Discussion

Our normal values for P.E.F. are similar to those quoted by others (Higgins, 1957; Tinker, 1961; College of General Practitioners, 1961; Read and Selby, 1961; Shephard, 1962) but are closest to those reported from the same city by Lockhart *et al.* (1960). We are not aware of published values for inspiratory flow measured by the peak flow meter, but we have found a good correlation with maximum inspiratory flow measured by the spirometric method (Fig. 4). The technique of maximum forced inspiration is undoubtedly more difficult to master. Nevertheless it is nearly always possible, and since we are interested in the alteration of the normal P.E.F./P.I.F. ratio rather than in absolute values, the coefficient of variation is of less importance.

We do not wish to imply that all patients with emphysema can be picked out with ease by the P.E.F./P.I.F. ratio. A patient with emphysema may have a surprisingly good P.E.F. as compared with other tests of ventilatory function. The explanation may be that the sudden and abrupt collapse of the bronchial walls displaces sufficient air to give a spuriously high reading on the meter. This flow, however, is not maintained long enough to be functionally useful and the patient may be seriously disabled. Nevertheless, we have usually found that when the forced expiratory and inspiratory spiograms show a selective impairment of expiration the peak flow meter shows a fall in the normal P.E.F./P.I.F. ratio.

Several reasons for increased airways resistance may be present in the same patient. Bronchial secretions or smooth-muscle spasm also impair inspiratory flow, and if present may mask the effect of "pure" emphysema. The significance of the fall in P.E.F./P.I.F. ratio is therefore more in its presence than in its absence, but when the fall is present and marked there is strong presumptive evidence of mechanical change in the lungs due to emphysema. In other less usual cases, such as the patient with laryngeal obstruction, useful information may be obtained by measuring the inspiratory flow. This patient was severely disabled, and, although the laryngeal obstruction was recognized, underlying emphysema was suspected. In fact, the severe and selective impairment of inspiration present was incompatible with the latter diagnosis. We have found in these and other cases that this simple modification of the peak flow meter has provided useful additional information.

Summary

An adaptation of the Wright peak flow meter is described which enables peak inspiratory flow to be measured. The original mechanical characteristics of the meter have not been altered by this.

The peak expiratory and peak inspiratory flow of 52 normal males and 47 normal females are presented. Both measurements show a fall with increasing age.

Normally, peak expiratory flow exceeds inspiratory. In patients suffering from emphysema a reversal of this ratio is commonly seen. This is interpreted as evidence of the bronchial collapse mechanism. The ability to measure peak inspiratory flow is also of value in other conditions.

We are very grateful for assistance from members of various departments of Queen's College, Dundee. Mr. Alex. Soutar, of the Department of Pharmacology and

Therapeutics, skilfully adapted a Wright peak flow meter purchased from Airmed Ltd., London; Mr. W. McNicoll, of the Department of Civil and Mechanical Engineering, calibrated it against steady flow; and Dr. D. M. Green carried out the bacteriological studies. We are also grateful to members of the Department of Social Medicine for the statistical analysis.

REFERENCES

- Ciba Guest Symposium (1959). *Thorax*, **14**, 286.
College of General Practitioners (1961). *Brit. med. J.*, **2**, 973.
Comroe, J. H., Forster, R. E., Dubois, A. B., Briscoe, W. A., and Carlsen, E. (1955). *The Lung*. Year Book Publishers, Chicago.
Fairbairn, A. S., Fletcher, C. M., Tinker, C. M., and Wood, C. H. (1962). *Thorax*, **17**, 168.
Fletcher, C. M., and Tinker, C. M. (1961). *Brit. med. J.*, **1**, 1491.
Higgins, I. T. T. (1957). *Ibid.*, **2**, 1198.
Lockhart, W., Smith, D. H., Mair, A., and Wilson, W. A. (1960). *Ibid.*, **1**, 37.
McNeill, R. S., Malcolm, G. D., and Brown, W. R. (1959). *Thorax*, **14**, 225.
Prime, F. J. (1960). *Brit. med. J.*, **1**, 423.
Read, J., and Selby, T. (1961). *Ibid.*, **2**, 1104.
Shephard, R. J. (1962). *Thorax*, **17**, 39.
Tinker, C. M. (1961). *Brit. med. J.*, **1**, 1365.
W.H.O. (1961). *Tech. Rep. Ser.*, No. 213.
Wright, B. M., and McKerrow, C. B. (1959). *Brit. med. J.*, **2**, 1041.

PARATHYROID INSUFFICIENCY AFTER THYROIDECTOMY

BY

J. A. GIRLING, F.R.C.S.

Senior Surgical Registrar, Royal Free Hospital, London

AND

R. S. MURLEY, M.S., F.R.C.S.

Surgeon, Royal Northern Hospital, London, and St. Albans City Hospital

A proportion of patients who undergo thyroidectomy develop tetany owing to a fall in the serum calcium. Reduced parathyroid function is responsible for this fall, and in some cases one or more parathyroid glands may be found on the operation specimen (Murley and Peters, 1961). However, in most cases no parathyroid tissue has been removed, and impaired function is probably due to damage to the blood supply of the parathyroid glands (Halsted and Evans, 1907). Occasionally, in toxic cases, tetany occurs as a result of the "hungry bones" phenomenon (Dent and Harper, 1958). Tetany is usually short-lived, and with its disappearance it has sometimes been assumed that parathyroid function has returned to normal. That this is not necessarily true is well established, and there is no doubt that a severe degree of hypocalcaemia can exist in the absence of tetany. The effects of this are sometimes both subtle and serious, and persistent hypocalcaemia may result in cataract formation (Lachmann, 1941) or in psychotic illness, usually of a depressive nature. Moreover, a variety of less serious symptoms, such as headache, lethargy, and abdominal pain, have also been ascribed to hypocalcaemia by Davis *et al.* (1961).

The lowest post-operative serum-calcium level that can be regarded as normal has not been agreed. Wade (1960) thought that any patient with a serum-calcium level between 8 and 9 mg./100 ml. was in need of treatment, and those with a level below 7.5 mg./100 ml. were in need of urgent treatment. Wade found only two cases of permanent hypoparathyroidism in his own

series of 119 thyroidectomies. Davis *et al.* stated that that 9.3 mg./100 ml. was the lowest permissible level of serum calcium, and in a series of 80 cases no less than one-third were classified as hypoparathyroid. In most of these cases certain symptoms were attributed to the low serum-calcium levels.

Present Study

Some years ago it was for a short time our practice to get the serum calcium and phosphorus estimated before and after operation in all cases. The results seemed so consistently normal that it was thought to be unjustifiable to continue to bother the laboratory with this work. However, after the publication of the paper of Davis *et al.* (1961) it seemed wise to undertake a more critical follow-up of some of our cases, more especially since we had accurate records of the size of the thyroid remnants as well as the incidence of what we have termed inadvertent parathyroidectomy.

Of a personal series of 177 cases (including many of those reported in an earlier paper, 1961), 123 patients were able to attend for clinical examination at varying periods from three months to eight years after operation. Seven other patients who had normal serum-calcium levels shortly after operation were not available for follow-up later. Of the remaining 47 cases, 2 had died of thyroid cancer, 31 could not attend but were reported as well, and 14 could not be traced.

Each of the 123 patients seen was interviewed by one of us (J. A. G.), inquiry being made about general health prior to operation and about post-operative symptoms possibly related to thyroid and parathyroid function. After physical examination a specimen of venous blood was withdrawn with minimal venous occlusion and with no prior dietary restriction. All specimens were collected by the same author in mid-afternoon, and calcium levels were estimated by the method of Clark and Collip (1925).

The normal range of serum-calcium level in the Royal Northern Hospital laboratory is from 9 to 11 mg./100 ml. The serum-calcium level in the thyroidectomy series is essentially normal except for one patient whose level was persistently below 7 mg./100 ml. six years after

Post-operative serum-calcium levels in the Royal Northern Hospital series of 123 cases. Mean level was 10.1 mg./100 ml.

her second thyroidectomy for recurrent toxic goitre. This patient declared that she was in good health, but on closer questioning admitted to paraesthesiae in the hands and possibly depression of mild degree. Her first operation had been done at another hospital and unfortunately there is no record of the serum-calcium prior to the second operation. However, we do know that there was no parathyroid tissue on our operation specimen.

Discussion

Since the type and extent of resection done may be relevant to the incidence of recurrent goitre, as well as to post-operative hypothyroidism and hypoparathyroidism, details of these complications are related to the specific operations in the Table. Total thyroidectomy

Relationship of Type of Goitre and Operation to Sequelae

Type of Goitre	Type of Operation		Sequelae		
	Partial	Total	Hypothyroid	Hypoparathyroid	Recurrent Goitre
Toxic ..	52 (3)	—	4	1 (1)	—
Nodular ..	66 (4)	—	—	—	1
Hashimoto ..	2	2	4	—	—
Carcinoma ..	—	1	1	—	—
Total ..	120	3	9	1	1

Numbers in parentheses indicate secondary operations included in main figures.

Inadvertent removal of parathyroid tissue occurred in 11 patients none of whom had any evidence of hypoparathyroidism.

One patient had a residual pyramidal lobe of which she was unaware.

was done in three of these cases, but the remaining 120 had a partial thyroidectomy. The latter operation consisted usually of a partial resection of both lateral lobes, the residuum on each side measuring approximately 2.5 by 1.25 by 1.25 cm. Occasionally the hemithyroid was resected on one side and a single small residuum was left on the other side. There is, of course, no doubt that over-radical resection of thyroid can increase the incidence of certain complications. Thus Painter (1960) reported hypothyroidism in 25% and permanent hypoparathyroidism in 13% of patients in whom mere "buttons" of thyroid tissue were left on each side.

Neither the measured size of our normal residuum nor the incidence of recurrent goitre would suggest that too large thyroid remnants were left in this series. Likewise the incidence of hypothyroidism does not seem to have been related to over-radical resection. Of nine hypothyroid cases, four were examples of Hashimoto goitre (in which a physician had requested operation for persistent symptoms or because of doubt in the diagnosis), and four had partial resection for toxic goitre. Three of these last four cases showed well-marked lymphadenoid infiltration, which is a frequent finding in the glands of those patients who later become hypothyroid (Greene, 1950).

Inadvertent parathyroidectomy has previously been reported in about 10% of our thyroidectomies, but this has apparently not been related to post-operative hypoparathyroidism. While removal of parathyroid tissue could clearly increase the risk of hypoparathyroidism, this has not been true of 11 such cases in the present series of 123 patients. However, a high incidence of inadvertent removal might well signify more frequent bruising and parathyroid vascular damage, so it is clearly desirable for surgeons to reduce this hazard to a minimum.

We have not so far subjected any of our patients to the calcium-deprivation test described by Davis *et al.* (1961), and on clinical and chemical grounds this does not seem to be necessary. But, though we have reported all except one case as being within the normal range for our own laboratory, it should be pointed out that five of our cases had serum-calcium levels below the accepted minimum of Davis *et al.* All five of these patients appear to be in normal health.

Although there would appear to be little cause for alarm about hypoparathyroidism following thyroidectomy doctors must certainly be alive to the possibility of this complication. Apart from the exercise of all possible care at the time of operation it does seem prudent to have an estimation of the serum calcium and phosphorus of every patient before and after operation.

Lest physicians should regard thyroidectomy alone as a possible cause of parathyroid insufficiency, it should be recalled that there is experimental evidence that treatment with radioactive iodine may endanger the parathyroids (Parrott *et al.*, 1960). The possibility of parathyroid insufficiency should therefore be considered after treatment of goitre by either surgery or isotopes.

Summary

A total of 123 thyroidectomy cases have been followed up to ascertain the incidence of post-operative parathyroid insufficiency.

The only patient in this series with an abnormally low serum calcium had twice been operated upon for toxic goitre.

Inadvertent parathyroidectomy occurred in about 9% of these cases but was not related to hypoparathyroidism.

Precise records have been kept of the gland residuum in all thyroidectomy cases. The incidence of recurrent goitre and that of post-operative hypothyroidism were within reasonable limits in relation to the length of follow-up.

Routine estimation of the serum-calcium and phosphorus levels is recommended before and after operation.

We are deeply indebted to Dr. R. Bird and his staff for all the biochemical work in connexion with this study.

REFERENCES

- Clark, E. P., and Collip, J. B. (1925). *J. biol. Chem.*, **63**, 461.
 Davis, R. H., Fourman, P., and Smith, J. W. G. (1961). *Lancet*, **2**, 1432.
 Dent, C. E., and Harper, C. M. (1958). *Proc. roy. Soc. Med.*, **51**, 489.
 Greene, R. (1950). *J. Endocr.*, **7**, 1.
 Halsted, W. S., and Evans, H. M. (1907). *Ann. Surg.*, **46**, 489.
 Lachmann, A. (1941). *Acta med. scand.*, Suppl. No. 121.
 Murley, R. S., and Peters, P. M. (1961). *Proc. roy. Soc. Med.*, **54**, 487.
 Painter, N. S. (1960). *Brit. J. Surg.*, **48**, 291.
 Parrott, M. W., Johnston, M. E., and Durbin, P. W. (1960). *Endocrinology*, **67**, 467.

DETECTION OF AMOEBIC LIVER ABSCESS BY ISOTOPE SCANNING*

BY

M. SALAH IBRAHIM, M.B., M.R.C.P.Ed.

Lecturer in Medicine, Ein-Shams Faculty of
Medicine, Cairo

M. F. ABDEL-WAHAB, Ph.D.

Lecturer in Radioisotopes Department, A.E.E.,
Cairo

The diagnosis of amoebic liver abscess is not infrequently difficult to establish, even in a country like Egypt, where the condition is commonly encountered. It may be confused with a variety of other conditions which involve the liver itself or adjacent structures, causing pain in the right hypochondrium and giving rise to constitutional symptoms (Craig, 1944; Zuckerbrod *et al.*, 1948; Zavaldá and Hamilton, 1952).

In many cases the diagnosis can be made with certainty only when the characteristic pus is obtained by aspiration of the liver. This is not always a safe procedure to undertake. Moreover, determining the accurate location of the abscess is desirable before aspiration is attempted. In the absence of localizing signs, which are rarely present, several radiological techniques have to be resorted to (Schorr and Schwartz, 1951). These, nevertheless, may not be of much help, and the aspiration has to be performed blindly.

With isotope scanning techniques it has recently become possible to locate space-occupying lesions in the liver without traumatizing effect (Friedell *et al.*, 1958; Donato *et al.*, 1959; Bender and Blau, 1959; Wagner *et al.*, 1961). This has become feasible by using compounds known to be specifically concentrated in the liver. The radioactive substance is injected intravenously, and by means of focusing a highly sensitive gamma-ray detector over different parts of the liver the amount of radiation arising therefrom can be recorded: this is normally uniform. Significant differences in the amount of radioactivity are produced by intrahepatic space-occupying lesions.

The present paper describes our experience with this new technique of diagnosis in a series of 11 patients suspected clinically to be suffering from amoebic liver abscess. A comparison with six suitable control subjects has also been made.

Clinical Studies

The diagnosis of amoebic hepatitis was suspected clinically according to the following: history of general ill-health of fairly recent onset (anorexia, apathy, weakness, rapid loss of weight, etc.); history of pain in the right hypochondrium; low-grade pyrexia and night sweats; enlarged tender liver. Generally all the history relating to these cases was obtained. Abnormal physical signs suggesting slight pleural effusion or consolidation at the lower base of the right lung were present in seven cases. The presentation in one case was haemoptysis. In four cases frank acute dysentery occurred during the three months preceding admission.

The diagnosis in one case was uncertain at first, as the enlarged tender liver was also irregular and firm in consistency. In this case there was a lack of response to emetine and chloroquine before pus was aspirated. In fact, malignancy was highly suspect.

In two cases examination of the stools for amoebae was positive. The white blood count showed a moderate leucocytosis (average 12,500), with a polymorph count averaging 72%. The sedimentation rate, haemoglobin, and liver-function tests were routinely performed in all cases.

Plain x-ray films of the upper abdomen and fluoroscopic examination were carried out in all cases. In nine elevation of the right cupola of the diaphragm was

*Partly delivered at the XXXth Conference of Arab Medicine, held in Bagdad during March, 1962.