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MEDICAL FITNESS FOR AIR TRAVEL

BY

Sir HAROLD WHITTINGHAM, K.C.B., K.B.E., LL.D., F.R.C.P.

Air Marshal, R.A.F. (ret.); Director of Medical Services, British Overseas Airways Corporation

A. BUCHANAN BARBOUR, O.B.E., M.R.C.S., F.R.Ae.S.

Chief Medical Officer, British European Airways Corporation

AND

J. C. MACGOWN, D.F.C., M.D., Ch.B.

Wing Commander, R.A.F.V.R.; Medical Adviser, British South American Airways Corporation

Those who are not well acquainted with the physiological problems of flying, particularly of long flights on a world-wide basis, doubtless find difficulty in assessing the fitness of certain individuals for air travel. To help the practitioner to advise on such cases as may be referred to him a tabulated statement has been prepared, based on experience gained in commercial and Service aviation, especially in connexion with the transport of casualties during and since the war.

In the first column of the accompanying Table the commoner medical conditions on which an opinion is likely to be required regarding suitability for air travel are listed and arranged in alphabetical order for ease of reference. In the second column the limiting factors of the disease are given: any person whose condition falls below the standard set here should be advised against travelling by air, except possibly on short flights of about an hour's duration at low altitudes under good flying conditions. Essential facilities to be provided and precautions to be taken by the passenger concerned during flight are indicated in the third column, and in the fourth column there is a note on the advisability of air travel for those suffering from each disease in question.

The advice given in the Table is in general terms and is particularly applicable to flights of over four hours' duration in public air transport flying at altitudes between 5,000 and 9,000 ft. (1,524 and 2,743 m.) and for short times at 15,000 ft. (4,572 m.) or above to circumvent a bad weather front or to avoid high ground. When the journey is by pressurized aircraft it can be assumed that the air condition of the cabin will be similar to that of an altitude of 8,000 ft. (2,438 m.) with respect to atmospheric pressure and oxygen content even if the aircraft is actually flying at 20,000 ft. (6,096 m.). The proportion of passenger aircraft which are pressurized is steadily increasing, so that in a year or two most will be of this type. Certain cases which might be rejected for public air transport might be acceptable in an air ambulance or in a privately chartered aircraft where the patient's condition would cause no offence to fellow passengers and the altitude and length of each stage of the flight could be arranged to suit the patient.

Every case must be assessed on its merits, bearing in mind the following points: (1) the medical condition and psychological make-up of the patient; (2) the effect of the patient's disability on fellow passengers; (3) the necessity or otherwise for a qualified attendant to travel with the patient; and (4) the conditions of air travel—that is, (a) the type of aircraft, particularly whether it is pressurized or not; (b) the length of the journey envisaged and the duration of the various stages, which may be as long as 10 hours when crossing the Atlantic; (c) the expected weather conditions at the time of the year, and the altitudes likely to be attained; and (d) the availability of oxygen.

Limiting Factors and Precautionary Measures

Though modern air travel is very comfortable and acceptable to the vast majority of invalids, long flights may be fatiguing even to the robust.

Patients with anaemia, even of moderate degree, suffer from anoxia at the altitudes usually flown by civil airlines, and they should have a blood transfusion to bring the haemoglobin above 50% (7 g. per 100 ml.) if an air passage is essential. Patients with acute leukaemia should not travel by air, as they readily suffer from anoxia, and haemorrhage is likely to occur with the lowered oxygen tension at altitude. If it is essential to transport such cases they should be given a blood transfusion to raise the haemoglobin level to 80%. Chronic types with pronounced splenomegaly experience respiratory distress.

Individuals who have cardiac and pulmonary lesions are apt to react badly to effects of low pressure, even at altitudes below 10,000 ft. (3,048 m.), particularly those who have had attacks of angina pectoris or coronary occlusion, as well as cardiac and renal asthmatics, chronic bronchitics, and those suffering from pulmonary tuberculosis, especially refill cases.

Patients with active tuberculosis should not travel by air unless their sputum is free from tubercle bacilli and any cavity is controlled by collapse therapy, but not within a week of a refill. If the mediastinum is fixed, the lung must be at least three-quarters expanded. Pneumo-peritoneal refill cases should not have more than

Medical Contraindications to Air Travel.

Condition	Limiting Factors	Essential Facilities and Precautions in Flight	Whether Advisable to Travel by Air
1. Blood and Lymphatic System Diseases			
(i) Anaemias	Less than 3,000,000 R.B.C. per c.mm.; less than 50% Hb. (May need transfusion before flight)	Maximum altitude 5,000 ft. Oxygen must be available	Inadvisable unless aircraft is pressurized to 5,000 ft.
(ii) Leukaemias	Less than 3,000,000 R.B.C. per c.mm.; less than 50% Hb. Gross enlargement of spleen. Haemorrhages. (May need x-ray therapy before flight, which should not be within 4 weeks of the x rays)	Maximum altitude 5,000 ft. Oxygen must be available	Acute cases should be rejected, unless Hb is raised to 80% by a blood transfusion. Chronic cases inadvisable unless aircraft is pressurized to 5,000 ft.
(iii) Lymphadenoma	Enlargement of mediastinal lymph glands revealed by x-ray film. Fever of the Pel-Ebstein type	Oxygen must be available	Cases to be considered on their merits
2. Cardiovascular Diseases			
(i) Angina pectoris	Frequent or recent attacks. Electrocardiogram to exclude coronary occlusion	Maximum altitude 5,000 ft. Oxygen must be available. Movement in aircraft should be limited to minimum	Inadvisable unless in aircraft pressurized to 5,000 ft., and attacks provoked only by brisk walk of about $\frac{1}{2}$ mile
(ii) Coronary occlusion	Symptoms within 12 months	Maximum altitude 5,000 ft. Oxygen must be available. Movement in aircraft should be limited to minimum	Inadvisable unless in aircraft pressurized to 5,000 ft.
(iii) Valvular lesions			
(a) Compensated	Degree of anaemia	Maximum altitude 8,500 ft. Oxygen must be available	If flight is under 8,500 ft.
(b) Uncompensated	Signs of congestive failure	—	Reject
(c) Congenital	Evidence of veno-arterial shunt (cyanosis), heart block, or severe hypertension	Maximum altitude 8,500 ft. Oxygen must be available	If flight is under 8,500 ft.
(iv) Myocardial lesions	Active disease or bradycardia. In post-diphtheria cases 6 months must have elapsed since illness	Maximum altitude 5,000 ft. Oxygen must be available	Cases to be considered on their merits
(v) High blood pressure	B.P. 200/120 mm. Hg or above. Headaches or loss of weight. Pulsus alternans. Cardiac asthma. Unsatisfactory condition of optic fundus. Albuminuria more than 2%. Cellular casts in urine	Maximum altitude 8,500 ft. Oxygen must be available	Inadvisable except in pressurized aircraft
3. Diabetes	Other than moderate types without cardiovascular disease, which must be stabilized by diet or insulin. Should have a recent blood-sugar estimation and report. Fasting blood-sugar level should be below 250 mg. per 100 ml.	Must adhere strictly to prescribed hours of meals and insulin injections. Not to move about at altitude more than necessary. Oxygen must be available. Hyoscine to prevent air-sickness	Only milder and moderate cases acceptable—that is, those not needing more than 50 units of insulin a day
4. Elderly	Unsatisfactory cardiovascular condition. In the case of a patient over 65 who is undertaking a long flight, it is advisable that a medical examination be carried out to eliminate anaemia or cardiovascular conditions. An electrocardiogram may be necessary where doubts exist	Not to move about at altitude more than is necessary. Oxygen should be available in non-pressurized aircraft	Depends on physical condition. Pressurized aircraft advisable (maximum altitude 8,500 ft.) for the very elderly
5. Gastro-Intestinal Diseases			
(i) Peptic ulcer			
(a) Quiescent and old perforation	As proved by absence of: (i) symptoms of activity; (ii) occult blood in faeces; (iii) x-ray evidence of active disease; (iv) proneness to travel sickness	Not over 8,500 ft. Hyoscine to prevent air sickness. Carminatives for flatulence	Preferably by pressurized aircraft (8,500 ft.)
(b) Active	Pain. Occult blood in faeces. X-ray evidence. Proneness to travel sickness	Not over 5,000 ft. Limit movements in aircraft. Hyoscine to prevent air-sickness. Carminatives for flatulence. Follow dietetic advice	Normally reject. Pressurized aircraft if journey essential
(ii) Post-operation			
(a) Appendicectomy	At least 10 days must have elapsed since the operation	Not over 8,500 ft. shortly after operation. Hyoscine to prevent air-sickness	Flight should be under 8,500 ft.
(b) Herniotomy	At least 10 days must have elapsed since the operation	Not over 8,500 ft. shortly after operation. Hyoscine to prevent air-sickness	Flight should be under 8,500 ft.
(c) Other resections and wounds	Depends on condition of gut, fluid in abdomen, etc. Unable to go to lavatory unaided	Not over 5,000 ft.	Inadvisable except at 5,000 ft. maximum in pressurized aircraft
(d) Colostomy	Effect on fellow travellers	—	Reject
(iii) Haematemesis and melaena	—	—	Reject
6. Genito-Urinary Diseases			
(i) Calculus	If attacks of renal colic are frequent	Hyoscine to prevent air-sickness	Normally acceptable
(ii) Nephritis	Systolic blood pressure over 200 mm. Hg. Degree of anaemia (see Anaemia). Ascites or hydrothorax. Unsatisfactory condition of optic fundi. Albuminuria more than 2%. Cellular casts in urine. Blood urea more than 60 mg. per 100 ml.	Maximum altitude 8,500 ft. Oxygen should be available	Normally acceptable, but consider each case on its merits
(iii) Venereal	Must be free of active lesions, especially those of skin or buccal infections	—	Reject till non-infectious
7. Infectious Diseases	While infectious	—	Reject
8. Liver Diseases			
(i) Abscess	Those liable to burst	Maximum altitude 8,500 ft. Oxygen must be available	Normally reject. If essential, travel below 8,500 ft.
(ii) Cirrhosis	Evidence of congestive failure. Haemorrhages. Ascites or hydrothorax	Maximum altitude 8,500 ft. Oxygen must be available	Normally reject
9. Mental and Nervous Conditions			
(i) Brain tumours	Pressure symptoms. Incontinence	Maximum altitude 5,000 ft. Doctor or nurse in attendance	Normally reject
(ii) Epilepsy	Frequently occurring fits	Attendant advisable. Suitable sedative. No alcohol	Inadvisable except in milder cases
(iii) Mental disease	Non-quiescent state. Lack of control of bowel and bladder. Homicidal or suicidal tendencies	Attendant essential. Calmed with suitable sedative	Normally reject
(iv) Poliomyelitis	Not less than one month after onset (i.e., must be non-infectious). Unable to walk to lavatory. Respiratory involvement during illness	Attendant, if patient is not freely mobile. Oxygen must be available	Acceptable
(v) Other palsies	Lack of control of bowel and bladder. Unable to walk to lavatory	Attendant, if patient is not freely mobile. Oxygen must be available	Decide each case on its merits

Medical Contraindications to Air Travel—(continued)

Condition	Limiting Factors	Essential Facilities and Precautions in Flight	Whether Advisable to Travel by Air
10. Pregnancy	Must not be beyond 8th month of pregnancy. Evidence or history of repeated or threatened abortion, eclampsia, or travel sickness	Ensure that retention belt is round pelvis, not abdomen, at take-off and landing. Sit in backward-facing seat, if available. Oxygen must be available. Hyoscine to prevent air-sickness	If medical certificate is satisfactory and weather conditions are favourable for smooth flight at altitudes under 9,000 ft. Oxygen available. Pressurized aircraft advisable
11. Respiratory Diseases			
(i) Asthma	Severe attacks. Cardiac or renal basis	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Consider each case on its merits
(ii) Emphysema and bronchitic conditions	Dyspnoea. Cardiac lesion. Offensive sputum	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. Consider each case on its merits
(iii) Fibrosis of lungs	Extensive	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. If essential, travel in aircraft pressurized at 5,000 ft.
(iv) Lobectomy and pneumonectomy	Must be more than 3 months since operation. Breathlessness on moderate exertion	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. If essential, travel in aircraft pressurized at 5,000 ft.
(v) Pleurisy			
(a) Dry	Pain and extent of lesion. Fever	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. If essential, travel in aircraft pressurized at 5,000 ft.
(b) Wet	If one side of chest is more than half filled. (Tap if necessary)	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible. Doctor or nurse in attendance	Normally reject. If essential, travel in aircraft pressurized at 5,000 ft.
(vi) Pneumonia	Must be more than a month since recovery	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. If essential, travel in aircraft pressurized at 5,000 ft.
(vii) Pneumothorax (artificial) ..	Refill must have been done more than 7 days ago. Degree of displacement. If mediastinum is fixed, lung must be not less than three-quarters expanded. Bilateral involvement	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. If essential, travel below 5,000 ft.
(viii) Pneumoperitoneum ..	Refill must not be more than 2,000 ml. at each site, and must have been done more than 7 days ago	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Normally reject. If essential, travel below 5,000 ft.
(ix) Tuberculosis			
(a) Active	Danger of haemoptysis and spread of infection	Maximum altitude 5,000 ft. Oxygen must be available. Move about as little as possible	Reject unless sputum is free from tubercle bacilli, or any cavity is controlled by collapse therapy
(b) Healed	As proved by: (i) Recent examination of sputum showing no evidence of tubercle bacilli. (ii) X-ray film of lungs. (iii) Clinical condition	Maximum altitude 8,500 ft. Oxygen must be available	Acceptable if flight below 8,500 ft. can be guaranteed
12. Tumours	Depends on site and presence of metastases and nature of complications	As required by symptoms	Depends on case

2,000 ml. of air introduced into each site. Moreover, the altitude of the flight should never exceed 5,000 ft., and oxygen must be available for immediate use in all pulmonary disease cases, whether tuberculous or otherwise. Lobectomy and pneumonectomy cases do not travel well by air, especially within three months of operation: normally they should be rejected, the degree of breathlessness on exertion being a good guide

Those suffering from angina pectoris must have the condition adequately controlled with trinitrate, and an electrocardiogram should be done to exclude infarction: such cases can be accepted if the angina is provoked only by a brisk walk of half a mile. Cases with congenital heart lesion can be accepted for low-altitude flights if there is no veno-arterial shunt as evidenced by cyanosis, or if there is no heart-block or severe hypertension resulting from coarctation of the aorta. Cases of high blood pressure are acceptable if the systolic pressure is not over 200 mm. Hg and the diastolic is less than 120, provided they have flown before and there is no pulsus alternans, cardiac asthma, gross albuminuria, or cellular casts in the urine: those who have not flown before may be upset by nervous tension.

Diabetics in whom the level of the fasting blood sugar is higher than 250 mg. per 100 ml. should not travel for long distances by air or at altitudes greater than 8,500 ft. (2,590 m.). Acceptable cases should be fully stabilized and keep strictly to the clock in respect of insulin and meals. They should not alter the time by their watch during the flight, but inform the chief steward of their hours of meals and their diet requirements, and have by them an adequate supply of sugar to take in the event of air-sickness. They can adjust their diabetic life to the change of time on arrival at their destination.

Elderly persons travel well at altitudes up to 10,000 ft., provided they are free from organic disease; it is advisable, however, that oxygen should be available, and where possible they should journey in a pressurized aircraft. In cases of doubt an electrocardiogram should be taken. Obese persons should be examined carefully to assess whether the fatty changes have affected the cardiovascular system, and advised accordingly.

Those with active ulcerative conditions of stomach or intestines should be warned against air travel owing to the danger of gaseous distension causing a haemorrhage or perforation. Cases of perforation or haemorrhage of the gastro-intestinal tract should not travel by air within two months of the occurrence, then only at an altitude not greater than 5,000 ft. It is essential in public air transport that all passengers should be mobile enough to go to the lavatory, aided by an attendant if necessary. Colostomy, urinary incontinence, and other odorous cases are obviously unacceptable in the confines of a public aircraft. When nephritis is present it is necessary to exclude severe anaemia, gross albuminuria, ascites, and hydrothorax before advising air travel. Infectious cases are rejected for obvious reasons. Those with cirrhosis of the liver should be rejected if there is evidence of congestive failure, haemorrhage, ascites, or hydrothorax.

Mental patients are not accepted normally, as their presence would worry the passengers and aircrew: when transported by air, they must be in a quiescent state vouched for by a mental specialist, and be accompanied by a doctor or nurse with suitable sedatives. Flying at altitude may precipitate fits in epileptics, so that only mild cases are acceptable: it is important that they should not take alcohol. Paretic cases must have full control of their bowels and bladder, and be able to walk to the lavatory,

aided if necessary. Hyperthyroidism of moderate degree is not adversely affected by air travel unless there is fear of flying, in which case sedatives should be prescribed: those with auricular fibrillation should not fly. Would-be travellers suffering from acute inflammations of the upper respiratory tract, or of the middle ear, should not fly until after the condition has subsided, as the changes in atmospheric pressure may lead to spread of infection to the paranasal sinuses and the middle ear. Those with chronic blockage of the paranasal sinuses or Eustachian tubes are unable to adjust the air pressure in their middle ears during descent, and should be advised not to fly.

It is important that expectant mothers should undergo a medical examination and obtain advice before undertaking a journey by air, and that the doctor consulted should know the proposed flight plan, its expected duration, and the altitudes likely to be attained. The difficulties of attending to a confinement or an abortion while in flight will be appreciated, so that the question of the date of expected delivery and the possibility of abortion must be carefully assessed. International airlines accept pregnancy cases up to the eighth month provided they are in good health and that oxygen is available, whether the aircraft is pressurized or not. It is important to be assured that reasonable weather conditions are forecast to avoid the danger of air-sickness or the need to use a retaining belt except at taking off and landing. Pregnancy cases should sit in backward-facing seats where these are available, so that the retention belt need not be tight at taking off and landing. They should be instructed to place the belt as low down as possible on the abdomen—just above the groins.

Children, infants, and babies travel well by air, but need oxygen at the same altitudes as do healthy adults. It is difficult to instruct very young children and babies how to equalize the pressure on either side of the ear drums on descent from altitude, so mothers should be told to feed a baby during descent and to give an older child a sweet to suck or some gum to chew to open the Eustachian orifice. If this is not done there will be pain in the ear and the child will cry: crying fortunately opens the orifice and relieves the condition.

Prevention of Air-sickness

Air-sickness is not a common occurrence in civil passenger flying, unless in "bumpy" weather. It is important, however, to take steps to prevent diabetics, expectant mothers, and those suffering from gastro-intestinal diseases (including post-operation cases) from being air-sick. The best preventive measure is to give hyoscine hydrobromide (1/100 gr.—0.65 mg.)* by mouth about an hour before flight, and to repeat this two hours later if necessary: for children the dose should be 1/200 gr. (0.32 mg.). Patients should be so advised and informed that after the first stage of the journey they will probably become acclimatized to flying and will not need any more tablets, unless bumpy weather is encountered. These anti-air-sickness tablets can be obtained from flight stewards and stewardesses in aircraft.

A number of factors predispose to air-sickness, such as fatigue, type of meal, noise, vibration, and cold. Advice should therefore be given regarding the need for sound rest the night before a flight, proper evacuation of the bowels, a light meal about an hour before taking off, and small light meals during the trip. In addition, those prone

to travel sickness should wear suitable clothing so as to be warm but not overheated and should protect their ears against aircraft noise by means of moistened cotton-wool plugs as provided on board. If they feel sick during flight they should be advised to relax and lie back in their seats, looking upwards, so as to minimize stimulation of the sensory hairs of the utricles by the otoliths (see Diagram).

Diagram to show position of otolith in the utricle in relation to vertical movements when the head is in various positions. Repeated vertical movements, whether accompanied or not by swaying, press the otolith on the sensitive nerve filaments in the floor of the utricle, leading to excessive stimulation and probably to travel sickness.

Travel Regulations

For international air travel the passenger has to carry certain inoculation certificates, depending on the destination and the countries to be traversed. The would-be traveller must have been vaccinated against smallpox within one to three years, and, if the journey is to be through a yellow-fever zone, immunized against that disease. Moreover, some countries still insist on inoculation against typhoid, typhus, plague, and cholera. Details of immunization requirements can always be obtained from the Medical Department, British Overseas Airways Corporation, Stratton House, Stratton Street, W.1 (tel.: Mayfair 6611, extension 134): these are published periodically in tabular form in the *British Medical Journal* under the heading "Air Travel." These requirements must be borne in mind when advising a patient regarding travel, as the immunizing procedure may have an adverse effect on the patient's condition.

The doctor concerned should see that the patient has all drugs and appliances necessary for the journey, and that he or she fully understands any action necessary *en route*. To this end, instructions should be written clearly. Apprehensive individuals and those who sleep badly when travelling should be given a sedative, which also will help to ward off travel sickness. If desired, the drugs and appliances can be handed to the chief steward of the aircraft for custody and control of medication. Air stewards and stewardesses have had a training in first aid and are normally in charge of the first-aid outfits. Any medical attendant or nurse required to accompany the patient must be provided by the passenger.

In any case of doubt the medical practitioner is advised to consult the appropriate airline medical authority—B.O.A.C., Stratton House, Piccadilly, W.1 (tel.: Mayfair 6611); B.E.A., Northolt Airfield, Middlesex (tel.: Ruislip 6061); B.S.A.A., Dr. J. C. Macgown, 21, Wimpole Street, W.1 (tel.: Langham 3243). To help the authority to make

*"Dramamine" (β -diaminoethyl benzohydryl ether 8-chlorotheophyllinate) is claimed by the Army Medical Department of the U.S.A. to be more efficient than hyoscine.

a decision the medical practitioner should provide a statement covering the following points:

1. Name, age, address, and telephone number of invalid.....
2. Diagnosis of condition.....
3. Manifest symptoms.....
4. Severity of disability (mild, severe)*.....
5. Whether infectious or non-infectious.....
6. Where under treatment—if in a hospital or nursing-home.....
7. Nature of treatment.....
8. Whether treatment effectively controls symptoms.....
9. Whether treatment is necessary during the air journey.....
10. Whether an attendant is necessary.....
11. Whether patient can walk unaided.....
12. Whether patient can travel in sitting position.....
13. Any other points.....
14. In my opinion..... is fit to travel by air
from..... to.....

Signature of doctor

Address and Tel. No.

*Clinical findings referred to in a Table as possible limiting factors, including the systolic and diastolic blood pressures, should be recorded.

THE PHYSIOLOGICAL BASIS OF VAGOTOMY

BY

A. DAVIS BEATTIE, F.R.C.S., F.I.C.S.

Surgeon, Leicester General Hospital

The surgical treatment of peptic ulcer has recently become a matter of some controversy. The place held so long by subtotal gastrectomy in the treatment of all types of gastro-duodenal ulceration is now being challenged by vagotomy, and it is therefore of some importance that the physiological principles underlying the newer procedure should be generally appreciated.

Aetiology of Peptic Ulcer

There is little fundamental difference between the factors primarily responsible for gastro-duodenal ulceration and those producing similar lesions elsewhere. Trauma is probably the usual initiating factor; though toxæmia, localized vascular spasm, and even trophic neuritis may occasionally play a part in its onset. When an acute ulcer results from the action of one or more of these factors the natural reparative processes of the body attempt to produce healing, but their action is opposed both by the physiological peristaltic activity and by the digestive nature of the gastric secretion. Dragstedt (1942) has shown that these alone are not sufficient to delay physiological healing and to lead to chronic ulceration in a normal individual.

The stomach and duodenum are readily digested by pure gastric secretion, particularly if the latter has a high acid content, but they are rarely exposed to such action in a normal individual. The acid content of the stomach is relatively low unless provoked by the presence of food, which itself acts as a diluent, and it is still further lowered during digestion by the periodic regurgitation of duodenal contents. Moreover, all living tissues display a considerable resistance to digestion by the gastric juices owing to the

protection afforded by their mucous surface secretions. It is only when these protective mechanisms are overcome that a typical peptic ulcer develops in experimental animals.

Past Attempts at Physiological Surgery

Hyperacidity has long been recognized as the main factor responsible for the abnormal persistence of the ulcerative process and the consequent development of a chronic ulcer. From the introduction of gastro-enterostomy by Wolfler in 1881, successive attempts have been made to deal surgically with this problem along physiological lines. None of them has proved entirely successful, however; even the various modifications of subtotal gastrectomy, which have so far formed the most certain approach, being not without certain drawbacks and a proportion of failures.

The rationale of these operations is the resection of a sufficient area of the acid-secreting portion of the stomach to prevent subsequent hyperacidity, and, since this will obviously vary from individual to individual, their success depends on striking a correct balance in each case. To leave too much stomach will obviously defeat the whole object of the procedure, whilst the removal of too much may lead to possible anaemia and the development of "small stomach" symptoms afterwards. The latter are, in fact, responsible for the majority of poor results following modern techniques, as the tendency is towards over-removal of gastric mucosa in an attempt to prevent subsequent ulcer recurrence. Recent figures show that a surprisingly high percentage of patients who have had apparently successful gastric resections are unfitted for full economic life afterwards by the intermittent gastro-intestinal upsets which follow and the impossibility of returning to normal dietetic existence.

Gastrectomy has other disadvantages also. The operative mortality, though surprisingly low in expert hands, is necessarily higher in the older age groups—the very patients in whom the complications of ulcer have themselves such a high death rate. Moreover, it is a mutilating operation and, while a physiological proceeding so far as the ulcer problem is concerned, leaves an unphysiological and deformed upper digestive tract in its wake.

The Ulcer Diathesis

The relative failure of all past surgical attempts to deal really successfully with peptic ulcer has recently resulted in careful reconsideration of the problem of the ulcer diathesis and its underlying factors.

It has long been recognized that a true ulcer diathesis does exist. The typical ulcer patient belongs to Goldthwait's (1915) asthenic type. He is a thin, lanky, narrow-chested individual with a "lean and hungry look"—driving, ambitious, emotional, and tense. The psychic make-up accompanying these physical characteristics often determines the choice of occupation, with the result that certain professions and trades—such as engineering, law, and surgery—are particularly ulcer-prone. There are, however, quite a number of ulcer patients who do not fall into this main group. These individuals belong more to the sthenic type. They may exhibit a most deceptive external calm and seem to keep their nervous stress hidden well beneath the surface. It is interesting, as Moore (1946) points out, that this type of individual tends to suffer from ulcers which bleed rather than from typical ulcer pain.

To whichever group the ulcer patient belongs, however, he shows the same reaction towards his environment. Most intelligent patients can correlate definite exacerbations of their symptoms with such events as prolonged nervous stress, fatigue, overwork, or irregular meal hours. Sex also seems to play a contributory part in ulcer development.