the "flight" they reported that the patient withstood the lowered oxygen tension better than both individuals with the sickle-cell trait and normal control subjects.

Findlay, Boulter, and MacGibbon (1947) demonstrated in-vivo sickling in three sickle-cell trait carriers flying at 15,000 ft (4,570 m) and they advised that oxygen should be carried in all aeroplanes in which Africans are passengers. The sickle-cell trait is no longer an important risk in most commercial flights, but if, as on certain African routes, a Negro traveller must take an unpressurized aircraft it would be wise to ascertain the sickling status before departure. Under these exceptional circumstances even the relatively benign sickle-cell trait carrier should seek surface transport, unless at over 7,000 ft (2,135 m) oxygen can be continuously administered.

Patients with sickle-cell haemoglobin C disease seem to be at greatest risk and they should if possible completely avoid air travel. While continuous oxygen therapy could be made available in exceptional circumstances, it is not feasible as a normal commercial practice.

However, cases may be so benign as to be unsuspected until an in-flight incident occurs. The only way to avoid this situation would be to set up a screening system available to all Negro travellers, which would detect not only the presence of sickle haemoglobin but specifically cases of undiagnosed sickle-cell haemoglobin C disease, sickle-cell thalassaemia, and the unusual clinically benign cases of sickle-cell anaemia with persistent splenomegaly. The classical case of sickle-cell anaemia will almost certainly be already diagnosed. While air travel, even in pressurized aircraft, cannot be recommended for these latter patients it would seem that the risk of infarction in flight is surprisingly small.

AIRCREW FITNESS

Finally, though the foregoing reports relate to problems for airline passengers the question of sickle-cell disease and aircrew fitness needs careful consideration. Clearly, patients with the more severe sickle-cell disorders, including sickle-cell haemoglobin C disease, should not be allowed to fly as aircrew, and this attitude seems to be generally accepted. There is currently less agreement on the suitability for aircrew duties of sickle-cell trait carriers. Lewis (1970) suggested that such patients should

not enter a career involving airline flying, but that those aircrew already trained who are subsequently found to have the sickle-cell trait should be allowed to continue flying under medical supervision.

There seems to be little logic in this argument, which presumably advocates rejection of new entrants with the sickle-cell trait on the grounds that they may represent a safety risk. To retain those already trained, though superficially humane, seems to ignore this implied risk, and it is difficult to reconcile the two attitudes. It would seem most important that some firm, lasting, and internationally acceptable policy be defined on this subject by the authorities responsible for aircrew licensing.

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References

- Aerospace Medical Association (1961). *Aerospace Medicine*, 32, 369.
- Beighton, P. H., and Richards, P. R. (1968). *British Heart Journal*, 30, 367.
- Canby, C. B., Carpenter, G., and Ellmore, L. F. (1944). *Archives of Surgery*, 44, 123.
- Coleman, W. A., and Furth, F. W. (1956). *Archives of Internal Medicine*, 98, 247.
- Cooley, J. C., Peterson, W. L., Engel, C. E., and Jernigan, J. P. (1954). *Journal of the American Medical Association*, 154, 111.
- Diggs, L. W. (1965). *American Journal of Clinical Pathology*, 44, 1.
- Doenges, J. P., Smith, E. W., Wise, S. P., and Breitenbucher, R. B. (1954). *Journal of the American Medical Association*, 156, 955.
- Erlandson, M. E., Schulman, I., and Smith, C. H. (1960). *Pediatrics*, 25, 629.
- Findlay, G. M., Boulter, E. A., and MacGibbon, C. B. (1947). *Journal of the Royal Army Medical Corps*, 89, 138.
- Henderson, A. B., and Thornell, H. E. (1946). *Journal of Laboratory and Clinical Medicine*, 31, 769.
- Jones, S. R., Binder, R. A., and Donowho, E. M. (1970). *New England Journal of Medicine*, 282, 323.
- Konotey Ahulu, F. I. D. (1969). *Lancet*, 1, 267.
- Lewis, R. A. (1970). *Sickle States: Clinical Features in West Africans*. Accra, Ghana Universities Press.
- McCormick, W. F. (1961). *American Journal of the Medical Sciences*, 241, 329.
- Rotter, R., Luttgens, W. F., Peterson, W. C., Stock, A. E., and Motulsky, A. G. (1956). *Annals of Internal Medicine*, 44, 257.
- Serjeant, G. R. (1970a). *West Indian Medical Journal*, 19, 1.
- Serjeant, G. R. (1970b). *British Journal of Haematology*, 19, 635.
- Sluiter, M. E. (1969). In *Recent Advances in Aerospace Medicine*, ed. D. E. Busby. Dordrecht, the Netherlands, Reidel.
- Smith, E. W., and Conley, C. L. (1955). *Bulletin of the Johns Hopkins Hospital*, 96, 35.
- Sullivan, B. H. (1950). *Annals of Internal Medicine*, 32, 338.
- Thompson, G. R. (1963). *British Medical Journal*, 2, 976.

Transrectal Prostatic Biopsy

W. F. HENDRY, J. P. WILLIAMS

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Summary

Transrectal prostatic biopsy specimens were taken from 218 patients with prostatic symptoms—138 by the Franzen aspiration technique without anaesthesia as out-patients and 80 by the Silverman technique under general anaesthesia. A reliable diagnosis was obtained in 82% of the former and 95% of the latter.

St. Peter's Hospitals and Institute of Urology, London W.C.2

W. F. HENDRY, CH.M., F.R.C.S., Senior Surgical Registrar
J. P. WILLIAMS, M.CHIR., F.R.C.S., Senior Lecturer

Introduction

It is generally agreed that the diagnosis of carcinoma of the prostate should be confirmed microscopically before treatment is started. Though an extensive transurethral prostatectomy will nearly always confirm the diagnosis (Denton *et al.*, 1967), there is good evidence that a specimen taken for biopsy by needle is more reliable than a limited specimen obtained via the urethra (Purser *et al.*, 1967). Estimates of the accuracy of needle biopsy, however, have ranged from 50 to 90% (Kaufman *et al.*, 1954) up to 95% (Rinker and Shuman, 1952; Bianchi, 1956).

While the perineal route has usually been used for taking tissue from the prostate by needle, Astraldi (1937) first described good results with the transrectal approach, and noted minimal morbidity in a series of more than 100 cases. The safety and efficiency of this approach has since been confirmed by Grabstald and Elliott (1953), Grabstald (1954, 1956), Graham (1958), and Daves *et al.* (1961).

Various needles have been used to provide material for cytological or histological diagnosis. Ferguson (1930) aspirated prostatic material for cytological examination by means of a fine needle inserted via the perineum. Franzen *et al.* (1960) developed a fine needle and guide for transrectal use, and satisfactory results with this technique have been confirmed by Williams *et al.* (1967). The needle designed by Silverman (1938) was first used for taking prostatic tissue for biopsy by Peirson and Nickerson (1943), who obtained satisfactory histological specimens in 86% of 36 cases.

In this study the merits of the Franzen and Silverman techniques are compared.

Franzen Needle Technique

Transrectal aspiration of prostatic tissue was carried out in 138 patients by means of the fine needle and guide (see Fig.) designed by Franzen *et al.* (1960). Early experience showed

Franzen needle and guide; the Gillette Scimitar plastic disposable syringe has proved satisfactory for aspiration.

that a Gillette Scimitar 10-ml or 20-ml disposable plastic syringe was as effective as the original specially designed aspirating syringe; other disposable syringes proved less satisfactory. No anaesthetic was used in these outpatients, all of whom tolerated the examination well.

The procedure was carried out with the patient in the left lateral position, up to four separate aspirations being performed. An account of this technique with details of the interpretation of smears has been published (Williams *et al.*, 1967). The criteria of malignancy were those described by Mason (1966).

In order to establish the method in our hands, 21 cases of benign prostatic hypertrophy were investigated in this way before undergoing surgery. Six patients in the overall series were diagnosed on clinical grounds as having prostatitis. The remainder were placed in the "clinically suspicious" and "clinically certain" categories of malignancy. The latter group included cases with hard craggy prostates on rectal examination, patients with characteristic bone deposits, and those with a sustained rise in the serum acid phosphatase. Some of these patients underwent transurethral resection, thus providing additional histological confirmation of the diagnosis. In the former group histological confirmation of the diagnosis was obtained less often; however, a positive diagnosis on Franzen aspiration led to hormone therapy which produced a diminution in obstructive symptoms in all cases.

TABLE I—Results in Franzen Needle Aspiration Specimens of Prostate in 138 Patients Related to Clinical Diagnosis

Clinical Diagnosis	No.	Diagnosis					Wrong Diagnosis
		Unsatisfactory Preparation	Benign	Prostatitis	Suspicious	Malignant	
Benign	21	—	20	—	—	1	1
Prostatitis	6	—	—	6	—	—	—
Suspicious	37	3*	19†	1	7	7	3
Malignant	74	13	5	—	7	49	5
Total	138	16 (11.6%)	44	7	14	57	9 (6.5%)

*One proved malignant.

†Two proved malignant.

The results are summarized in Table I. In just over 10% of the cases unsatisfactory material was aspirated, even on repeated attempts; errors in diagnosis were made on nine occasions (6.5%). Thus a reliable diagnosis was made in 82% of the cases. There were no significant complications.

Silverman Needle Technique

During 1968 to 1970 80 specimens obtained by the transrectal route were examined at St. Mary's General Hospital, Portsmouth. After bimanual examination of the prostate under general anaesthesia, with the patient in the lithotomy position, specimens were taken from glands that were suspected of malignancy, the Franklin modification of the Silverman needle being used; generally, three cores were taken, two from the more suspicious side. These specimens were immediately fixed in buffered neutral formalin and sections were prepared and stained with haematoxylin and eosin. The results are summarized in Table II, from which it may be seen that satisfactory material for examina-

TABLE II—Results in Specimens of Prostate Taken by Silverman Needle in 80 Patients Related to Clinical Diagnosis

Clinical Diagnosis	No.	Diagnosis				Wrong Diagnosis
		Benign	Dubious	Malignant	Other	
Benign	1	1	—	—	—	—
Suspicious	23	11*	1	9	2†	1
Malignant	56	2†	—	54	—	2
Total	80	14	1	63	2	3 (4%)

*One proved malignant.

†Both proved malignant.

‡One case carcinoma of bladder, one case tuberculosis.

tion was obtained in all cases except one, though the procedure had to be repeated in three cases to give a positive result when the histological diagnosis seemed to be at variance with the clinical impression. The histological diagnosis was subsequently shown by prostatectomy to be wrong in three cases. Thus a reliable diagnosis was made in 95% of cases.

Serious complications did not occur after this procedure. In eight patients the urine changed from bacteriologically sterile to infected; however, since all these patients had indwelling catheters, the significance of this finding is uncertain. In 55 patients who were examined per rectum after intervals of 3 to 24 months there was no evidence of tumour tracking along the needle path.

Discussion

In order to establish the diagnosis of carcinoma of the prostate effectively the procedure for obtaining material for biopsy should be simple, safe, and accurate.

The Franzen aspiration technique offers distinct advantages to the patient. The fine needle causes minimal discomfort, and is used on outpatients without anaesthesia; in addition, the risks are minimal—Esposti (1966) recorded 1,430 aspirations in 1,110 patients without significant complications. In contrast, Wendel and Evans (1967) recorded a complication rate of 7% in 250 patients after using the Silverman needle by the perineal or transrectal route. Davison and Malament (1971) described a high incidence of positive urine cultures and febrile reactions after transrectal use of the Silverman needle, and they recommend routine antibiotic cover. However, no serious infective complications were observed in our patients.

Several studies have compared the accuracy of the Franzen technique, which gives a cytological diagnosis, with results obtained with needles of larger bore inserted via the perineum and providing histological material. Andersson *et al.* (1967)

noted that the chances of obtaining adequate specimens were better when they were taken by a surgeon well versed in the method, and concluded that in experienced hands the chances of obtaining representative material were probably equal irrespective of the type of instrument used. Ekman *et al.* (1967) also found little difference in the rate of positive findings and concluded that the Franzen technique was preferable since it was gentler and less inconvenient to the patient. Similarly, Alfthan *et al.* (1968) concluded that the diagnostic reliability of cytological samples obtained by a thin needle was as good as in histological samples obtained by a transperineal Silverman needle. In contrast, our results suggest that multiple cores of prostate removed by the transrectal route under general anaesthesia with the Silverman needle are more likely to provide a positive result than aspiration of a small amount of material without anaesthetic by the Franzen technique. However, the latter possesses advantages in safety and convenience to the patient.

We therefore suggest that the Franzen technique be used initially as an outpatient procedure when the patient first attends; should the result prove unexpectedly negative, it can easily be repeated. However, should the second attempt prove unsatisfactory, or should the patient require a general anaesthetic for other reasons, such as for cystoscopy, the Silverman technique should then be used, as it is more likely to produce a positive specimen. Whichever method is used, we conclude that the transrectal approach is simple and accurate for the surgeon and safe for the patient.

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References

- Alfthan, O., Klintrup, H. E., Koivuniemi, A., and Taskinen, E. (1968). *Duodecim*, 84, 506.
 Andersson, L., Jonsson, G., and Brunk, U. (1967). *Scandinavian Journal of Urology and Nephrology*, 1, 227.
 Astraldi, A. (1937). *Urologic and Cutaneous Review*, 41, 421.
 Bianchi, F. (1956). *Journal of Urology*, 76, 645.
 Daves, J. A., Tomskey, G. C., and Cohen, A. E. (1961). *Journal of Urology*, 85, 180.
 Davison, P., and Malament, M. (1971). *Journal of Urology*, 105, 545.
 Denton, S. E., Valk, W. L., Jacobson, J. M., and Kettunen, R. C. (1967). *Journal of Urology*, 97, 127.
 Ekman, H., Hedberg, K., and Persson, P. S. (1967). *British Journal of Urology*, 39, 544.
 Esposti, P. L. (1966). *Acta Cytologica*, 10, 182.
 Ferguson, R. S. (1930). *American Journal of Surgery*, 9, 507.
 Franzen, S., Giertz, G., and Zajicek, J. (1960). *British Journal of Urology*, 32, 193.
 Grabstald, H. (1954). *Journal of Urology*, 74, 211.
 Grabstald, H. (1956). *British Journal of Urology*, 28, 176.
 Grabstald, H., and Elliott, J. L. (1953). *Journal of the American Medical Association*, 153, 563.
 Graham, W. H. (1958). *British Journal of Urology*, 30, 389.
 Kaufman, J. J., Rosenthal, M., and Goodwin, W. E. (1954). *Journal of Urology*, 72, 450.
 Mason, M. K. (1960). In *Cytological Diagnosis in Medical Practice*, ed. J. Bamforth. London, Churchill.
 Peirson, E. L., and Nickerson, D. A. (1943). *New England Journal of Medicine*, 228, 675.
 Purser, B. N., Robinson, B. C., and Mostofi, F. K. (1967). *Journal of Urology*, 98, 224.
 Rinker, J. R., and Shuman, W. G. (1952). *Journal of Urology*, 67, 709.
 Silverman, I. (1938). *American Journal of Surgery*, 40, 671.
 Wendel, R. G., and Evans, A. T. (1967). *Journal of Urology*, 97, 122.
 Williams, J. P., Still, B. M., and Pugh, R. C. B. (1967). *British Journal of Urology*, 39, 549.

PRELIMINARY COMMUNICATIONS

Detection of Hepatitis Associated Antigen by the Latex Agglutination Test

J. M. LEACH, B. J. RUCK

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Summary

Hepatitis associated antigen may be detected quickly and reliably by the latex agglutination test, using antiserum from guinea pigs immunized with the antigen. The latex test has a sensitivity comparable to the counter current immunoelectrophoresis technique.

The discovery by Blumberg *et al.* (1967) of the Australia antigen (hepatitis associated antigen—HAA) has been followed by the development of a number of tests for the presence of this agent in blood. For routine work the most commonly used tests are gel diffusion in Ouchterlony plates, counter current immunoelectrophoresis, and complement fixation. Each of these tests has its merits and disadvantages for screening of large numbers of blood samples.

The gel diffusion test is simple to perform and is economical in the use of detector antiserum but is not very sensitive and the results are not available for at least 24 hours. It is useful, however, in being readily adapted to making comparisons of antigenic identity. Counter current immunoelectrophoresis is more sensitive than gel diffusion and gives a definitive result in about two hours. This technique has the additional advantage of allowing the simultaneous demonstration of antigen and antibody in the test sample. It is, however, more extravagant in the use of antiserum than gel diffusion and there is an appreciable expense in the preparation or purchase of agarose films and ancillary equipment. The complement fixation test is the most sensitive of these three tests but it is more tedious to perform, is invalidated by anticomplementary sera, consumes very much more antiserum than the tests based on the precipitin reaction, and the results are not available for 24 hours (Blumberg *et al.*, 1970).

Latex Agglutination Test

It was felt that a need existed for a rapid test with a sensitivity comparable to the complement fixation test which could be performed without elaborate equipment, and for this reason it was decided to investigate the possibility of using a latex agglutination technique. The latex agglutination test has become accepted for the detection of the rheumatoid arthritis factor (Singer and Plotz, 1956) and is widely used as a test for human chorionic gonadotrophin in the urine of pregnant women (Graham and Kalish, 1967). Our experience shows that it is equally suited to the detection of HAA in human serum and plasma.

Pfizer Limited, Sandwich, Kent

J. M. LEACH, M.A., Project Leader in Research Division
 B. J. RUCK, M.I.BIOL., Senior Technician