

Section of Urology

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DISCUSSION ON MALE INFERTILITY

Dr. G. I. M. Swyer: Since the husband is considered to be wholly or partly to blame for more than 50% of infertile marriages, it is clear that in the past the wife has received more than her fair share of attention at the expense of the husband. With increasing attention being paid to the male factor, knowledge of male gonadal function is slowly growing. Nevertheless it is still fair to say that we have little idea of the cause of, or the remedy for, defective spermatogenesis in most cases.

There are one or two practical aspects of the aetiological problem which should be better known. For example, a testicle which is not inside the scrotum at the time when spermatogenesis ought to begin will never produce spermatozoa, even if it be brought into the scrotum later. So that boys with undescended testicles should not be allowed to go on to puberty in the hope that spontaneous descent may occur; if it does not, the inevitable result is sterility. And again: it is very easy to leave the testicular blood supply impaired after operations for the cure of inguinal hernia, and surgeons in general should be more aware of the sterility that not uncommonly results from the slow degenerative changes in the testis following such vascular obstruction.

Diagnosis and prognosis can be considered together since they are concerned with the decision as to whether a man is fertile, or, if not, just how much of a chance he stands of producing a pregnancy at all. The history and the findings on physical examination are usually not illuminating, but since they sometimes give the key to the individual problem, they should seldom be omitted. The key test, of course, is the seminal analysis.

SEMINAL ANALYSIS

The exact length of the period of continence which should precede the production of seminal fluid for analysis is probably not very critical. Farris (1950) adduces evidence that a five-day period of continence has advantages over a shorter period but my own observations do not altogether support this view. He believes that some men require five days to reach their optimal sperm densities, though others may reach them in three days. On the other hand, since an average coital frequency is of the order of twice a week, it can be argued that the seminal fluid, as tested after a three-day period of continence, will give the better picture of conditions in actual practice. An indefinitely prolonged period of continence is merely misleading, since, though it may increase the sperm density, it will also greatly increase the abnormal morphology and proportion of immotile or feebly motile spermatozoa.

Doubts of no kind may be permitted regarding the best way of producing the seminal specimen. It is still not universally appreciated that condom specimens contain no moving spermatozoa; and patients have had costly courses of injections because their spermatozoa, produced in a condom, showed no activity. Coitus interruptus will seldom permit collection of the entire specimen; and since the ejaculated semen is far from homogeneous, the sources of error introduced by this technique have often led to the wildest mistakes. Scooping the semen from the vagina after intercourse—even this has been advocated—is still more unreliable. Distasteful as it may be to some doctors to recommend it and to some men to perform it, the conclusion is inescapable that masturbation is the only worthwhile technique for collecting seminal fluid for analysis.

The clean, dry glass jar as a receptacle is appreciated by all of us; but how many are aware, as are the cattle artificial insemination workers, of the profound susceptibility of spermatozoa to temperature shock? Strictly, the glass jar should be at about 30° C. before the semen touches it, and it should be cooled slowly to room temperature. In cold weather it is wise to instruct the patient to warm the jar, perhaps by keeping it in an inside pocket for ten minutes, before collecting the seminal fluid.

The volume of semen matters only when it is either small—for then little if any interface may exist between ejaculate and cervical mucus—or unduly large, for then a normal total number of spermatozoa may be so diluted down that few have an opportunity of reaching the cervical canal.

The sperm density is usually looked upon as the most important single criterion in determining the adequacy or otherwise of semen. The tendency nowadays, based on increasingly reliable data, is to consider the lower limit of density to be a good deal less than was formerly thought. MacLeod (1951), for example, whose comparisons of the findings in 1,000 fertile men and in 1,000 husbands of infertile marriages are outstanding, considers 20 millions per ml. to be the dividing line. Above this figure excellence of activity and smallness of the proportion of abnormal forms are more important in the determination of likelihood to fertilize, while below this figure these other criteria were of little consequence. My own small series suggests a comparable influence of density upon likelihood to fertilize.

The sperm densities of seminal samples from 90 men whose wives conceived have been arranged in the following groups: less than 20 millions per ml.; 20–50 millions per ml.; 50–100 millions per ml.; and more than 100 millions per ml. These 90 men came from a group of 456 men attending the Fertility Clinic and providing seminal specimens for analysis, the results of which have been arranged in similar groups. If the likelihood to fertilize were independent of sperm density, it would be expected that the proportion of men producing pregnancies in each group would be about the same; while if greater density meant greater likelihood to fertilize, then the proportion of men producing pregnancies would increase as the sperm density increased. As can be seen (Figs. 1, 2) the latter holds

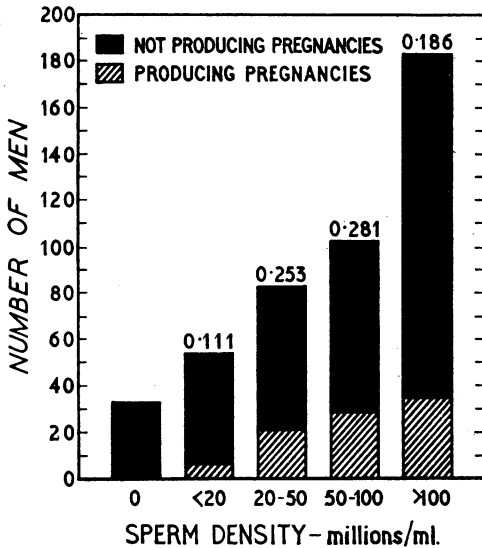


FIG. 1.—The distribution of sperm densities in seminal specimens provided by 456 men attending a fertility clinic, and of the densities of specimens provided by 90 of these men whose wives conceived.

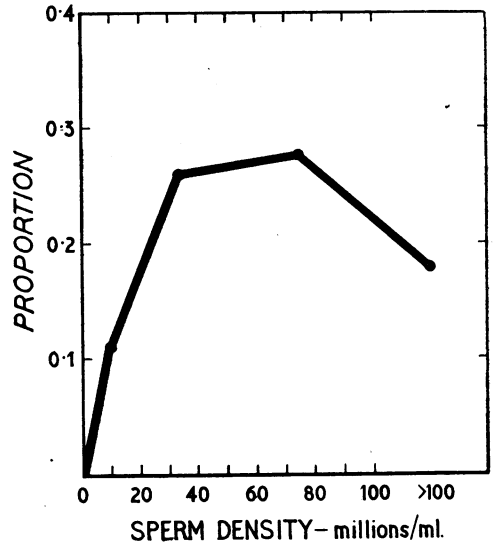


FIG. 2.—The proportions of seminal specimens from men producing pregnancies to the total number of specimens in each sperm density group, plotted in relation to sperm density.

true up to a point only, since the proportion of men producing pregnancies in the group with highest sperm density is lower than in the two preceding groups. These findings suggest that the acceptable lower limit for sperm density, other features of the semen being satisfactory, lies between 20 and 50 millions per ml. and I am inclined to place it at about the 30 million mark.

Since only moving spermatozoa can have a chance of fertilizing the ovum, Farris (1950) has proposed that the total number of moving spermatozoa is the best guide to the fertilizing potentialities of seminal fluid. He uses three grades: (1) Fully fertile, with more than 180 million total moving spermatozoa; (2) relatively fertile, with 80–180 million and (3) subfertile, with less than 80 million total moving spermatozoa in the ejaculate. This is an attempt to put the matter on a more precise basis than that usually followed, so it is only fair to point out that there may be inherent fallacies. To determine the total number of moving spermatozoa, the semen is diluted with a suitable diluent and a count of the moving spermatozoa is made in a hæmocytometer chamber. In general, the number of moving spermatozoa in the diluted fluid will be less than that in the original semen, and if no regard is paid to temperature changes, it may be very much less. The susceptibility of the spermatozoa to the deleterious action of the diluent will, of course, vary from semen to semen, so that an unpredictable variation is introduced by this technique, the precision of which is thus more apparent than real.

There seems little doubt that none of the commonly used methods for estimating the activity of the spermatozoa is satisfactory. Counts of the proportion of moving spermatozoa have little value unless a further estimate is made of the speed of travel of the spermatozoa, as well as of the proportion showing translational, as opposed to merely vibrational, activity. I have myself used a semi-subjective method, originally devised by Emmens (1947) and shown by him to have statistical validity, in which a score from 0–4 is given according to the vigour of spermatozoal activity, the approximate proportion of moving sperms, and the approximate proportion of those showing translational to those showing vibrational motion. Though far from perfect, this seems to be fairly satisfactory in practice. No doubt the future will see the development of a purely physical method for estimating sperm activity. This has been achieved (impedance change frequency) for cattle but is not yet applicable to humans.

Abnormal spermatozoal morphology has received considerable—and probably unwarranted—attention in the past. I shall merely comment on a fairly widely held view that increased proportions of abnormal forms carry an increased risk of abortion, should conception occur.

I know of no evidence to support this view, while MacLeod's (1951) data are against it, and so are those of Bender (1952). I have collected some figures from my own records and can compare the seminal findings in 58 specimens provided by 28 men whose wives conceived but aborted with those in 100 specimens provided by 63 other men whose wives conceived and went to term (Table I). It

TABLE I.—MEAN VALUES AND STANDARD DEVIATIONS FOR VOLUME, DENSITY, ACTIVITY AND MORPHOLOGY IN THREE GROUPS OF FERTILE MEN, SHOWING NEGATIVE CORRELATION WITH ABORTION

Group	Volume (ml.)	Density (millions/ml.)	5-hour motility*	Abnormal forms (%)
63 men whose wives conceived and went to term	3.59 ± 1.90 (100)	92.82 ± 94.02 (100)	52.0 ± 31.25 (94)	33.74 ± 11.89 (99)
28 men whose wives conceived but aborted	3.46 ± 1.64 (58)	70.3 ± 74.1 (57)	52.34 ± 32.65 (55)	32.46 ± 16.07 (52)
22 men whose wives had had 3 or more consecutive abortions	3.69 ± 1.79 (22)	131.0 ± 76.20 (22)	73.20 ± 24.97 (22)	25.9 ± 9.29 (22)

*This is the interpolated motility score at 5 hours, expressed as a percentage of the maximum.

is perfectly obvious that there is nothing whatever to choose between the two groups. A further, and still more selected, group consisted of 22 men whose wives had had 3 or more abortions. If there were anything in the hypothesis, the seminal analyses from these men should show a clear excess of abnormal forms. On the contrary, the mean figures for this group are the best of all; and since the variances are less than for the other groups, it implies that these men formed a more homogeneous group in respect of seminal excellence than did those of the others.

I must emphasize, even though only in passing, the great variability from specimen to specimen commonly encountered in seminal analysis. The important conclusion to be drawn is that a single poor result may mean nothing; it merely indicates the need for at least two further specimens to confirm or refute the original findings. It is always wise, before reaching a final conclusion, to do a post-coital test, since this may prove entirely adequate even though repeated seminal specimens fail to measure up to the desired standards. Particularly is this discrepancy likely to occur when spermatozoal motility is the faulty factor in the seminal analysis.

OTHER SPECIAL TESTS

Other studies of the male which have a place in the investigation of infertility are: testicular biopsy; basal metabolic rate determination; estimation of F.S.H. (follicle stimulating hormone) excretion; and estimation of 17-ketosteroid excretion. Testicular biopsy will be dealt with by Mr. Tulloch. The second is not much used in this country, though it is commonly employed in the United States where there is a widespread belief that if the B.M.R. is below normal, spermatogenesis may be defective; and it is further thought that subclinical hypometabolism may occur, detectable only by measuring the B.M.R. Very little evidence for either of these views has been adduced.

Estimation of F.S.H. excretion is of great value in cases of hypogonadism, for it shows whether the fault lies primarily in the testes (in which case the F.S.H. output will be high, the pituitary being over-active) or in the anterior lobe of the pituitary gland (when the F.S.H. output is low or zero). When hypogonadism is of testicular origin, it is perfectly clear that no form of treatment can induce spermatogenesis, since there is already an excess of the normal stimulating hormone. In particular, the hope of producing any effects from further stimulation with gonadotrophic hormones is obviously forlorn.

Estimation of 17-ketosteroids gives a rough measure of the secretion of male hormone by the interstitial cells of the testis. It will be remembered that a proportion of the 17-ketosteroids arises from the adrenal cortex in both men and women; therefore, if no androgens are being produced by the testis, the 17-ketosteroid output will be similar to that of women, and since this, even on the average, is not very different from that of men, the interpretation of this investigation may be difficult. More information can be obtained from a clinical appraisal of the man—the extent and distribution of facial and bodily hair; the pitch of the voice; the extent of his muscular development and bodily proportions; and the size of his penis and scrotum—than from the estimation of his 17-ketosteroid output.

It will thus be appreciated that the value of these special investigations of the male is strictly limited.

TREATMENT

I know of no therapy which can be expected to give good results in cases of oligospermia. When azoospermia is due to obstruction in the epididymis, be it the result of gonococcal epididymo-orchitis, microcyst of the epididymis or other obscure lesion, vaso-epididymostomy offers at least a theoretical

chance of success. I think the prevalent view in this country, propagated mainly by surgeons who have had little experience of the technique, is unduly pessimistic. Bayle (1952) of Paris, who has probably done more of these operations than anyone else, has obtained something like 66% of success in patients who, on exploration, proved amenable to such surgery. He feels that since the operation can do no harm and may do much good, there is a great deal to be said in favour of it. To succeed, however, apart from the requirements of active spermatogenesis, free passage of spermatozoa into the head of the epididymis and patency of the vas deferens and ejaculatory ducts, the operation must be performed with great delicacy, as in an eye operation, and tuberculosis must not be the aetiological factor.

The other cause of azoospermia which may be amenable to treatment is secondary hypogonadism, where the testes are themselves normal but have never received adequate gonadotrophic stimulation. In such eunuchoids prolonged testosterone therapy by implantation, in addition to bringing about the expected general somatic changes, may eventually lead to normal testicular spermatogenetic function and full fertility (Swyer, 1951). Similar results have also been reported by Hurxthal *et al.* (1949).

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Mr. W. Selby Tulloch: *Testicular biopsy: Indications and technique.*—I propose to discuss briefly the indications for a biopsy from the testis and the simple technique of this procedure.

Direct evidence of the state of spermatogenesis may be obtained from the biopsy tissue, and pathological disturbance of the seminiferous tubules may be easily recognized. Biopsy is a valuable diagnostic procedure in investigating the subfertile male. The indications for its use are:

- (a) In azoospermia, to distinguish between obstructive and non-obstructive lesions.
- (b) In low seminal counts, to differentiate between arrested spermatogenesis and post-inflammatory states.
- (c) In any specific cases, to assist with the prognosis and to determine the severity of the process and the capacity of the tubules to regenerate.
- (d) In assessing the effects of various therapeutic agents, by direct examination to determine the efficacy of specific therapy.

The common causes of testicular changes are divided into two main groups: congenital and acquired.

Congenital causes.—Testicular hypoplasia, cryptorchidism, congenital abnormalities, such as the absence of the vas deferens or failure of complete formation of the lumen from the testes to the ejaculatory ducts, and endocrine disturbances causing failure of maturation of the germinal epithelium.

Acquired causes.—These include inflammatory states, such as gonorrhoeal infection, non-specific urethritis (both these conditions may gradually disappear as a cause, because of the remarkable effects of chemotherapy and antibiotics); tuberculous epididymitis is a common cause, and, rarely nowadays, syphilis; traumatic injury of the testes, mumps orchitis, and irradiation with deep X-ray therapy. With the more extensive use of irradiation, particularly in ankylosing spondylitis, which occurs commonly in the young adult male, although attempts may be made to protect the testes, there is often gross destruction of the germinal epithelium. Even if conception does take place there may be an effect on foetal development. In the treatment of malignant tumours of the testicle, an attempt should also be made to protect the remaining testicle. Another cause of acquired change in the testicle is the therapeutic use of oestrogens in the male.

As long ago as 1913 Huhner described his procedure of testicular puncture. The investigation was carried out in all his cases of azoospermia in an endeavour to differentiate between obstructive and non-obstructive lesions, i.e. if spermatozoa were found then the lesion was presumed obstructive. However, it is obvious that this procedure has its limitations, because a positive finding would be significant, whereas a negative finding would mean nothing. The technique adopted by Huhner was, without anaesthesia, to use a large bore needle which was plunged through the entire length of the epididymis and testicle, and, on withdrawal, suction was applied throughout. The material withdrawn was immediately examined for spermatozoa. Although I have no personal experience with this method of investigation, it seems to be a rather unpleasant procedure.

For careful direct microscopic study of the seminiferous tubules it is necessary to adopt the procedure of testicular biopsy, which was first carried out by Hotchkiss in the U.S.A. This consists of the excision of a small portion of the testicle, so small that its removal has no effect on the gland, but large enough to include a representative group of the tubules. It has been suggested that this method may not produce a representative portion of the testis. However, some observers who have cut serial sections through the whole testis have shown that the general pattern is consistent.

Technique.—This operation is extremely simple and it is done in the Out-Patient Department under local anaesthesia. Each operator will quickly develop his own method, but I shall describe mine. After the area has been carefully cleansed, the spermatic cord is held between thumb and forefinger. About 5 c.c. of local anaesthetic (10% procaine) are injected, and if the injection is in the correct tissue plane the cord is felt to distend. This concentration of local anaesthetic acts almost immediately, and by simple squeezing of the testicle it can be determined whether or not testicular sensation is lost. This is a very definite and certain test for the success of anaesthesia. The scrotal skin over the convex surface of the testis is then stretched and about 1 c.c. of local anaesthetic is injected. An incision is made through the layers of the scrotum. The tunica albuginea is incised 1 cm. or less, and by pressure on the testicle a small portion of seminiferous tubules prolapse. A piece approximately 5 mm. in diameter is removed. The tunica albuginea is approximated with a fine catgut suture. The skin is closed with silk. Immediate fixation is necessary, preferably with a fixative such as Bouin's fluid containing 1% urea, which coagulates the tissue. It is unusual for patients undergoing this procedure to lose any time from work. There are virtually no complications from this operation.

[Lantern slides were shown of representative sections of the various forms of pathology revealed by testicular biopsy.]

Conclusions.—By the use of biopsies it can be decided whether or not the case may respond to treatment. Obviously if the biopsy shows complete destruction of the germinal cell layer, treatment is of no avail. In such cases the position can be made quite clear to the patient, a state of indecision and futile hope avoided, and advice given regarding adoption. In cases showing underdevelopment or partial destruction of the essential cells, repeated biopsies may well determine the efficacy of any treatment instituted. It is possible that in future a biopsy may be considered of more value than the detailed sperm count, especially in that wide group of cases where the cell count is depressed below the normal level.

Mr. Reynold H. Boyd: There is rightly much pessimism and scepticism regarding the medicinal or hormonal treatment of oligozoospermia. Nothing can improve a *Fixed Low Count* due to partial testicular atrophy, which, if necessary, can be proven by biopsy. Such a fixed low count must be accepted and the best use made of it by

- (1) Concentrating intercourse around the time of ovulation.
- (2) Artificial insemination using the whole ejaculate by the plastic cap and crooked cannula technique (Fig. 1).
- (3) Artificial insemination after centrifuging and adding hyalased-fructose solution.

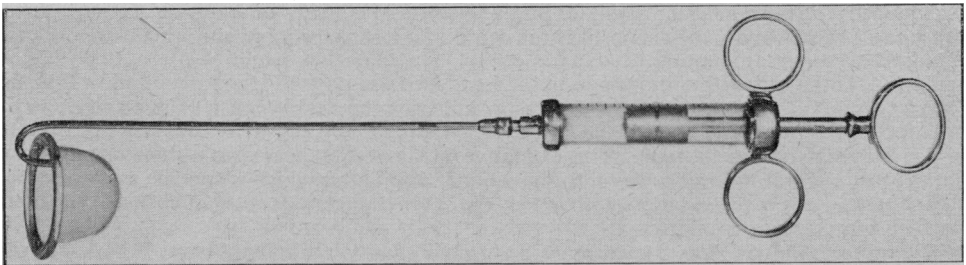


FIG. 1.—Plastic cap and crooked introducing cannula for A.I. in cases of gross oligozoospermia. The cap is inserted and pressed on the cervix, where it is held by bullet forceps while the whole ejaculate of semen is introduced through the crooked cannula.

I do not, however, believe that the *Fluctuating Low Count* is hopeless just because our present gonadotrophins prove capricious or unsatisfactory. The fact that these counts are variable—and I am speaking in terms of fives or tens of millions—shows that spermatogenesis is being depressed or stimulated by some cause. Hope in this field lies in

- (a) Active pituitary extracts.
- (b) Irradiation of the pituitary.

The dosage I am at present using is:

Two treatments of 80 r of pituitary irradiation, one week apart, first by exposure on the left side and then by exposure on the right side, totalling 160 air r, corresponding to a tissue dose of about 80 r in the pituitary area. The other factors are 200 kVp; 15 mA; H.V.L. 1.1 mm. Cu; 1.0 mm. Al + 0.5 mm. Cu added filter; 50 cm. S.T.D. and a 7 cm. diameter portal.

Pre-requisite: There must be spermatogenic tissue to stimulate.

There is considerable overlap in the commonest causes of oligozoospermia and azoospermia. Analysis of 500 of my own cases has shown these causes to be:

(1) *Bilateral Gonococcal Epididymitis* which is, year by year, becoming rarer. In the last 200 cases of gonococcal urethritis at three Essex V.D. Clinics there was not one case, although there were two

with unilateral epididymitis. In my experience this is the most satisfactory condition for vaso-epididymostomy, which may be successfully performed five, ten, or fifteen years later. In some cases, when there has been extensive epididymo-orchitis, the upper pole of the epididymis and the rete testis are, however, affected beyond anastomotic help;

and *Bilateral Recurrent Non-specific Epididymitis*. This was 1% in my series. It is much less hopeful and operation here reveals hard, grating fibrosis and no bulging or sperm-containing tubules. The use of antibiotics or sulphonamides in genito-urinary infection has also greatly lessened the incidence of this form of epididymitis, and I believe that in the future early combined use of cortisone or ACTH and antibiotics may break down recently formed granulation tissue and prevent subsequent sterility.

The whole success of vaso-epididymostomy depends not only on meticulous technique but also on careful selection by:

- (a) Providing normal spermatogenesis by biopsy. The rete testis area and head of epididymis can be palpated at the same time by inserting the little finger.
- (b) Excluding absence of the vas.
- (c) Excluding tuberculous infection of vas or epididymis.
- (2) Among the more unusual causes in my series were:
 - (i) *Idiopathic Absence of Ejaculation and Absence of Ejaculation* due to lumbo-dorsal sympathectomy for malignant hypertension.
 - (ii) Complications following *Operations for Slipped Lumbar Disk*—actually partial paraplegia due to damage of nerve roots.
 - (iii) *Retrograde ejaculation of neurogenic origin*.

All these are suitable cases for A.I. (though in hypertension it may not be desirable). The expressed semen in retrograde ejaculation must be collected by means of a Guyon catheter prior to insemination by intra-uterine or intra-cervical method.

Leaving the rarer causes we come to four main groups.

(3) *Testicular under-development and atrophy* of uncertain origin account for 35% of my cases of azoospermia.

(4) *Bilateral cryptorchism* which accounts for a further 15% of azoospermia. There is urgent need for an analysis of operation results and too few cases are followed up. My own feeling is that there is still room for improvement in operation results and indeed of the whole management of undescended testes.

(5) *Varicocele* is, I think, a frequent cause of moderate oligozoospermia and, at times, of grossly low counts. Here there is room for improvement in our approach and treatment—operation in my own hands not always proving beneficial.

▶ (6) And lastly *Mumps orchitis*. Seguy in his analysis of 2,000 cases of azoospermia gave this to be the cause in 11% and in my own series it is the cause of a like percentage and also of many cases of gross oligozoospermia amounting to actual sterility. On the other hand, Werner (1950) has stated that only 1.7% of adults with mumps get orchitis and of those only 15% are impaired. Clinic figures here seem to refute this statement. Surely this is another preventable cause of infertility.

The infection is brought to the testicle by the blood stream and results in two types of orchitis.

(a) The classical fulminant type: The exudative inflammation seems to soften and destroy the membrana propria and to force a way into the seminal ducts after which it spreads ever more widely, destroying within a few days the greater part of the spermatogenic tissue though here and there are islets which may remain unaffected.

(b) The quiescent type: This is even more destructive than the fulminant type.

Atrophy ensues at times within the space of three to four weeks but usually within two months. Local changes assessed by palpation are by no means always accurate and can be gravely over-optimistic. Mild unilateral cases recover fertility but bilateral are of grave significance. Prevention of this complication has been tried by giving convalescent serum but large doses are necessary and the method is usually not practical. Latterly the employment of *stilbæstrol* to reduce spermatogenic activity *plus antibiotics* has offered hope as a preventive measure and it would seem that cortisone or ACTH should also be used at the earliest moment in the actual treatment.

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Mr. William S. Mack said that he had recently reviewed a series of cases of infertility over a period of eight years. He proposed to deal with one aspect, namely, infertility associated with undescended testicles. The total number of patients investigated for male infertility during the eight-year period was 2,433, of whom 1,096 showed some degree of subfertility. There were 108 patients with undescended testicles. 11 with unilateral descent lay in the normal range of fertility and 97 were sub-fertile. He had divided them as follows:

			Seminal fluid				
			Normal	Impaired	Grossly impaired	Sperm absent	
Unilateral, no operation	37	7	8	12	10
Unilateral, with operation	23	4	11	4	4
Bilateral, no operation	21	0	0	5	16
Bilateral, with operation	27	0	2	3	22
				11	21	24	52

These patients had been treated by a number of different surgeons and physicians and it was obvious that there was very little agreement about the correct line of treatment since many patients had been left without treatment and others had been operated on at various ages, the operation consisting either of removal of the testicle, or attempts to bring it down. As expected, where no operation had been carried out in bilateral undescended testicles, most patients showed a total absence of sperms, though in a very few cases a few sperms were present. Operation in bilateral cases improved the prospects a little but not greatly. The unilateral descents, with or without operation, were most interesting. Even when the descended testicle felt normal many of the patients showed either complete sterility or gross impairment and biopsy of some of these apparently healthy testicles did show that their development was incomplete. At first sight the prognosis as regards fertility in undescended testicles looked gloomy in the extreme if one was to judge by these results alone.

However, on reviewing a series of cases referred to him for operation, because of maldescent of the testicles, he had been struck by the fact that the majority of these patients were not suffering from failure of descent at all but from ectopia into the superficial inguinal pouch. These ectopic testicles were almost invariably well developed anatomically. In striking contrast the true undescended testicles showed a high proportion of abnormalities, varying from failure of union of the body and the epididymis to actual absence of the body though the vas was present. He would suggest therefore that good results might be obtained, as regards fertility, by bringing the ectopic testicles down before puberty, whereas the true undescended testicle, because of some central failure, is often imperfect and its descended fellow might also be immature. Good results were therefore unlikely to be obtained by any form of treatment.

Dr. V. C. Medvei asked about the success rate of infertility clinics and how this was judged; secondly, how common was the deleterious effect from overheating of spermatozoa. A few years ago he had a patient who was a foreman in a factory testing the efficiency of refrigerators and spent eight or ten hours a day in an overheated atmosphere and a very low oligospermia developed. Three months after he had changed his work for a different environment his wife conceived.

Dr. Swyer, in reply to Dr. Medvei, said that the value of the fertility clinic was not wholly to be measured by its success in terms of pregnancy. The increasing number of these clinics reflected an increasing demand for the services they gave, one of which was simply to answer the question whether or no childbearing was likely.

The precise incidence of pregnancy amongst patients attending fertility clinics—as he preferred to call them, rather than infertility clinics—depended very much, of course, upon the extent to which the cases were followed up. It had been said that if all cases were followed up until the wife reached the menopause it was very likely that—in Liverpool, at all events, where these computations had been made by Dr. S. Bender—there would be 50% of pregnancies. He himself would not claim so high a figure, but he thought it was true that approximately one-third of the patients attending a fertility clinic had a fair chance of producing live children. It might be that some would say the figure should be nearer 40%. Of the remaining two-thirds it was very likely that half had no hope of childbearing at all. Thus it looked as if two-thirds of those attending the clinic were likely to be assisted either in furthering a pregnancy or in receiving a definite answer that pregnancy was highly improbable.

Although there was no doubt that the scrotum served as a thermostatic regulating device, it was well known that people who worked in hot atmospheres such as those of a bake-house, were liable to be infertile. Many practitioners would also have encountered men who wore suspensory belts for no very good reason and were sterile. It was a pernicious habit which should be discouraged.

Dr. H. A. Davidson said that it had been known for a long time that the scrotum was a thermo-regulator, and in veterinary research in the 'twenties and 'thirties much work had been done along these lines. He quoted the classical work published by Phillips and Mackenzie who produced sub-fertility in rams by heat-insulating the scrotum.

In the human field insufficient attention had been paid to this matter although it had been shown that the human testis was normally maintained at about 2° C. below body temperature. When testicular temperature approached too close to body temperature the scrotal skin relaxed moving the testes away from the body and increasing the surface for heat loss by radiation and evaporation; conversely, if the testes cooled down too far the scrotum contracted, producing the reverse effect.

He had long been convinced that civilized clothing, and particularly suspensory bandages or a similar type of underwear interfered with the thermoregulatory function of the scrotum by keeping the testes close to the body and preventing heat loss.

He quoted the case which initiated his research along these lines. A man who had sperm counts of about 40 million per c.c. came back over a year later and produced repeated counts of between 2 and 5 million. There had been no intervening illness or treatment but he had started wearing a suspensory bandage soon after his first test. Six weeks after leaving this off the count had risen to 15 million, two months later to 45 million, and then his wife conceived. There had been several similar cases since, and he had not the slightest doubt that suspensory bandages could depress fertility, in some men at least.

He had then turned his attention to men suffering from varicoceles. For here the presence of a considerable volume of blood-filled veins in the scrotal compartment would tend to keep the testes near body temperature, and scrotal movements could not compensate for this. He had collected 6 successive cases of oligozoospermia whose varicoceles he had had operated upon. In 2 of these it was too early to tell the result. In all cases there had been several sperm counts before and several after operation in some cases. The first 4 cases showed the following results:

- Case I.* Number of spermatozoa per total ejaculate—before op. 47–52 mill.; after op. 250–360 mill.
Case II. Number of spermatozoa per total ejaculate—before op. 52–76 mill.; after op. 199–286 mill.
Case III. Number of spermatozoa per total ejaculate—before op. 90–96 mill.; after op. 172 mill.
Case IV. Number of spermatozoa per total ejaculate—before op. 20–36 mill.; after op. 256 mill.

The last 2 cases had not had time for further counts.

Usually it took three months from the operation before the improvement showed. This he attributed to the transitory depressing effect of the pyrexia following operation. Details of this short series would be ready for publication within the next two to three months.

A **Speaker** asked Dr. Swyer about the post-coital test. One heard different opinions as to this. On the one hand it was said to be valuable, and on the other to be quite useless.

Dr. Swyer thought the usefulness of the post-coital test depended on knowing how to interpret it. If it was done at the wrong time in the cycle, when the mucus could not be expected to be receptive, nothing was gained from it; but if done at the right time in the cycle and the findings were not consistent with the seminal analysis, it could reasonably be concluded that there was some coital inadequacy or else some inadequacy of sperm invasion or survival. If one interpreted the test along sensible lines one could get a good deal out of it. But if one were to prophesy on the basis of a negative post-coital test that pregnancy could not ensue, one was likely to be faced with many surprises.

Mr. Howard G. Hanley confined his remarks to 31 consecutive cases of azoospermia with clinically well-developed testicles, and with no evidence of any previous epididymo-orchitis. In 3 patients, tuberculous vesiculo-prostatitis was detected during routine rectal examination. In 3 more bilateral orchiopexy operations had been performed, and in the speaker's opinion, such operations had little more than cosmetic value (Table I).

TABLE I.—31 CASES OF AZOOSPERMIA WITH WELL-DEVELOPED TESTICLES AND NO EVIDENCE OF EPIDIDYMO-ORCHITIS

Tuberculous prostate or vesicles ..	3	Absence of vasa	4
Bilateral orchiopexy operations ..	3	Blind ending vasa	1
Non-patent or atrophic vasa	5	Vaso-epididymostomy	15

25 cases were surgically explored, and of these, 5 had non-patent or atrophic vasa. 4 had complete absence of any vasa, while one man showed a blind ending epididymis unjoined to an atrophic vas. There were thus 10 men with gross congenital lesions.

15 patients were subjected to vaso-epididymostomy, and of these, 4 had atrophic vasa on one side making bilateral anastomosis impossible.

At operation, if the epididymal tubules were seen to be distended under a glistening transparent capsule, they would generally be found to contain live sperms and the chances of success after anastomosis were very much increased. If these tubules were collapsed, or there were multiple cysts in the upper pole of the epididymis, the prognosis was poor, since the site of obstruction was probably too high for any anastomosis to be performed. (Slides were shown.) Such multiple cyst formation was found in 5 cases.

A summary showed that anastomosis was only possible in 15 of 25 cases operated upon, and in 5 of these the chances of success were small owing to cyst formation in the upper poles of the epididymides. Of the 10 cases where a distended epididymis was found containing live sperms, 4 had since shown a few sperms in the ejaculate following anastomosis. Therefore in spite of the fact that over 50% of these operations were doomed to failure from the start, exploration was considered worth while, since the patients were no worse off and some of them may have been greatly improved.

No success had resulted from the use of Hagner's original operation, but, during the past year, a modified technique had been used which had resulted in the 4 positive ejaculates already referred to.

Mr. E. W. Riches said that nearly ten years ago a Royal Commission on population was appointed and he had had the privilege of serving on the Biological and Medical Committee. One of the matters brought out was the small number of clinics in this country, particularly in London, devoted to the study of fertility. A vast change had since taken place; numerous fertility clinics had grown up, and they were being run by urologists in conjunction with gynaecologists as in his own clinic. There had been a great improvement in diagnosis and investigation and some improvement in treatment.

Dr. W. M. Davidson asked whether, as it had been suggested that there was a linkage between periods of infertility, increased tendency to abortion and the production of fetal malformations, there was any danger that the artificial aiding of subfertile marriages might lead to the birth of deformed infants.

Mr. David Band considered it very important that a clinician should be in charge of clinics for infertility; these patients, after all, attended because they desired children and presumably they were the kind of people who would bring up their children properly and contribute usefully to the community. Therefore it was right that the problem of the infertile marriage should be considered with all the resources of the profession—the clinician, the endocrinologist, and the laboratory worker.

He had been impressed by Dr. Swyer's diagrams illustrating the inter-relationship of the various hormones which led to spermatogenesis. Supposing one testis were at fault and by its endocrine contribution led to an adverse reaction or the pituitary, might this lead to inhibition of spermatogenesis in the contralateral testicle? Possibly in such a case orchidectomy might be, in fact, the wisest treatment.

No mention had been made of the empirical treatment of infertility by hormones, and he hoped that Dr. Swyer in his reply would comment on the so-called androgen rebound, when improved spermatogenesis occurred after the cessation of testosterone therapy.

Dr. Swyer, in a general reply, said that he had, in fact, been engaged in analysing the outcome of pregnancy in women who had attended his fertility clinic and had completed their pregnancy either by aborting or going to term. Although these women seemed to show a statistically significant increase in the difficulties of labour of one kind or another—they had longer labours and more breech deliveries, for instance—he was glad to say that in a small series of cases (some 220 pregnancies) the stillbirth and congenital malformation rate of the babies born at term was as low as, or lower than, that of the 2,500-odd lying-in patients forming the control group at his hospital. It looked as though a woman going to the fertility clinic, once she became pregnant, might expect a slightly rougher time than her more fertile sister, but ought to produce as good a baby.

The incidence of abortions among the women attending fertility clinics was supposed to be high. In his series it was 19% whereas the incidence for all women at University College Hospital was only 3.5%. But these figures were not comparable, because in most cases abortions were treated out of hospital, and it was probable that there were a large number of abortions before the women got to the antenatal clinics. The figure for all spontaneous abortions might possibly be as much as 20%, so that the incidence among those attending the fertility clinic might not be so high after all.

In commenting further, **Dr. Swyer** thought the endocrinologist was not entirely to be blamed for the maltreatment of cryptorchidism. A boy of 9 who had had a course of hormone treatment without success should be handed over to a competent urologist straight away.

It was possible that one damaged testis might, by reason of its hormonal contribution, or lack of it, interfere with the other. That was a point which might be well worth studying, though the outcome was not too hopeful.

As for the use of hormones in defective spermatogenesis in eunuchoids with low F.S.H. output, chorionic gonadotrophin or testosterone appeared to be effective in some cases. They might, it would seem, even lead to cure, so that normal spermatogenesis continued on cessation of treatment. High doses of testosterone depress the testis and, as was well known, Heckel claims that on stopping treatment, a rebound phenomenon ensues, carrying the sperm density to levels far above those before treatment. This might be so but he had not yet observed it in his own patients subjected to this form of treatment.

Mr. W. Selby Tulloch, in reply, said that the President had told of having once made an exploration of the vas and finding it absent. This has been the experience of others including the speaker. He agreed with the view expressed by Mr. W. S. Mack that more active measures must be taken to avoid infertility associated with cryptorchidism. If the testes had not descended spontaneously by the age of 11 years, then operation should be done. He was very interested in Dr. H. A. Davidson's remarks regarding varicocele. Varicocele was a common cause of infertility. In the clinical examination of a person suffering from varicocele the testis—either one or both—was of normal size or slightly reduced in size and of soft consistence. This was probably due to a nutritional state. The speaker had drawn attention to this condition and had reported one case of azoospermia reversed by bilateral operation for varicocele—the case had a successful conclusion by the birth of a normal child to his wife (1952, *Trans. Edinb. Obstet. Soc.*, 104, 17, 29). Many more operations had been performed, with considerable success, but it was not successful in all cases.