1995.
12. Pellicer A., Calatayed C., Miro F., Castellvi R. M., Ruiz M., Perez M., Musoles F. Domilla, *Ultrasound Med.* 10:31;1991.
13. Zaidi J., Campbell S., Pittrof R., Tan S.L., *Ultrasound, Obstet Gynecol*, 6:91;1995.