Case 2 also had two acute cerebral attacks: the first resulted in a right hemiparesis, and the second, three weeks later, in a left hemiparesis. Supranuclear bulbar palsy developed with the second attack and disturbance of articulation was the most striking feature.

In Case 3 it seems likely that several small cerebral emboli affected both sides of the brain almost simultaneously. Typical supranuclear bulbar palsy immediately resulted and the spastic laughter and tears were very evident. Although emotional control improved considerably it was not complete six months later.

All three cases had marked dysarthria and dysphagia and all were temporarily incontinent of urine. The onset of supranuclear bulbar palsy was in each case abrupt, but all three showed considerable improvement.

In supranuclear bulbar palsy resulting from cerebral arteriosclerosis the vascular degenerative changes are likely to be diffuse and multiple. Bilateral pyramidal-tract signs are usually present and there may be a history of double hemiplegia, though there is often an interval of months or years between the involvement of the two sides. Sometimes the supranuclear bulbar features are accompanied by only a hemiplegia or hemiparesis. More rarely there is no limb paralysis at all, though the plantar responses may be extensor. In addition to the involuntary laughter and crying, progressive dementia is seen in the arteriopathic group and occasional extrapyramidal features have been described. The course of the disease is irregular and may be prolonged.

When supranuclear bulbar palsy is produced by bilateral cerebral embolism, however, there is usually a history suggesting sudden vascular occlusion on one side of the brain, followed quite rapidly by the same process on the opposite side, so that bilateral interference with the cortico-bulbar and cortico-spinal pathways immediately results. The embolic form of supranuclear bulbar palsy may occur in young subjects. Dementia is not a feature of the condition, and, if the emboli are small, rapid resolution of symptoms may occur.

Summary

Supranuclear bulbar palsy (so-called pseudobulbar palsy) most often results from diffuse cerebral arteriosclerosis, with or without a history of double—that is, bilateral—hemiplegia.

Three cases of mitral stenosis are described in which bilateral cerebral emboli resulted in the abrupt development of the characteristic syndrome of supranuclear bulbar palsy with bilateral pyramidal-tract signs.

We should like to express our thanks to Professor E. P. Sharpey-Schafer, Dr. J. W. Aldren Turner, and Dr. E. D. Mackworth for permission to describe these cases, originally admitted to hospital under their care.

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Dr. L. Leslie has been made vice-chairman of the Berkshire Executive Council in place of the late Dr. J. McCrea.

MORTALITY IN GERIATRIC SURGERY*

BY

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The life-span has been increasing markedly, as is shown by Chart 1. According to the National Office of Vital Statistics (1950), it is 67.2 years in the United States. Chart 2 indicates that those aged 65 and over constitute 7.6% of the population. The Royal Commission on Population (1949) reports that in 1947, in Great Britain, those who were 60 years and over constituted 15% of the population.

More attention is being focused on problems of ageing. It is our function to apply our art not only to save life but to add years to life and life to years, and to reduce mortality. The surgeon has come to play a most important part in the attainment of these goals. We have had an unusual opportunity for the practice of geriatric surgery at the Goldwater Memorial Hospital, in New York City. This 1,500-bed municipal hospital was opened in 1939 for the care and study of chronic disease. Most of the patients are old and are substandard risks. They are afflicted with chronic and degenerative diseases and with nutritional deficiencies. Nevertheless, we do not hesitate to meet surgical indications if there is a chance to save life or to prevent invalidism.

Only patients over the age of 60 are included in this report. Table I (Carp, 1946) shows comparative operative mortality statistics from a number of clinics. At our clinic, from 1939 to 1944, the mortality rate in 450 major

TABLE I.—*Comparative Operative Mortality Statistics (Carp, 1946)*

Source	Age Groups	No. of Major Operations			Mortality %		
		M.	F.	Total	M.	F.	Average
Goldwater Memorial Hospital*, 1939–44	61–70	152	50	202	15·78	22·0	18·89
	71–80	148	47	195	24·18	27·6	25·89
	81–90	38	12	50	44·73	25·0	34·86
	91–100		2	2			
	101–110		1	1			
	Total	338	112	450			22·66
Bailey (1934) ..	60–84			185			7·6
Parsons and Purks (1942)	60 and over			100			17·0
Clagett (1943) ..	60 ,, ,,			1,204			9·0
Hay (1940) ..	70 ,, ,,			536			16·6
Evans and Key (1942)	60 ,, ,,			83			7·2
		Grand total		2,558	Grand aver.		13·1

* The emergency operations were 12·88% of the total number.

TABLE II.—*Goldwater Memorial Hospital: Major Operations on Substandard Risk Patients Over 60 Years of Age. Post-operative Mortality Rates Within 30 Days*

Period	No. of Major Operations		% Emergency of Total	Post-operative Deaths Within 30 Days		% Mortality Rate	
	Total	Emergency		Total	Emergency	Total	Emergency
1945 ..	166	32	19·4	40	23	24·1	71·9
1946 ..	131	32	24·4	25	16	19·1	50·0
1947 ..	162	44	27·2	23	12	14·2	27·3
1948 ..	193	41	21·2	25	11	12·9	26·8
1949 ..	199	56	28·1	34	18	17·1	32·1
1945–9 ..	851	205	24·1	147	80	17·3	39·0
1939–44 ..	450	59	13·0	102	26	22·6	44·0

*Read before the Section of Geriatrics at the Annual Meeting of the British Medical Association, Liverpool, 1950.

TABLE III.—*Analysis of Causes of Death in 100 Consecutive Necropsy Protocols in Patients Over 60 Years of Age Who Died Within One Month After Operation (Carp, 1948)*

	Principal Causes	Important Contributory Causes
Bronchopneumonia	28	10
Cardiac dilatation	27	3
Peritonitis	18	1
Thrombosis and embolism	7	2
Sepsis	7	1
Pyelonephritis	6	15
Coronary occlusion	3	2
Anaesthesia	2	—
Lung abscess	1	—
Metastatic carcinoma	1	12
Decubitus ulcers	—	5
Pulmonary tuberculosis	—	3
Bronchiectasis	—	2
	100	

operations, 13% of which were emergency cases, was 23%. During 1945–9 the mortality rate in 851 major operations (Table II) has been reduced to 17%, with the emergencies constituting 24%. There is also a 5% drop in mortalities from emergency surgery when the years 1939–44 are compared with the years 1945–9. Table III (Carp, 1948) shows that the major causes of death in 100 consecutive necropsies on patients over 60 who died within one month after operations were bronchopneumonia, heart failure, and peritonitis. The major contributory causes were pyelonephritis and metastatic carcinoma.

Some Common Problems

Disease in the aged may be complex, varied, and confusing, contributing to diagnostic error and presenting problems in treatment.

Emergency Surgery.—This produces an inordinately high mortality rate. It is about two and a quarter times that of elective surgery. Cutler's (1947) figures from our service showed that among patients whose average age was 74 years there were 84 deaths following 188 emergency operations — a mortality rate of 44%. If no attempt at surgical relief had been made nearly all these patients would have died. Recent mortality in emergency cases is 32% (Table II). The risk is greater when patients come to operation late, especially in cases of spreading infections and obstruction in various systems. Deterioration is then very rapid. Valuable time may be lost because differential diagnosis is difficult; pre-operative preparation may be prolonged; the patients are considered "too sick or too old"; and hope for improvement is too long entertained. If the mortality in acute cases is to be reduced there must be quick supportive therapy, with the earliest and simplest operation to effect relief and measures to prevent post-operative complications.

Early Cholecystostomy.—This is the operation of choice for acute cholecystitis and/or cholelithiasis. The patients in this group were desperately ill. Old people are especially susceptible to sudden gall-bladder catastrophes. The largest

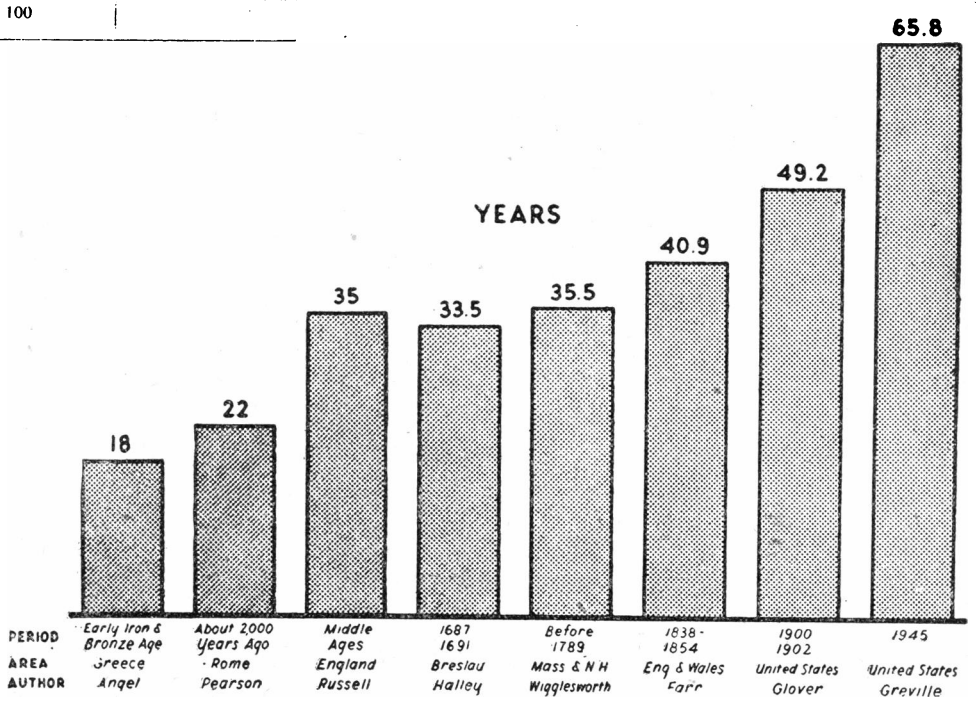

CHART 1.—Showing average length of life from ancient to modern times (Metropolitan Life Insurance Company, 1947).

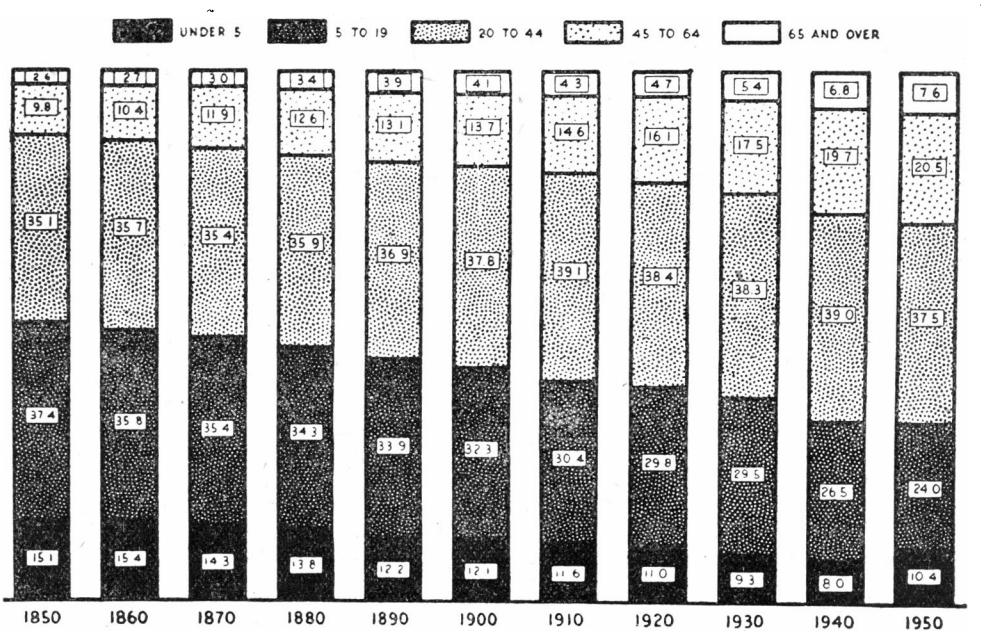

CHART 2.—Percentage distribution of total United States population by age, 1850 to 1950 (Metropolitan Life Insurance Company, 1949). 1850 to 1940 from U.S. Census data; 1950 estimates published by Bureau of the Census, 1949.

percentage of gall-stones are found in the sixth and seventh decades (Jaffé, 1933). Rosenthal (1944) showed that of 300 routine necropsies at the Goldwater Memorial Hospital on patients between the ages of 60 and 100, 23% of 133 men and 40% of 87 women had diseased gall-bladders with stones. At first, cholecystostomy was the operation of choice. However, with improvement in anaesthesia, and with supportive and antibiotic therapy, and influenced by the propaganda for cholecystectomy, we undertook this procedure instead. Almost 50% mortality ensued from pneumonia, heart failure, or peritonitis. Cutler (1949) reported from our service 34 acute cases, whose average age was 73 years. He concluded that such cases should come to surgery as soon as is consistent with adequate preparation, and he recommended cholecystostomy as the safer emergency procedure. With the readoption of cholecystostomy the nine succeeding cases (average age 79.3 years) showed a mortality of 22%. In common-duct obstruction by stone, cholecystostomy is done if a free flow of bile results. If subsequent indications arise a patient is then in better condition to withstand cholecystectomy or choledocotomy.

Intestinal Obstruction.—This calls for immediate tube decompression, for methods to increase blood volume and to restore fluid and electrolyte balance, and for quick operative relief. In treating intestinal obstruction there has been a tendency to prolong the use of tube decompression. Clinical results have convinced us that in the aged such a policy will lead to a mortality of 60%. Surgical relief within 24 hours cuts mortality to 39%. Cutler (1950) has supplied these figures after a study of 120 cases. A patient may improve rapidly with tube decompression and parenteral therapy, encouraging postponement of surgery. Undue postponement will turn the tide against him. Location of the obstruction can be aided by rapid *x*-ray examination. Relief of the obstruction by the simplest appropriate procedure is indicated. More radical therapy, if required, can be undertaken at a later date when the patient is in better condition.

Acute Appendicitis.—This is a difficult diagnostic problem and its mortality is high. Frequently the clinical picture of appendicitis in the aged is confused and the history and physical signs are atypical. Patients, as a rule, come to operation too late. Accompanying disease and diminished resistance to infection increase the incidence of gangrene and perforation, and raise the post-operative morbidity and mortality (Darling and McIver, 1950). We have had 26 patients of over 60 diagnosed as suffering from acute appendicitis. The mortality rate in 19 proved cases was 36%. In another six patients (23%) the diagnosis was incorrect. In three of these no accountable pathology was found, one had a carcinoma of the caecum, one had a fibrotic appendix, and one had a calculous pyonephrosis. The average age of the proved cases was 75 years. Ten of the appendices perforated. At the four necropsies among the seven patients who died the causes of death were found to be pneumonia and cardiac failure in one case, general peritonitis in two cases, and shock in the other.

Hernia.—Surgical therapy under local analgesia is advisable for symptom-producing inguinal and femoral hernia. When hernia is accompanied by pain, a disabling mass, or recurrent incarceration, operative relief, especially under local analgesia, is gratifying. Patients walk within 24 hours after operation. Strenger (1949) has reported from our clinic on 95 operations for hernia, including 78 inguinal and 10 femoral. Three patients died after emergency surgery for strangulation. One elective case died of brain tumour. There were no fatalities in 44 additional cases. The patients' average age was 71 years. Four of them had strangulation, but in no case was resection necessary.

Tourniquets.—The use of the tourniquet for amputations is not approved. We hold that the trauma of tourniquet constriction will further damage affected blood vessels. We have abandoned its use in the past three years. Previously, 15 patients had mid-thigh amputations for arteriosclerotic gangrene under crymo-anaesthesia (refrigeration) with tourniquet. All the stumps were closed and eight of them broke down. Five patients died. In three of these there was found massive thrombosis in large blood vessels in the abdomen or thorax. We believe that the tourniquet was the main predisposing factor in thrombosis and stump breakdown. While preparing the patient for amputation, however, the tourniquet is useful in limiting the swift ascent of infection in acute cellulitis.

Mid-thigh Amputation Stumps.—Closure of mid-thigh amputation stumps in layers is advisable for diabetic or arteriosclerotic gangrene, except when ascending infection is present or when the circulation of the amputation site is seriously impaired. The practice of leaving stumps open does not seem justified. Wounds take much longer to heal, asepsis and nitrogen balance are difficult to maintain, and the stump may be unsatisfactory. Unless there is ascending infection or thrombosis of the femoral vessels we close muscle, fascia, and skin, with the free use of antibiotics. Sixty patients (average age 68) had closure of stumps. Of these, 23 had diabetic and 37 arteriosclerotic gangrene. In 20 of the diabetic patients (87%) the stumps healed nicely. In 22 of the arteriosclerotic patients (60%) there was good union. Four other patients in this group had delayed union. Of the 15 patients in both groups who had crymo-anaesthesia with tourniquet, eight (53%) had wound breakdown. We believe that factors in the breakdown were the anoxia and the thermal injury to the tissues. In 16 patients (average age 72) stumps were left open and traction was applied. In 75% the indication was ascending infection. The average healing-time in the 11 patients who survived was 50 days.

Suggested conclusions are : (1) the interdiction of the tourniquet and crymo-anaesthesia, except in sepsis and swift ascending infection ; (2) careful haemostasis ; (3) traction on stumps which are left open ; and (4) early and frequent wound inspection to detect infection.

Decubitus Ulcers.—Prophylactic care will minimize the incidence of decubitus ulcers. The factors in the physical decline that accompanies decubitus ulcers are toxic absorption, sepsis, and nitrogen loss. Decubitus ulcers were the contributory cause of death in 5% of our necropsies. Maintenance of a positive nitrogen balance, the relief of local pressure, early ambulation, repeated change of position, cleanliness, skilful nursing, and keeping the skin dry constitute the best treatment. We have tried operative closure of some of the decubitus ulcers without success.

Ambulation.—Early out-of-bed care and ambulation are beneficial. Early ambulation is indicated in the old patient. It induces better breathing, appetite, and urinary and bowel function. It seems to reduce the incidence of pneumonia, heart failure, thrombosis and embolism, and decubitus ulcers.

Chemical Balance

Adequate chemical balance helps to maintain comparatively normal homoeostasis and physical reserve. In the

aged, physical deterioration is accompanied by rapid and marked chemical imbalance. Our principles for supportive therapy are :

1. Food is preferable to parenteral therapy. A high-calorie, high-protein, and vitamin-rich diet is important. The edentulous should be given cooked ground meat.

2. The daily water requirement of 2.5 litres may have to be doubled, with additional sodium chloride, in patients who have been dehydrated.

3. The daily requirement of 1 g. of protein per kilogram of weight may have to be doubled or trebled after operation, or in depleting diseases or infection.

4. Starvation produces both nitrogen and potassium loss. Low blood potassium may produce asthenia, flaccid paralysis, respiratory distress, and ileus. Bodansky (1950) gives potassium as beef broth or meat juices, or potassium chloride, 2–4 g. daily. Randall *et al.* (1949) recommend a mixture of 1 g. each of potassium acetate, bicarbonate, and citrate in 8 ml. of water: 4 ml. may be taken three times daily. For intravenous use, 2–4 10-ml. ampoules of 15% potassium chloride may be given in 24 hours. Repeated blood potassium determinations are required.

5. Patients with diminished cardiac reserve tolerate best a hypodermoclysis of 2.5% glucose in 0.45% solution of sodium chloride. If diuresis is poor, 50–100 ml. of hypertonic (25–50%) dextrose solution intravenously is recommended.

6. In alkalosis Bodansky (1950) has used a 2% ammonium chloride solution intravenously.

7. A controlled diet and insulin are indicated for the diabetic. In emergencies 5% glucose in saline intravenously, with one unit of insulin for each 2 g. of carbohydrate, is recommended.

Other Problems

Heart Disease.—An ageing heart, coronary sclerosis with myocardial fibrosis, and valvular defects do not necessarily contraindicate operation. Pre-operative digitalization is advisable unless there is a definite contraindication. In 100 necropsies, 27% of the post-operative deaths were found to be caused by heart failure and 3% by coronary occlusion. All the necropsies revealed varying degrees and types of cardiac pathology. Master *et al.* (1950) have stated that "patients with severe heart disease tolerate even major operations if adequate precautions are taken to avoid anoxaemia and coronary insufficiency." Our experience supports these observations. We have used digitalis to strengthen the myocardium, unless there was a contraindication. Irregular cardiac action on the operating table can be controlled by the intravenous use of 5 ml. of a 1 or 2% solution of procaine for ventricular arrhythmias or auricular tachycardia ; oxygen and digitalis for interference in the conduction system ; intravenous quinidine for ventricular fibrillations ; and adrenaline and cardiac massage for cardiac arrest (Collins, 1950).

Anaesthesia.—Improvement in anaesthesia is a major factor in the increasing success achieved by geriatric surgery. Recent advances in anaesthesiology have contributed to reduce morbidity and mortality. Anaesthetists plan the anaesthesia for the individual patient and supply supportive therapy during operation. Pre-operative sedation should be minimal. Cyclopropane is the preferable general anaesthetic. Intravenous sodium thiopentone is favoured for short anaesthesias, with curare as an adjunct for long procedures. Local analgesia, without adrenaline, is very useful in selected cases. Intratracheal anaesthesia is used in thoracic and some oral surgery, and in prolonged upper abdominal surgery. Our service has had but one anaesthetic death in ten years.

Psychological Approach.—Sick old people respond to kindness and understanding. A frank, tactful, and optimistic manner, patience, and kindness will help understanding and inspire confidence. They can convert an uncooperative or frightened patient to a more reasonable and hopeful frame of mind. Ministers in the various religious groups have been most helpful. A proper psychological approach can mean the difference between co-operation and a will to live, and frustration and a hope to die.

Summary

With scientific advance, improved techniques and anaesthesia, and better understanding of the degenerative processes accompanying old age, it is possible for geriatric surgery to provide more comfort in disabling diseases and to prolong life when it is threatened.

Our mortality statistics show a decline (5%) in elective and emergency surgery when the years 1939–44 are compared with 1945–9.

In emergency surgery the mortality rate will be from two to two and a quarter times that of elective surgery.

Our clinical and necropsy experience has pointed to methods of reducing mortality. Some of them are briefly discussed.

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THERMAL COAGULABILITY OF SERUM PROTEINS AND THE DIAGNOSIS OF MALIGNANT DISEASE

BY

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The publication from a reputable source of any laboratory test which may be of value in the diagnosis of malignant disease is a matter to be examined seriously.

Huggins *et al.* (1949) published the results of their investigations on the altered thermal coagulability of serum proteins in malignant disease. They described a test involving the use of iodoacetic acid which was said to increase the sensitivity of the discrimination between the sera of patients with malignant disease and those of healthy individuals and subjects with non-cancerous diseases. While these authors stated that the deficiency revealed in the serum in malignant disease was not specific, and that similar results were obtained in pulmonary tuberculosis and some acute inflammatory processes, their results were striking enough to demand further investigation. Some other groups of American workers have recently described their experience with this test. A series of tests was carried out at the Christie Hospital during the last year, the results of which are given below.