Andrological procedures used in the diagnosis of infertility in the married couple

by

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Studies carried out in the last few years on infertility in the married couple, statistically attribute the cause in equal measure to both husband and wife.

Thus a new field of investigation has emerged, andrology, which is a discipline interdependent in character on other disciplines. The andrologist works in close collaboration with endocrinologist, the histologist, the geneticist, the immunologist, the urologist and the bacteriologist.

In such studies the opinion of gynaecologist is essential. After having studied the couple from the biginning he is in a position to select those cases which warrant fertility investigations on the male as well.

In practice a thorough andrological should be undertaken whenever the ginaecologist makes such a request. The investigation should follow this scheme:

Immunological investigations: This type of investigation has been widely used in the past few years and interest in its use is bound to grow ever wider also because of its therapeutic implications. As for the methodology involved, which si rather complicated and uncertain, we refer the reader to the literature available ([1, 2, 3, 4]).

Endocrinological investigations: One of the first aims of andrology was the hormonal study of infertile males. In the andrological field estimates of Gonadotropins, Testosterone, D.H.T., E_2 and the dynamic tests with GnRH, Clomiphene, FSH and LH, are fundamental. After knowing these estimates, it is possible to make a complete study of the endocrine component of male fertility (Fig. 1).

Uroandrological investigations: In all cases of azoospermia and serious oligospermia it is always well to keep in mind the possible agenesia of the vasa deferentia and of the seminal vescicles which occurs more frequently than commonly believed, besides obstructive flogistic phenomena and the Sertoli Cells Only Syndrome ([5]). In our Andrological Unit we practise the exploration of the excretory ducts using D.V.G., bilateral biopsy and possibly other uroandrological investigations.

Of particular interest are some rare malformations of the excretory ducts such as the one we are herewith reporting in which the vasa deferentia terminate in a blind end utriculocele (Fig. 2). Endoscopic resection released live spermatozoa.

Electron microscopy: The power of resolution of the light microscope is very limited and does not exceed 0.5 μ. This does not solve many queries in the study of the ejaculate. We centred our study on the morphology of spermatozoa obtained from some cases of serious dyspermia or just from simple cases of oligokinesis

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employing, at the same time and whenever necessary, D.V.G. and testicular biopsy, examining everything at the scanning and transmission electron microscopes whose power of resolution is 250 Å and 2-3 Å respectively. Malformations may be found in all components of the spermatozoon: the nucleus, the neck region, the acrosome, the axonema, the intermediary tract with different manifestations in different spermatozoa of the same individual or even in the same spermatozoon [6, 7, 8, 9].

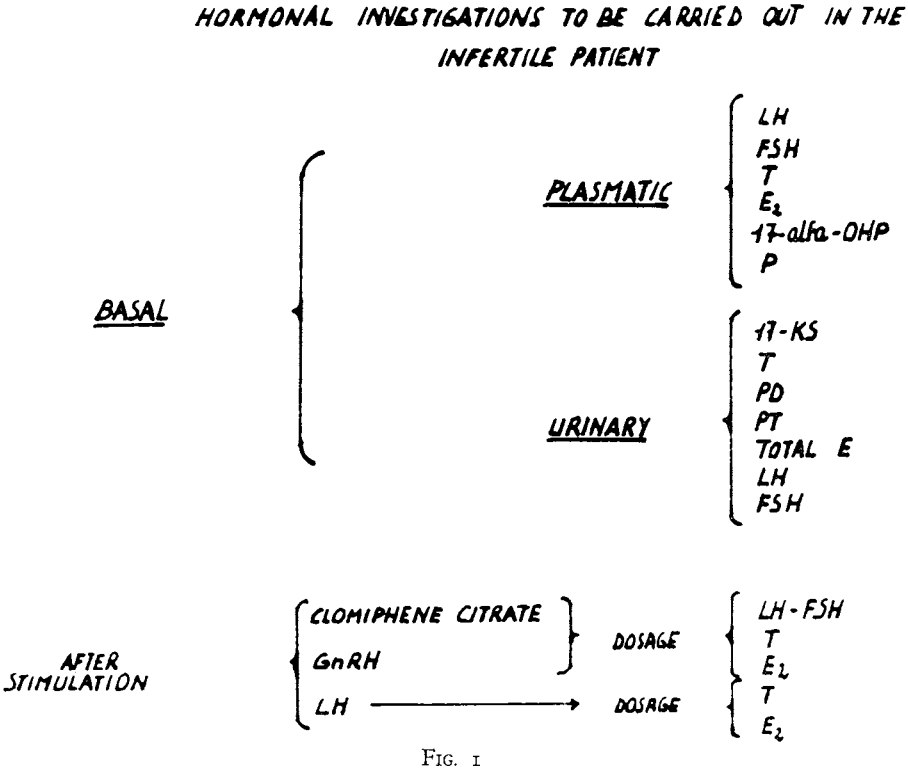


FIG. 1

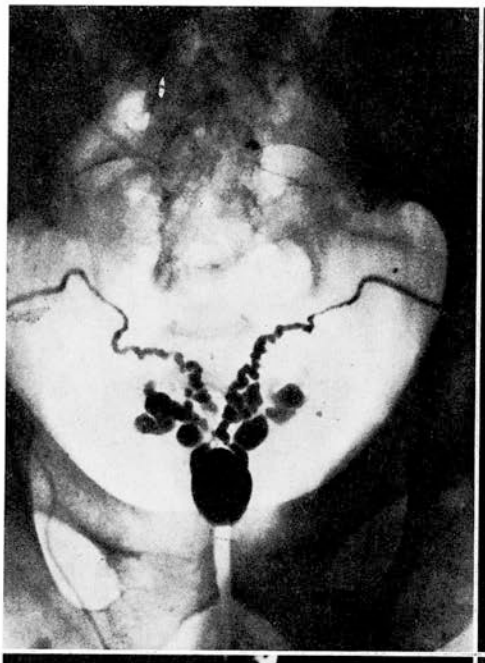
Figs 3 and 4 show a normal spermatozoon. In fig. 4 the acrosome is particularly clear.

The aberrant forms most commonly found by us are the following:

Spermatozoa with coiled tail: The tail of these spermatozoa is spiral, often visible with the light microscope. Such spermatozoa are immotile and the overall incidence, in our samples of infertile subjects, was found to be about 15% (Fig. 5).

Spermatozoa with a small ovoid head: The head of this type of spermatozoa is abnormally small and the acrosomal cap is missing. Often even the tail, in which supplementary filaments are present, is abnormal: spiral shaped and exceedinggly thin. These sperms are also immotile. The percentage of this particular type of sperms in our samples was about 12% (Fig. 6).

Spermatozoa with a folded neck region: In this type of spermatozoa the flagellum is sharply folded just behind the head. These sperms, easily identified



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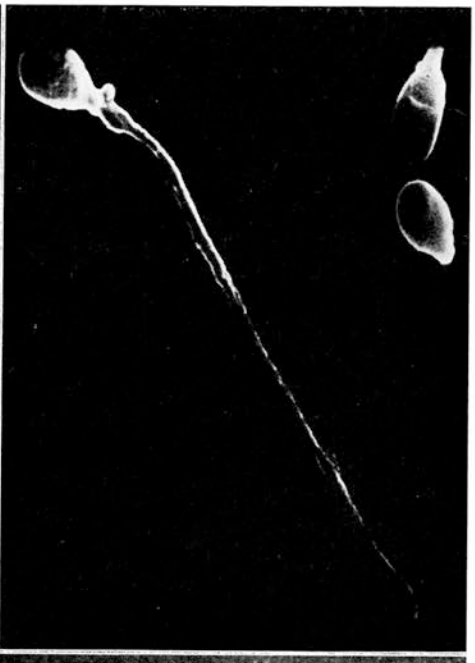

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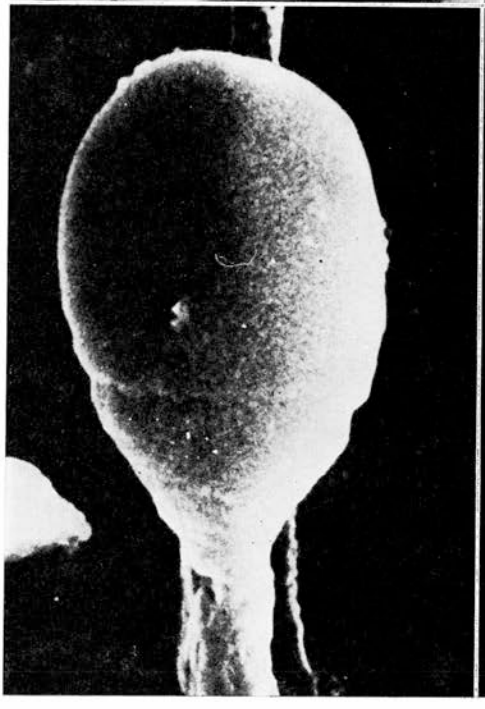

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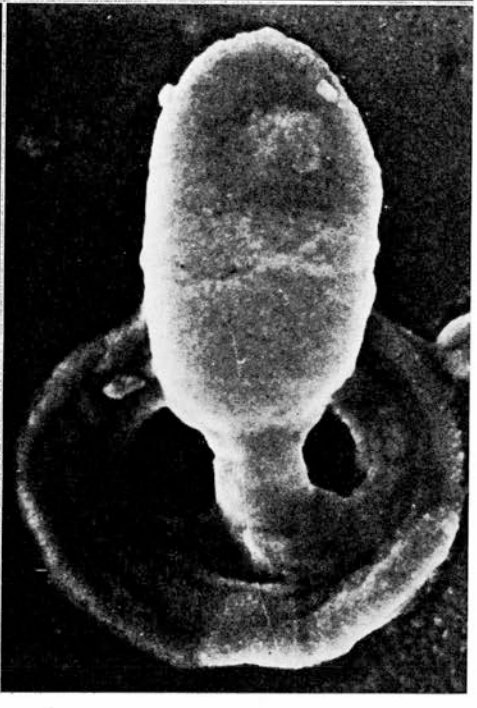

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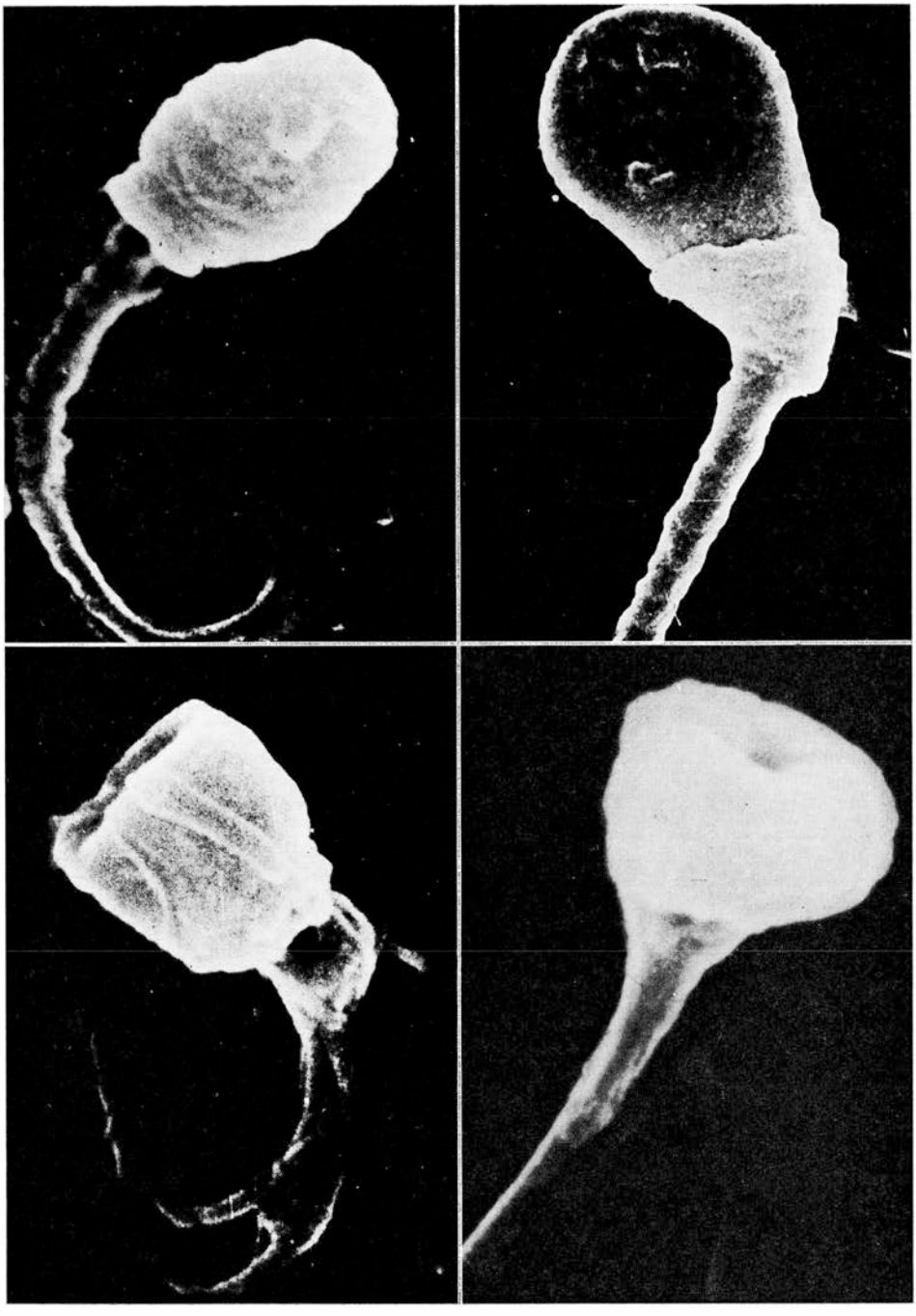

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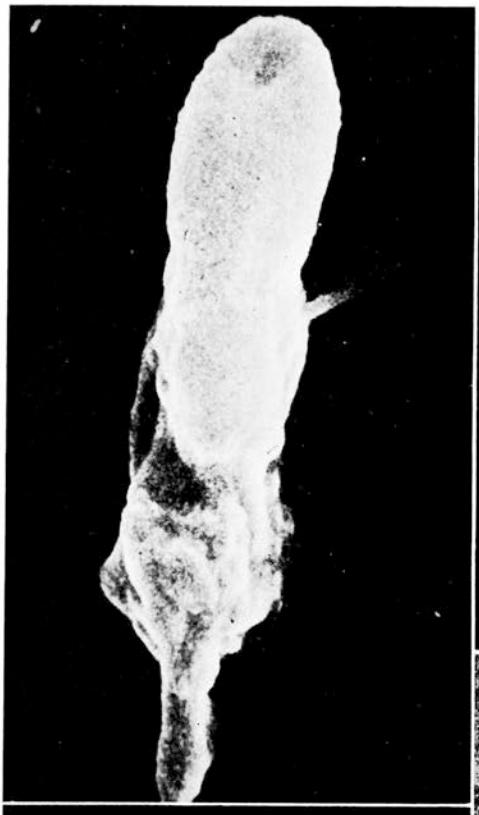

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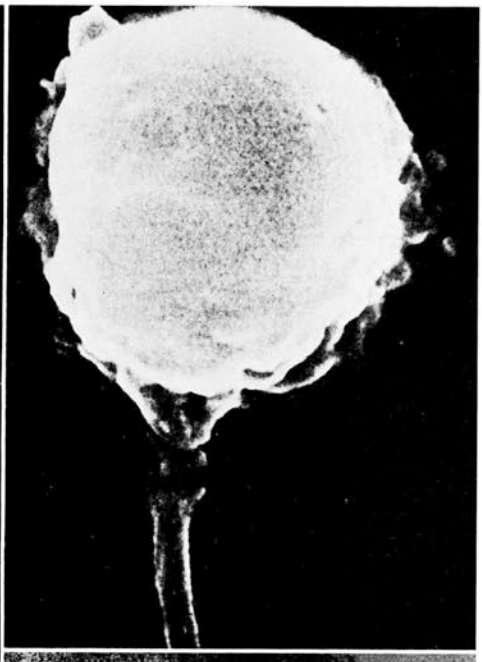

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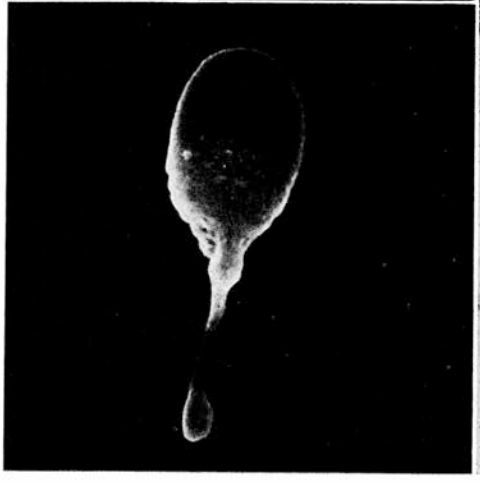

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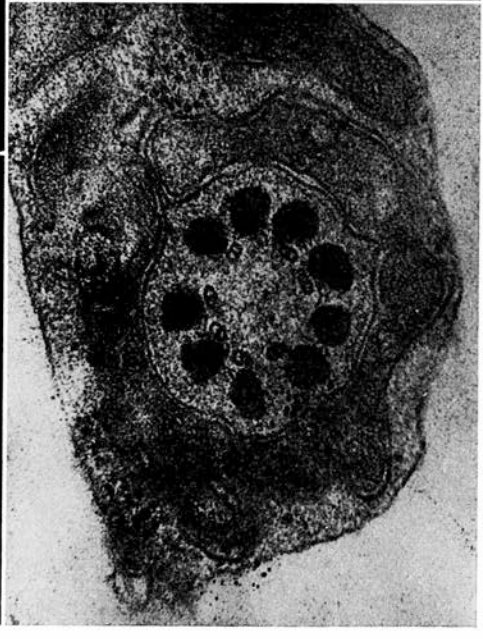

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with the light microscope, are not all motile. Those which are motile axhibit a characteristic movement. The percentage of sperms with this tape of malformation was about 5% (Fig. 7).

Spermatozoa with a corolla-shaped head: These are characterized by a more or less marked depression in the apical part of the head. This type of malformation, which we studied with the transmission electron microscope, involves directly the acrosome. Alterations often involve the middle piece which appears shorther than usual and stumpy. The percentage of this malformation was about 2% (Fig. 8-9).

Spermatozoa with cytoplasm in the neck region: They are normal as far as motility is concerned. It seems that this malformation is caused by an incomplete maturation of the sperm. The percentage was about 8% (Fig. 10).

Spermatozoa with globe-shaped head: Their head is larger than normal, roundish and bumpy. The acrosome is not visible. They are not easily recognized with the light microscope and their motility is irregular. With the transmission electron microscope we foud these sperms to be immature and, as consequence of this, their fertilizing ability is scarse. The percentage of this type of sperms was about 4% (Fig. 11).

Spermatozoa with a short tail: These were the last to be identified and are characterized by a short tail. Their percentage is not yet known and their presence seems to be very important in determining infertility (Fig. 12).

MALFORMATIONS OF SPERMATOZOA STUDIED WITH THE TRANSMISSION ELECTRON MICROSCOPE

These malformations are localized in the nucleus or in the axial filaments. There main types have been identified:

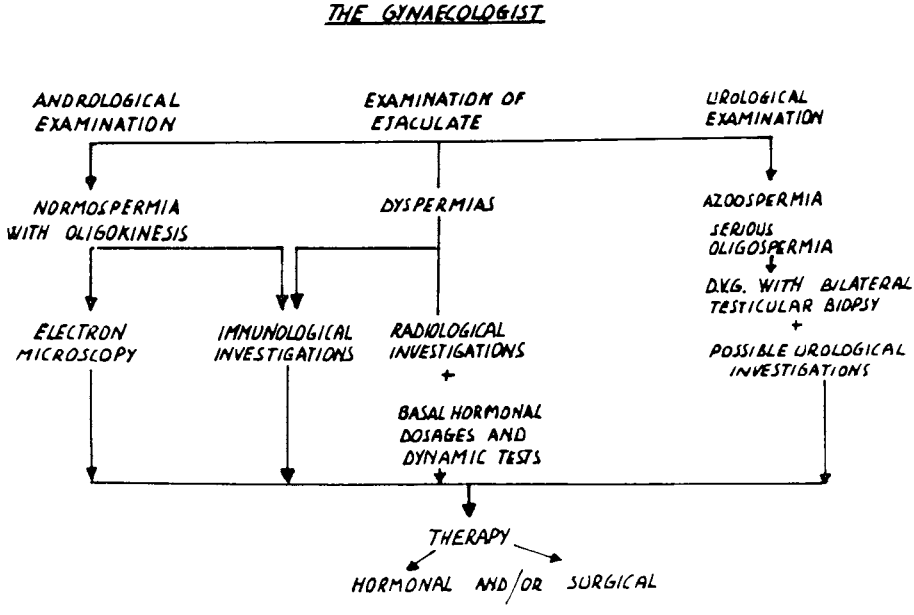

FIG. 14

Malformations of the acrosome: The acrosome normally occupies two thirds of the anterior part of the head; it is externally bounded by a plasma membrane. The most outstanding demages suffered by this organelle in this type of malformation are a cospicuous increase in thickness accompanied by the loss of regularity in its membranes. Many vacuoles appear in its interior.

Malformations of the nucleus: Normally the nucleus exhibits one or more vacuoles full of lightly electron-dense granular material without a limiting membrane. In these malformations we found one or two vacuoles which opened up into the subacrosomal space.

Another malformation characteristic of the nucleus is an incomplete condensation of the chromatin which is responsible for the formation of electron-dense granules having different diameters separated from one another by less electron-dense spaces.

Malformation of the axial filament: Essentially two type of malformations may found in this organelle: lack of the central pair of microtubules and lack of four or five pairs of peripheral microtubules (Fig. 13).

In conclusion andrological diagnosis could be so summarized in order to find the a possible therapeutic application (Fig. 14).

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SUMMARY

The authors illustrate the modality of andrological investigations in an infertal couple, remembering particurarly the investigations uroandrological, endocrinological, an with electron microscope.

BIBLIOGRAPHY

1. Mancini R.E.: *Mon. Ost. Ginec. Endocr. Met. XLII, III,* 141 1971. - 2. Mancini R.E.: *Immunologic and testicular response to a damnage induced in the contralateral gland. Male fertility and sterility.* Pag. 273-300. Edited by R.E. Mancini and L. Martini, Academic Press 1974. - 3. Isidori A. and Dondero F.: *Ann. Endoc.* 1973. - 4. Isidori A. and Dondero F.: *Minerva Ospedaliera, III,* 2935, 1973. - 5. Giannotti P., Menchini Fabris G.F.: *Some thoughts on the use of deferentovesiculography. Male fertility and sterility,* pagg. 539-544, edited by R.E. Mancini and L. Martini, Academic Press, 1974. - 6. Fawcett D.W.: *Int. Rev. Cytol. 7,* 195-234, 1958. - 7. Anberg A.: *Acta Obstet. Gynaec. Scand. 36,* Supp. 2, 1971. - 8. Stefanini et al.: *Nature, 216,* 173-174. - 9. Pedersen H., Rebbe H.: *J. Reprod. Fert. 37,* 51-54, 1974.