STUDY OF ENDOMETRIAL GLYCOGEN IN CASES OF INFERTILITY

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The proper embedding of the ovum depends much on the production of sufficient amount of glycogen by the endometrium. Failure to do so will lead to the development of poor quality of endometrium resulting in death of ovum either before or after implantation (Baveja *et al* 1972). Other workers (Zondek and Stein 1940; Zondek and Shapino 1942; Hughes *et al* 1950; Arronet and Latour 1957) have emphasized the importance of study of endometrial glycogen content in infertility and other conditions.

The present report deals with the observations experienced by the authors during their study of endometrium in cases of infertility attending the outpatient section of the Department of Obstetrics and Gynaecology, Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh.

Material and Methods

Five hundred infertile females with their male partners having normal semenogram were selected for the study. Endometrial tissue in premenstrual phase was obtained in 452 cases. The tissue was preserved in 10% formal saline for 24 hours. Besides routine haemotoxylin and eosin staining endometrial glycogen was demonstrated by using Periodic Acid Schiff's reagent according to the technique described by Pearse (1949). The grading of glycogen content was expressed as follows (Arzae and Blanchet 1948):

0 — Negative reaction.
\+ — Very small granules.
++ — Coarse granules.
+++ — Small masses.
++++ — Large amounts.

Glycogen study was carried out in 348 cases only.

Results

Out of 452 cases the morphological picture of endometrium was proliferative in 100 cases (22.13%); secretory in 301 (66.59%); irregular ripening in 21 (4.65%); tuberculous endometritis in 18 (3.98%) and abnormal endometrium in 13 (2.65%). Glycogen was demonstrated in 100 cases of proliferative and 248 cases of secretory endometrium.

While subdividing the cases of proliferative endometrial reaction, atrophic proliferative endometrium was seen in 3 (3.0%); early proliferative in 4 (4.0%); mid-proliferative in 41 (41.0%) and late proliferative in 52 (52.0%).

Glycogen Study

(A) Proliferative Phase Endometrium:

No PAS positive material was witnessed in atrophic proliferative and early pro-

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Accepted for publication on 17-12-75.

liferative endometrial tissues, though glycogen in form of small and coarse granules was demonstrated in 9 cases (21.6%) out of 41 of mid-proliferative endometrium. In cases with late proliferative endometrium moderate to good amount of glycogen was demonstrated in 20 cases (36.53%), little amount in 13 (25.0%) while no PAS positive material was seen in 19 (38.47%) (Fig. 1).

(B) Secretory Type Endometrium:

The results of the score of glycogen content in the glands and the stroma have been shown in Table I (Fig. 2).

It was further observed that glycogen when absent or less in glands, was present in good amount in the stroma, particularly in endometrium of 26th and 27th day of the cycle. On the other hand in the early part of postovulatory cycle the glycogen was seen in the glands only in 12 cases with none in the stroma. However, there was no such endometrium where the glycogen was absent both in the glands and in the stroma of the endometrium.

Glycogen in the form of fine or coarse granules or large masses was present in the glandular epithelial cells or inside their lumina. In the stroma it was seen around the blood vessels or in the predecidual cells. Overall assessment of the glycogen content showed that good amount was seen in 138 endometria (55.64%, Fig. 3), moderate in 80 (32.27%) and very little or poor secretory activity in 30 (12.09%).

Table II shows the comparision of the glycogen contents of the endometrial glands and the stroma. In 87 endometria (35.08%), glycogen score for the glands and the stroma was equal, in 116 (46.77%) glycogen was present in high concentration in the glands than in the stroma while the reverse was true in 45 (18.15).

TABLE I

P.A.S. Scoring in Glands and Stroma in 248 Cases of Secretory Endometrium

P.A.S. Score	Glands		Stroma	
	Number	Percentage	Number	Percentage
0	6	2.42	12	4.84
1+	25	10.08	42	16.94
2+	79	31.86	91	36.69
3+	98	39.51	75	30.24
4+	40	16.13	28	11.29
Total	248	100.00	248	100.00

TABLE 2

Comparison of P.A.S. Scoring in Glands and Stroma

P.A.S. Scoring	Number of cases	Percentage
Equal score in glands and stroma	87	35.08
More in glands than in stroma	116	46.77
Less in glands than in stroma	45	18.15
Total	248	100.00

Discussion

Formation of glycogen is essential for the proper embedding of the fertilised ovum and the cases, where the glycogen production is either weak or does not occur at the proper time of the cycle, may experience sterility or abortion. In the premenstrual phase endometrium very little or weak secretory activity was noticed in 12.09% of cases. Other workers have also reported weak secretory activity in varying proporation of their cases (Zondek and Stein 1940, 18.4%; Baveja *et al* 1972, 25.1%; Jhaveri *et al* 1972, 26.87%). Zondek and Stein (1940) have labelled this condition of glycogen deficiency as 'glycopaenia uteri' which may be responsible for improper embedding of ovum.

It was observed that the glycogen makes its appearance in the glandular epithelium shortly before ovulation and increases progressively during the secretory phase where it is seen in the lumina of the glands along with the secretions. Before menstruation it is less in the glands and more in the stroma. Zondek and Stein (1940) and Baveja *et al* (1972) have also made similar observations. Arzae and Blanchet (1948) studied alkaline phosphatase activity and glycogen content in the human endometrium. They have observed that the glycogen is formed at the expense of phosphatase which fits in well with the phosphorylation theory of glycogenesis.

Baveja *et al* (1972) noticed that large amount of glycogen in stromal cells in mid-proliferative phase and less quantity in late proliferative and secretory phases amount to abnormal stromal response to hormones. Thus, large amount of glycogen may be present at a time when it is not needed (mid-proliferative) and is deficient when needed most (secretory phase). In the present study, however, moderate to good amount of glycogen was seen in 9 out of 41 cases of mid proliferative type and 36.53% of late proliferative phase endometrium. In rest of the cases the glycogen was either very deficient or altogether absent. This showed defective glycogen formation resulting in infertility due to a poorly formed endometrium to receive the ovum. Further, in sections with secretory endometrium there was close correlation between the morphological changes in the stroma and in the glands. However, there was a disparity in the distribution of endometrial glycogen between the two which may further attribute to the improper development of suitable bed. Arronet and Latour (1957), on the other hand, have laid much emphasis on the morphological picture of the endometrium rather than the glycogen content. According to them cases with abnormal endometrium and glycogen content failed to conceive while patients having normal secretory endometrium with low, normal or high concentration of glycogen became pregnant.

Thus, it was concluded that besides studying the morphological picture of the endometrium glycogen concentration study is also essential in cases of infertility, especially of the preparatory endometrium as the poorly prepared endometrium may also react badly in the secretory phase.

Summary

Endometrial glycogen was studied in cases of infertility. Glycogen was absent in cases with atrophic proliferative and early proliferative endometrium. It was visualised in mild to moderate concentration in 21.6% of mid-proliferative endometrium. In late proliferative phase endometrium it was present in moderate

to good amount in 36.53% cases, little amount in 25% and absent in 38.47%. In secretory phase good amount was seen in 55.64%, moderate in 32.27% and poor secretory activity in 12.09% cases.

The poor preparatory endometrium and the poor secretory activity in secretory phase of the cycle may be responsible for laying down of unsuitable bed for the ovum thus resulting in infertility.

References

1. Arronet, G. H. and Latour, J. P. A.: J. Clin. Endocrinol. 17: 261, 1957.
2. Arzae, J. P. and Blanchet, E.: J. Clin. Endocrinol. 8: 315, 1948.
3. Baveja, R., Verma, H. C. and Samant, V.: Proceedings of the XVIth All India Obstetrics and Gynaecological Congress, March 1972, p. 20.
4. Hughes, E. C., Van Ness, A. W. and Lloyed, C. W.: Am. J. Obst. & Gynec. 59: 1292, 1950.
5. Jhaveri, C. L., Shah, R. H., Shah, M. R. and Bhatt, H. K.: Proceedings of the XVIth All India Obstetrics and Gynaecological Congress, March 1972, p. 255.
6. Pearse, A. G. E.: J. Path. & Bact. 61: 195, 1949.
7. Zondek, B. and Stein, L.: Endocrinol, 27: 395, 1940.
8. Zondek, B. and Shapino, B. A.: Am. J. Obst. & Gynec. 44: 345, 1942.

See Figs. on Art Paper V-VI