MATERNAL TOXAEMIA AND FOETAL GONADAL ACTIVITY WITH SPECIAL REFERENCE TO PROLACTIN—II. TESTIS

by

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SUMMARY

The maternal serum prolactin (PRL) level and foetal testicular morphology in 25 mothers, 15 of toxaemia of pregnancy and 10 non toxaemic cases have been studied. In the toxaemic cases the striking morphological appearance was the prominent and well developed interstitial cells of the testes observed in 93.3% cases and the remaining case showed haemorrhagic stroma. The average maternal serum PRL level was significantly higher in the toxaemic group of cases than the non toxaemic ones. Two cases in control group showing prominent interstitial cells in testis had high maternal serum PRL.

Toxaemia of pregnancy, one of the commonest complications of late pregnancy, is being encountered with high frequency in the developing countries. The aetiology of this complication is not yet settled. Many factors have been postulated in the past and present years. Recently prolactin (PRL), the pituitary gonadotrophin, is being incriminated as an important factor in the genesis of toxaemia of pregnancy. High level of this hormone is being observed in the maternal blood in cases of toxaemia of pregnancy (Horrobin 1977; Friese 1977).

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Study of morphological changes of the foetal genads born to toxaemic mothers has not been extensively studied. Only a few reported works, referring only to the female gonad, the ovary, are available (Govan and Mukherjee, 1950; Pryse-Davies and Dewhurst 1971). In this study, an attempt has been made to find out the testicular changes in male foetuses in cases of toxaemia and its relation to maternal serum PRL level.

Material and Methods

This study includes examination of 25 pregnant mothers in labour of which 15 cases belonged to toxaemia of pregnancy evident by presence of hypertension, oedema, albuminuria with or without con-

vulsions and the remaining 10 cases without the above mentioned features of toxaemia served the Control Group. The age group in both the groups ranged between 17 and 42 years and included both primi and multigravidae. The causes of foetal death in the non-toxaemic cases were cord prolapse, placenta praevia, post maturity and/or difficult breech delivery.

Estimation of level of serum PRL of mothers were carried out during labour. It was measured by radio-immunoassay technique (Hwang *et al* 1971) (The human PRL standard and antisera was obtained by courtsey of Dr. K. Mashiter of Hammersmith Hospital, London).

Both gross and microscopic examination of the foetal testes were carried out. For histopathologic examination, the tissues were fixed in 10% buffered formol saline and were routinely processed and the sections were examined under light microscope after staining by haematoxylin and eosin.

Results

I. *Non-Toxaemic Group*: The dimensions of the foetal testis varied as follows; length: 8-15 mm (mean 11 mm) and breadth: 6-10 mm (mean 7 mm). The surface of the testis was smooth in all the cases and the epididymis was on the posterolateral aspect, Microscopically, 8 out of the 10 cases did not show any abnormality. The parenchyma showed lobular arrangement with cord like arrangement of the seminiferous tubules. The cells of the cords were cuboidal with vesicular hyperchromatic nuclei. The tubular lumen was not evident. The interstitial cells were scanty.

In the remaining 2 cases, the picture was otherwise same excepting the interstitial cells were prominent and were diffusely distributed with formation of islets at places.

The average maternal serum PRL level was 189.03 ng/ml with a range of 63.7 to 321 ng/ml. The 2 cases showing prominent interstitial cells had high PRL level of 215 and 321 ng/ml.

II. *Toxaemic Group*: The length and breadth of the testes in this group ranged between 8-17 mm (mean: 13 mm) and 5-10 mm (mean 8 mm) respectively. On histopathological examination, the striking difference with the previous group was in relation to the intestitial cells. In 14 cases these cells were prominant and well developed. They were diffusely distributed with club formation (Fig. 1). In 2 cases the lumen of the seminiferous tubules was patent, but without any evidence of spermatogenesis in 1 case the tunica albuginia along with the entire stroma showed extensive haemorrhage and most of the seminiferous cords showed features of ischaemic necrosis. In this case the interstial cells were not indentified.

The average maternal serum PRL level in this group was 345.2 ng/ml with a range of 210-560 ng/ml. The case showing haemorrhagic stroma revealed the PRL level to be 410 ng/ml.

Discussion

Structural changes in the foetal ovaries in cases of toxaemia of pregnancy has been reported by a few authors with the observation of follicular maturation (Govan and Mukherjee, 1950. Pryse-Davies and Dew-hurst, 1971). While such morphological changes in the foetal ovaries have been established, the factor leading to such changes in cases of toxaemia has not been definitely substantiated. The factor which had been held responsible was the human chorionic gonadotrophin (HCG) (Segaloff *et al*, 1951; Pryse-Daves

TABLE I

Morphological Changes in Testis and Average Maternal Serum Prolactin (PRL) Level

Morphological changes in testis	Non-toxaemic group (10 cases)			Toxaemic group (15 cases)		
	No of cases	Average maternal PRL level ng/ml (Range)	Percentage	No. of cases	9verage maternal PRL level ng/ml (Range)	Percentage
Scanty interstitial cells	8	169.4 (63.7-293)	80	Nil	—	—
Prominent and well developed interstitial cells with slump formation	2	268 (215-321)	20	14	340.5 (210-560)	93.3
Haemorrhagic stroma	Nil	—	—	1	410	6.7

and Dewhurst, 1971). However, such a possibility has been questioned and rejected (Govan and Mukherjee, 1950; Peters *et al*, 1975). Govan and Mukherjee (1950) rather postulated the action of pituitary gonadotrophin in the maturation of foetal ovaries in toxaemia of pregnancy. The existence of prolactin (PRL), the third pituitary gonadotrophin is now well documented and its role in reproductive system has been well established (Tyson *et al*, 1972; Friesen *et al*, 1972; Jaffe *et al*, 1973; McNatty *et al*, 1974; Horrobin, 1977). The serum PRL level is known to rise during pregnancy with a maximum at 38-40 weeks (Tyson *et al*, 1972; Jaffe *et al*, 1973). PRL having low molecular weight can easily pass to the foetus and high level of this hormone has been detected in the foetuses older than 38 weeks (Hauth et al, 1978). Furthermore specific PRL receptors have been demonstrated in the testis (Aragona and Friesen, 1975). Therefore it may rightly be presumed at this stage, that the testes are exposed to the high concentration of the circulating PRL. In toxaemia of pregnancy the maternal PRL level rises much more than in normal pregnancy (Horrobin, 1977; Friese, 1977) and positive correlation of serum PRL level with fluid and electrolyte balance leading to hypertension and oedema (Manku *et al*, 1973; Nassar *et al*, 1974) points towards PRL to be one of the main aetiologic factors of toxaemia of pregnancy. In this study we have also observed much increased levels of maternal serum PRL in cases of toxaemia than in the control cases.

In our present investigation we have observed some relevant correlation between the maternal toxaemia and the foetal testicular morphology. On the histological examination of the foetal testes, the essential difference between the toxaemic group and the non-toxaemic one, was the development of the interstitial cells. While majority (80%) of the cases in the non-toxaemic group showed scanty interstitial

cells, most of the cases (93.3%) in the toxaemic group revealed prominent and well developed interstitial cells arranged mainly in clumpps. Normal testicular morphology and scanty interstitial cells was observed in this group. The high maternal PRL level also showed positive correlation with the observation of prominent interstitial cells. The average PRL level in the toxaemic mothers was significantly high (345.2 ng/ml) and 93.3% of their foetuses showed prominent and well developed interstitial cells. The remaining case showing haemorrhagic stroma in testis had maternal PRL level as high as 410 ng/ml. Conversly in the control group the two cases (20%) showing prominent testicular interstitial cells also had high maternal serum PRL levels, whereas the majority cases in the control group did not show prominence of interstitial cells and the average PRL level in the mothers was low. The luteotrophic action of the PRL in ovary has been demonstrated (McNatty *et al*, 1975) and moreover it is now known that PRL has interstitial cell stimulating hormone (I.C.S.H.) like action on the testicular interstitial cells stimulating the growth of these cells (Yang *et al*, 1974). Hence the development with differentiation of the interstitial cells clumps might be considered a direct effect of high PRL level occurring in toxaemia of pregnancy.

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