The Variety of Abnormal Spermatozoa from Patients with Fertility Problems, an Ultrastructural Study

II. Immature forms

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Abnormal varieties of mature spermatozoa from patients with fertility problems has been previously reported (Sun and White 1978). The present investigation deals with the high percentage of the *immature* forms in the semen samples from these patients and their ultrastructural abnormalities.

Materials and methods

The same techniques were followed as in the previous communication (Sun and White 1978).

Results and conclusions

The most striking finding is that some of the patients have a surprisingly high percentage (30-70%) of immature forms. Within the group of immature forms, there is a variety of abnormalities. Primarily, we noted immature uni-nuclear forms with partial delay of maturation, (Fig. 1), and forms with two or more nuclei within the pericaryon of one spermatid in which several anomalous forms were observed. Polynuclear forms also show different stages of condensation (Figs. 3-5). Other lesions include a honeycomb type of nuclear envelope (Fig. 7), malformation of the acrosomal structure (Fig. 6), internuclear annulate lamellae (Figs. 8, 9), and intranuclear membranes (Fig. 2).

As we have observed in patients with fertility problems, the decreased motility of spermatozoa is most often due to the high number of immature forms although abnormal mature forms are also present (Farris 1950). Among the more commonly seen sperm in the former category are multinucleate spermatids which are probably derived from delayed cytokinesis of the division of the primary and secondary spermatocytes. In this instance, karyokinesis proceeds but cytokinesis does not take place. Also, in the multinucleate forms, it is of interest to note that the differentiation of acrosomes takes place independently in association with each nucleus.

Why immature forms are released prematurely may also be related to the problem of sterility and should be the subject for future investigations. Some authors suggest that the epididymis contributes to the maturation of sperm and

Figs. 1-2. 1, immature form with one condensed nucleus. A, acrosome; G, Golgi apparatus; M, mitochondria; N, nucleus. $\times 10,000$. 2, two condensed nuclei and one with intranuclear membranes ($\rightarrow$), one tail (T) is shown. $\times 20,000$.

Figs. 3-6. 3 and 4, immature forms, nuclei with incomplete condensation. $\times 13,000$. 5, immature form, cell with three nuclei at various stages of condensation. $\times 16,000$. 6, four degenerated nuclei having their acrosomal complex connected to each other. $\times 10,000$.

Figs. 7-8. 7, honeycomb type of nuclear envelope (arrow). A, acrosome. $\times 12,000$. 8, annulate lamellae (AL) are present in the two condensed nuclei. The nuclei share the same acrosome complex. 12,000.

Fig. 9. Internuclear annulate lamellae (AL) and intranuclear membranes (IM) are present in the immature spermatozoa. A, acrosome; G, abundant Golgi complex; M, mitochondria. $\times 15,000$.

thus epididymal functional failure may be of considerable importance in this regard (Bedford *et al.* 1973).

Summary

A variety of abnormalities of immature spermatozoa can be observed. Examples include cells with four condensed nuclei at various stages of maturation,

a honeycomb type of nuclear envelope, abnormal pieces of acrosomes, membranous structures of various origins, and finally, occasional annulate lamellae.

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